Designing Effective Team-based Performance Measurement Systems: An Integrated Approach

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ABSTRACT

The current trend in industry to move towards team-based organisational structures has resulted in an increased interest to seek innovative ways for managing team performance. In that sense, team performance measurement has been recognised as an effective management practice.

This research departs from an industrial problem identified while working on a number of projects with industry – i.e. *lack of understanding of how to design effective team-based performance measurement systems.* The overall goal is to create a better understanding of the design of effective team-based performance measurement systems (TPMS). In particular, its aim is to gain new insights into (1) the process for designing effective TPMS and (2) the factors that enable and/or constrain the design of effective TPMS. An effective TPMS is defined here as *a performance measurement system that enables the team to increase its contribution to the business and at the same time motivates and develops the team and its individuals.*

This study falls into the *empirical and applied research* category because it focuses on an industrial problem and provides a solution through continuous collaboration with industry.

The following is the most significant contribution of this research:

(1) A typology for TPMS design that describes the characteristics of a comprehensive process for designing TPMS.

(2) The identification and description of ten factors that enable and/or constrain the development of effective TPMS.

(3) A practical construct to enable industrial organisations to design effective TPMS.

The quality of the research was ensured by defining the evaluation criteria and the specific research tactics early in the process. These criteria and tactics guided all the activities carried out during this study.

This thesis will be of interest to managers, team leaders and indeed anyone who works in a team. Researchers working in the fields of performance measurement and team management will also benefit from this research.

ACKNOWLEDGEMENTS

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Kepa Mendibil Telleria

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1. INTRODUCTION

Any researcher, no matter how unstructured or inductive, comes to fieldwork with some orienting ideas (Miles and Huberman, 1994, p.17)

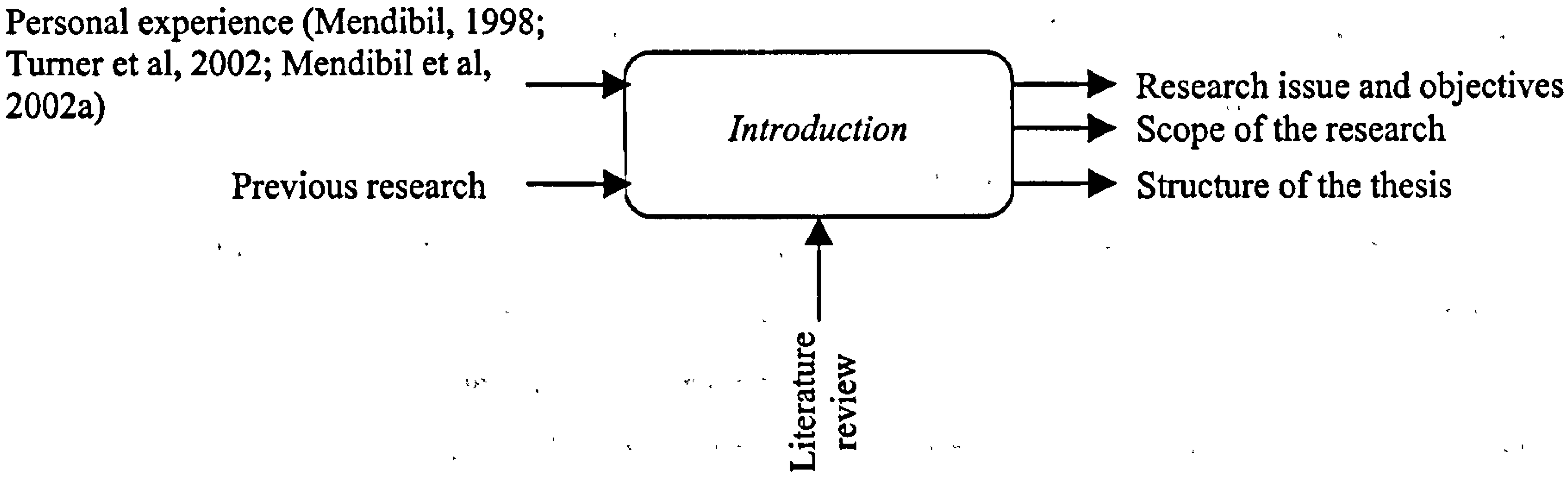

Figure 1.1: Chapter 1 input-output diagram

The motivation for this research resulted from this researcher's previous professional and academic experience in team management and performance measurement. The interest in team performance management emerged while working as the coordinator of the customer order fulfilment team within a steel tube manufacturer. In fact, managing team performance was already high in his agenda from being involved in a number of music and sports teams for some time. After joining the Centre for Strategic Manufacturing[1], the researcher got deeply involved in performance measurement research during a PMS audit study with Honeywell Scottish Operations (Mendibil, 1998) and two action monitoring projects (Turner et al, 2002; Mendibil et al, 2002a) prior to this research.

This chapter introduces the thesis with a description of the point of departure and background of this research work. It then continues with the discussion of the research issue, the research objectives and the definition of the scope of the study. The final section presents the structure of the thesis.

Each chapter within this thesis is introduced with an input-output diagram similar to Figure 1.1. These diagrams summarise the content of the corresponding chapter by identifying the inputs received (left hand side arrows), the outcomes or results delivered (right hand side arrows) and the mechanisms used to carry out the specific activities (bottom arrows).

[1] The Centre for Strategic Manufacturing is part of the Department of Design, Manufacturing and Engineering Management in the University of Strathclyde, Glasgow, UK.

1.1. Point of departure and background of the study

Back in 1999, whilst working with a number of industrial collaborators on process re-engineering and performance measurement projects, this researcher noticed that companies were battling with the issue of team performance management. Industrial collaborators had invested large sums of money in re-engineering and change programmes, which in turn led them to adopt a process view of their organisations and to develop team based structures. Many had also bought into the need for integrated performance measures but they all felt that they were not managing to successfully deploy performance measures at the team level.

Having adopted existing frameworks for designing performance measurement systems, companies were able to measure the performance of their business, business units, divisions and some were even successfully measuring the performance of business processes. At the grass roots level, however, managers were finding it difficult to manage and motivate the people within teams. Organisations that were familiar with performance measurement were looking for a way to measure the performance of their teams in a manner that was consistent with strategic, team and individual requirements (Mendibil et al 2000; Mendibil et al, 2002a). Evidence, backed up by the Institute of Personnel & Development, suggested that it was not just industrial collaborators who were struggling with this problem.

Increasingly, organisations are seeing the benefits of taking a business process view of their organisation. This enables them to increase stakeholder value and overall competitiveness. One of the most important consequences of adopting a business process approach has been the change in people's roles and the reliance on teamwork as a key working practice. As a result, organisations are adopting alternative forms of work organisation, appropriate for a process strategy, including cross-functional and self-managed teams.

As more companies move towards business process structures, in turn calling upon more teamwork, there is an increased interest in business process and team management. The majority of organisations, however, are still experiencing problems in introducing performance measurement systems that effectively measure performance in these new work environments and that are at the same time aligned to the strategy, actions and performance measures at other levels of the organisation. This was the question that most puzzled this researcher: *how can we help organisations design effective team-based performance measurement systems?*

At the time when all these questions about team performance management started intriguing the researcher, Hammer and Stanton (1999) published yet another article in the Harvard Business Review in which they highlighted the importance of using team-based performance measurement systems. In the article titled 'How Process Enterprises Really Work', they recognised that one of the main reasons why process based organisations were failing to gain the benefits that researchers and consultants claim to be linked to business process re-engineering is that

'traditional ways of measuring performance, determining compensation, provide training, and even organising facilities are tailored to vertical units, not processes, and to individuals, not teams' (Hammer and Stanton, 1999, p.116)

Research on performance measurement has demonstrated the importance of aligning performance measures associated with stakeholder requirements, business strategy and business processes whilst accounting for competitive sensitivities of business units (e.g. Lynch and Cross, 1991; Meyer, 1994; Kaplan and Norton, 1996; Neely et al, 1996; Bititci and Carrie, 1998; Neely et al, 2002). However, one piece of the jigsaw still is missing. The issue that many organisations are still battling with is *how to create effective team-based performance measurement systems that enable the team to increase its contribution to the business and at the same time motivate and develop the team and its individuals.*

By the time this research started, extensive work had been conducted with reference to organisational performance measurement systems and building successful teams. Little research had been carried out, however, on performance measurement in the context of teams (Bruns, 1992; Shaw and Schneier, 1995; Fleishman, 1997; Senior, 1997; Jones and Schilling, 2000; Mendibil et al, 2000). There was a real need for further investigation in the area of team performance measurement and, in particular, the design of team-based performance measurement systems (TPMS).

An important part of the research presented in this thesis was carried out as part of a two-year EPSRC (Engineering and Physical Science Research Council) research project[2]. This project was aimed at helping industrial organisations to develop effective TPMS and included four industrial collaborators from the electronic, food and drink, construction and aeronautic sectors.

1.2. Research issue and objectives

This section plays a key role in the entire thesis because it defines the logic of this work by presenting the initial assumptions and ideas underlying the research study. All research projects should start by defining the problems or issues that the study is focusing on (Miles and Huberman, 1994; Yin, 1994; Stake 1995). Eisenhardt (1989) also points out that even

[2] Grant numbers GR/M98203 and GR/R43792

when using a grounded theory approach (Glaser and Strauss, 1967), it is useful to define initial research questions (in broad terms) in order to focus the research effort.

The main issue of this research is the design of effective team-based performance measurement systems. In particular, the study is concerned with those teams that are organised along the internal business processes of organisations. Following the current trend where organisations are re-structuring their systems around internal business process, both teams and performance measures will need to be re-aligned with these new structures.

The research problem that this work tackles, and which was evident during previous projects in industry (Mendibil et al, 2002a), is the *lack of understanding of how to design effective TPMS.* The overall aim of the study is *to improve current knowledge and develop new understanding on the design of effective TPMS.* In order to achieve this, four generic research objectives were initially defined. These are:

- to investigate how industrial organisations measure team performance and design TPMS
- to provide a critical analysis of the factors that affect the development of effective TPMS
- to study the process for designing TPMS
- to provide organisations with a solution to facilitate the design of effective TPMS

1.3. Scope of the research

In conducting the research, it is essential to first set the boundaries of the research. There are many interesting issues and topics surrounding team performance measurement, and so it is important only to focus on selected issues.

This study falls into the *applied research* category. It departs from an industrial problem and the objective is to solve this problem through rigorous research. This requires continuous collaboration between the researcher and the industrial organisations. In fact, there were four companies collaborating from the start of the study.

Before sharpening the scope of this research, three interesting themes that are not the main focus of this study are introduced. The first theme is related to methods for measuring variables of team performance. Currently, there is a considerable amount of research (e.g. Brannick et al, 1997; Cooke et al, 2000; Bailey and Adiga, 1997; Castka et al, 2003) that looks at methods for measuring team performance variables, especially intangible variables such as team knowledge, share mental models, autonomy, coordination or teamwork culture. This thesis does not focus on the development of new measures and methods for measuring team performance variables but uses the research available in order to incorporate those measures and methods into the TPMS.

The second interesting theme is the design of performance appraisals and reward systems. Systems for appraising and rewarding teams and individuals have been studied for a number of years, in particular within the human resource management arena (e.g. Lawler and Cohen, 1992; Armstrong, 1994; Zobal, 1998; Armstrong and Murling, 1998; Cacciope, 1999). All this research is taken into account when studying TPMS design but it is not the purpose of this thesis to develop performance appraisals and/or rewards systems.

The third theme is change management, which relates to the study of the issues that enable the success of change initiatives in organisations. Although TPMS can also be considered as a change initiative, this thesis mainly focuses on the design of TPMS rather than on implementation. It does not, therefore, place emphasis on managing the transition of individuals, teams and managers as much as an implementation study would. Some of the concepts from change management research, however, are still relevant to this study and are incorporated within the thesis.

The main issue of this thesis is the design of TPMS. In particular, it is concerned with the study of (1) the factors that enable and/or constrain the design of effective TPMS and (2) the process for designing TPMS. A clear understanding of these two aspects will close the gap between theory and practice and will provide a solution to industry. Figure 1.2 highlights (shaded areas) the specific areas that this study set out to investigate – i.e. team performance and performance measurement system design.

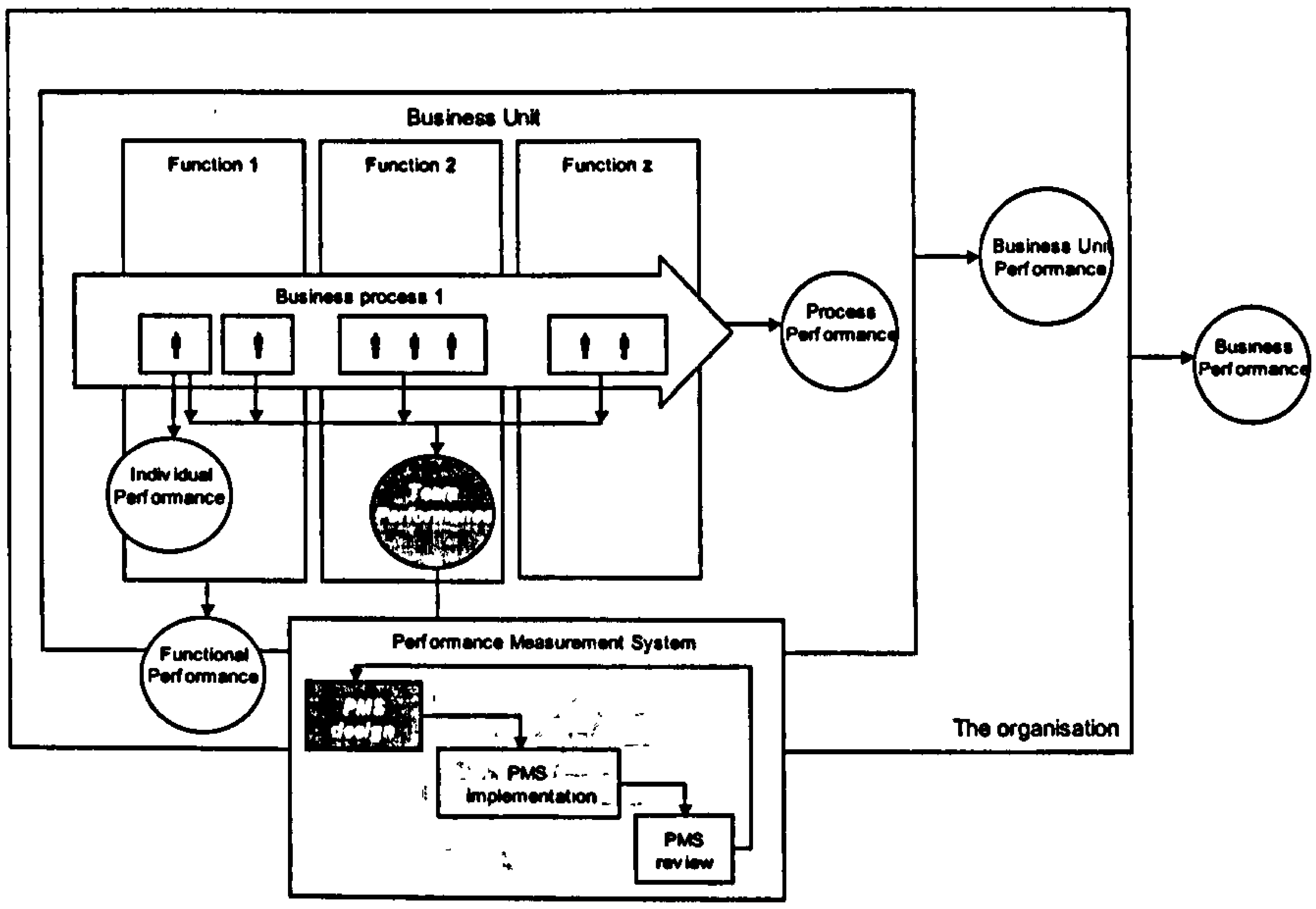

Figure 1.2: Scope of the research (shaded areas)

It is important to emphasise the fact that team performance is not exclusive from the rest of performance units. In fact, individual and process performance are an integral part of team performance. At the same time, it is essential to maintain an alignment with all the other performance units. This research, therefore, aims to study the particular characteristics of team performance and related measurement systems while keeping in mind the relationships with the other performance units.

This study focuses on teams that are organised around business processes. These teams have a cross-functional nature because they include members from several functions. Cross-functional teams can be responsible for a wide variety of tasks (e.g. production, development, strategy making, product support, employee development) and they can be used at several organisational levels (e.g. strategic, operational, middle management).

Although the initial objective was to study teams operating within manufacturing companies, the study requires a more generic approach because of the nature of one of the industrial collaborators (i.e. construction company). In fact, the lack of understanding of how to design effective TPMS goes beyond the boundaries of the manufacturing sector.

The focus of this research lies in the operations management arena. The research issue (i.e. design of effective TPMS), however, requires a cross-disciplinary approach because it needs to integrate research on performance measurement, team performance and TPM, all of which have been studied from a number of research disciplines. The study, therefore, integrates existing knowledge from a number of research disciplines such as operations management, strategic management, human resource management and organisational psychology. It was Neely (1999) who argued that breakthroughs in performance measurement will come through crossing academic and research disciplines.

1.4. Structure of the thesis

Figure 1.4 outlines the structure of this thesis illustrating the research phase (right hand side), the key issues of each chapter and the relationships between the different chapters.

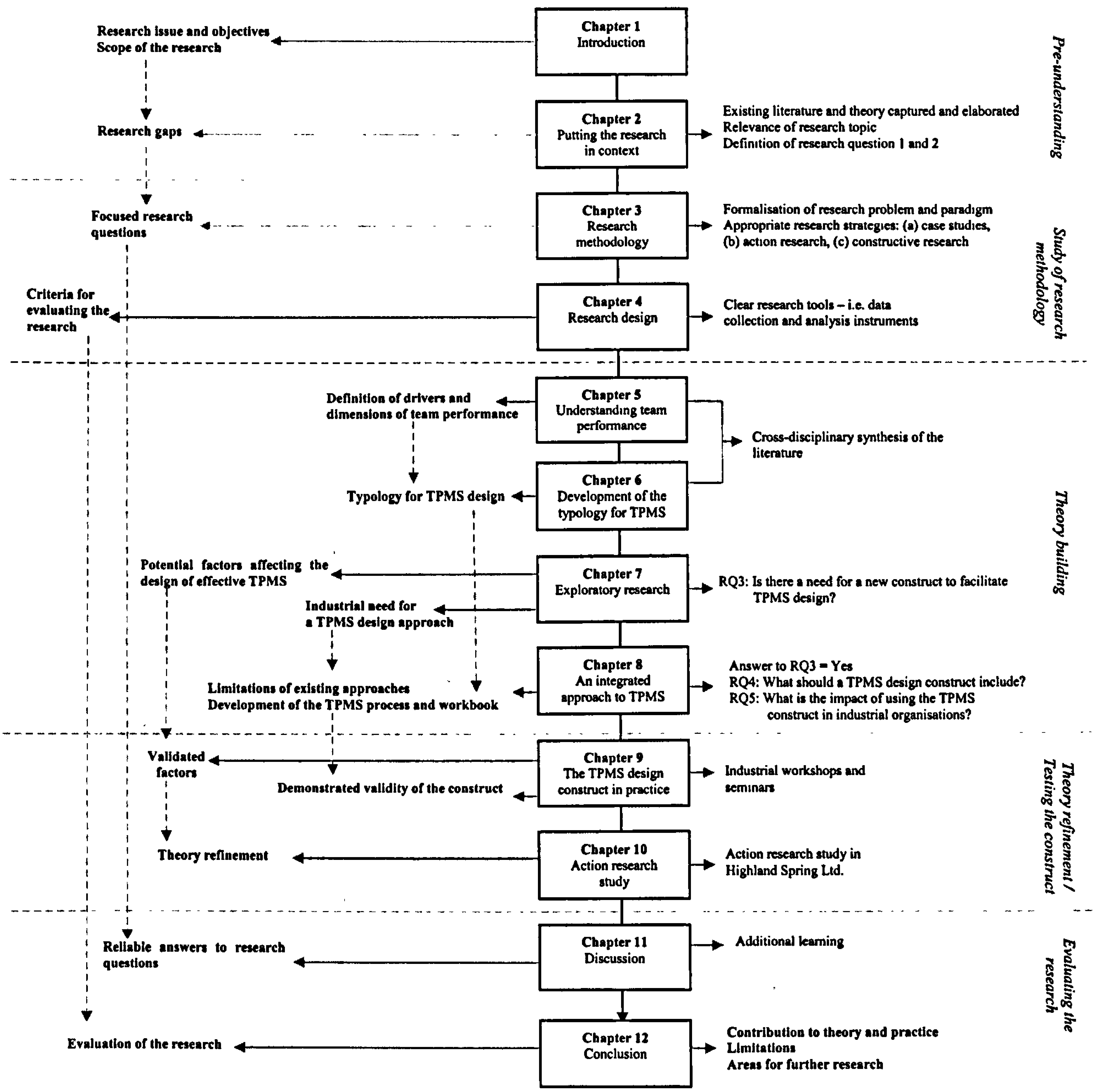

Figure 1.4: Structure of the thesis

In Chapter 1, the background and motivation, the research issue, the research objectives and the scope of the research are discussed. These are necessary to give the reader a broad understanding of the problem domain.

Chapter 2 captures relevant theory related to the research issue. The purpose is (1) to further develop the relevance of the research issue, (2) to identify gaps in current knowledge and (3) to provide the basis to define relevant research questions. The main outcome of this chapter is the definition of research questions 1 and 2 (RQ1 and RQ2).

Chapter 3 discusses the different scientific paradigms and strategies to formalise the research. Based on the research issue and questions, it defines the research paradigm and strategies used in this study.

Chapter 4 expands this work by discussing research design issues. The purpose is to offer the reader an overview of how the required data was collected (i.e. from which sources and by which methods) and analysed. It also defines the criteria to evaluate the overall quality of the research.

Chapter 5 is the first part of the theory-building phase. It provides a detailed description of the meaning of team performance by identifying the drivers that affect and dimensions that determine team performance.

Through the synthesis of the literature, Chapter 6 presents a typology for TPMS design that describes the characteristics of a comprehensive TPMS design process. This typology provides an answer to RQ1 and closes a gap between theory and practice.

Chapter 7 describes an exploratory research phase that includes 10 case studies. Based on the cross-case analysis it identifies and describes 10 potential factors that enable and/or constrain the design of effective TPMS (which partially answers RQ2). It is in this chapter where research question 3 (RQ3) emerges.

Chapter 8 is split into two sections: the first section evaluates existing TPMS design constructs and clearly identifies their limitations. As a result, it provides an answer to RQ3 and defines research questions 4 and 5 (RQ4 and RQ5). The second section of this chapter describes the development of the TPMS design construct. This provides an answer to RQ4.

Chapter 9 discusses the testing of the construct in a series of workshops. The objective of these workshops is to evaluate the validity of the construct and to assess the impact of using it in industry. The latter answers RQ5. These workshops also facilitate the validation of the potential factors affecting the design of TPMS identified in Chapter 7. This provides a final answer to RQ2.

Chapter 10 describes an action research study carried out in a natural mineral water company. It discusses the findings from this study and triangulates them with the findings from previous chapters. By doing so, it refines the understanding about the impact of the factors that enable and/or constrain the design of effective TPMS.

Chapters 11 and 12 discuss the evaluation phase of the research. In Chapter 11, the answers to each of the research questions are clearly addressed. It also discusses additional learning gained during the study. Chapter 12 discusses the overall quality of the research by assessing the findings and research tactics against each of the quality criteria defined in Chapter 4. It also identifies the limitations of the study and the areas for future research. The thesis concludes with the personal reflections of the researcher and a look to the future of research.

1.5. Keywords

The following are a number of keywords and their specific meaning in the context of this study. Note that certain keywords include abbreviations (in brackets), which will be used when referring to the specific keyword during the thesis.

Team performance measurement (TPM) – the process of quantifying the performance level of a team through the collection, analysis and interpretation of data

Performance measurement system (PMS) – the set of performance metrics used to quantify both efficiency and effectiveness of actions (Neely et al, 1995, p.81)

Team-based performance measurement system (TPMS) – the set of measures and measurement strategies used to quantify the performance level of a team

Effective TPMS – a performance measurement system that enables the team to increase its contribution to the business and at the same time motivates and develops the team and its individuals. In this thesis, it refers to the effectiveness of the design, not implementation.

Team performance measure – metric used to quantify a dimension of team performance

TPMS design – the process of identifying the key team objectives and designing the corresponding measures and measurement strategies

Performance management system – the formal, information-based routines and procedures managers use to maintain or alter patterns in organizational activities (Simons, 1999, p.4)

Construct – a practical solution for a real problem (Kasanen et al, 1993)

1.6. Chapter conclusions

This research departed from an industrial problem identified while working with industry, i.e. *the lack of understanding of how to design effective team-based performance measurement system.* Based on this industrial problem, and on the initial review of the literature, the researcher defined the following generic research objectives:

- to investigate how industrial organisations measure team performance and design TPMS
- to provide a critical analysis of the factors that enable and/or constrain the development of effective TPMS
- to study the process for designing TPMS
- to provide organisations with a solution to facilitate the design of effective TPMS

This chapter has clearly defined the scope of this research as being within the operations management arena and the empirical research category. It highlighted the cross-disciplinary nature of the research issue and provided an overall description of the structure of the thesis.

2. PUTTING THE RESEARCH IN CONTEXT

The beginning of knowledge is the discovery of something we do not understand (Frank Herbert, 1920-1986)

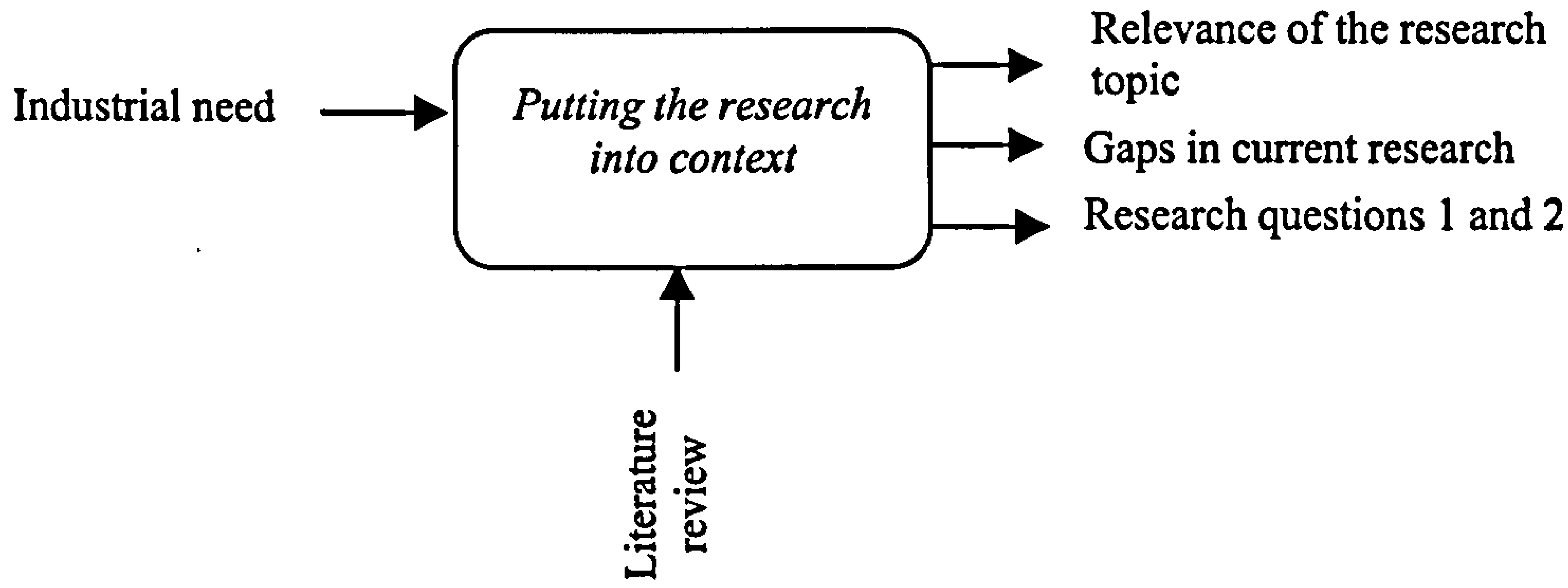

Figure 2.1: Chapter 2 input-output diagram

The objective of this chapter is to further demonstrate the relevance of the research issue (i.e. design of Team-based Performance Measurement Systems) and to identify gaps in current research. In order to do so, it discusses the implications of three management phenomena, which have a considerable impact on the research topic. These are *business process management* (BPM), *teamwork* and *performance measurement* (PM).

In the early 90's BPM and PM were brought into to the forefront of the management agenda. Since then hundreds of researchers and practitioners have focused their efforts on studying issues surrounding these two phenomena. As a result, the number of publications, conferences and interest groups based on these two topics had an exponential increase. Companies and consultants have also been involved in costly change projects to incorporate BPM and PM concepts into their organisations.

The rise of the third management phenomena (i.e. teamwork) is less recent. Research and industry have highlighted the potential of teamwork for several decades. It was mainly due to the introduction of philosophies such as TQM, cellular manufacturing and lean manufacturing that teamwork became a prominent feature of business management. The more recent transition towards process-based, network and extended type of organisations is also having a real impact on the role that teams play within organisations.

This chapter puts the research study into context by describing the evolution of these three management concepts with a particular emphasis on their impact on TPMS. The final section of the chapter provides an overview of current research on TPM and identifies the gaps in current knowledge that this thesis intends to fill. The chapter concludes by defining the initial research questions of this research.

2.1. Scope of the literature review

In order to carry out the initial review of the literature this research first looks at current knowledge on business process management, teamwork and performance measurement. The aim is to understand the implications of each of these areas for TPM.

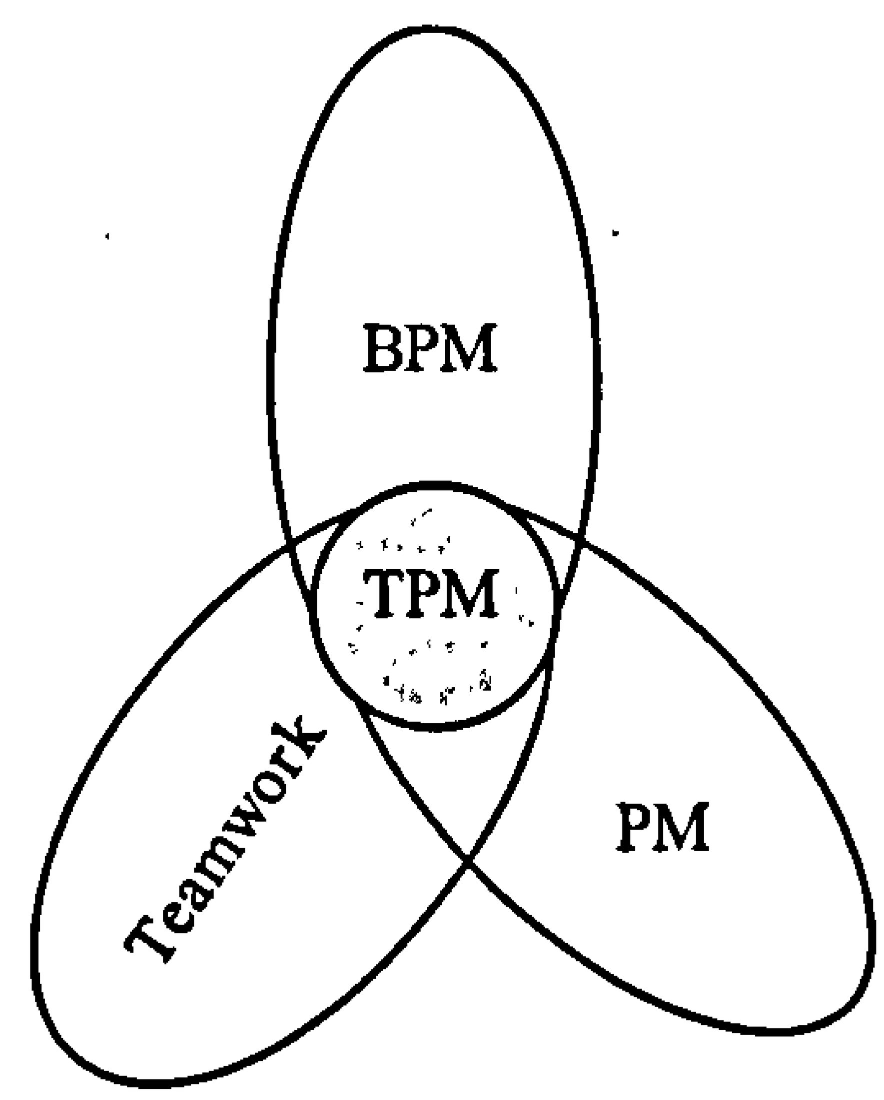

Figure 2.2: Scope of the literature review

These 3 research areas are still very broad in the sense that they have been studied from a number of research disciplines. The initial focus of this review was on operations management, strategy management and human resource management research. The researcher soon realised, however, that research on organisational psychology had also a great impact on the subject of this study.

Although the initial focus is on manufacturing organisations, it is important not to neglect research carried out in other type of organisations. Teams are a common feature and the industrial problem (i.e. lack of understanding on how to design effective TPMS) is evident in other types of organisation too (e.g. construction industry). Therefore, valuable lessons can be learned from them.

2.2. Business Process Management (BPM) era: Implications

2.2.1. A brief introduction to the business process paradigm

The early 90's witnessed the emergence of the business process paradigm, a heterogenous collection of theories, concepts, and practices for analysing and managing organisations (Coombs and Hull, 1995). This collection of new ideas shared a common view of a fundamental change in managing and thinking about organisations. The focus shifted from optimising specialist functions to the optimisation of end-to-end cross-functional processes that deliver value to the customers. The traditional organisational design, which focused and organised its resources around specific activities and functions, was no longer valid because it led organisations to huge inefficiencies (e.g. low responsiveness to customer order, high ratio of non-value adding activities). Garvin (1995) points out several reasons for adopting a business processes view:

- Encourages customer focus
- Allows increasing the flexibility required to meet changing external demands
- Addresses the speed to market of new product and services, and the responsiveness to customer demands
- Facilitates cost reduction
- Facilitates delivery reliability
- Helps address quality issues

The work carried out at the Massachusetts Institute of Technology and Sloan Management School by Michael Hammer (Hammer, 1990; Hammer and Champy, 1993) and Tom Davenport (Davenport, 1992; Davenport, 1995) amongst others is said to have stemmed the business process paradigm shift. This work is based on the concept of 'value chain model' proposed by Porter back in 1985 (Porter, 1985). Porter's model emphasises on the horizontal integration of the activities carried out by an organisation that add value to a particular product or service from its early stages to final delivery.

The acceptance of the business process paradigm came as a result of a variety of management initiatives that required a change in the way organisations were structured and managed. During the 80's and 90's, customer driven strategies led organisations to embark on Total Quality Management (TQM) and Supply Chain Management projects, which challenged the existing functional structures. The capabilities and potential of IT systems also provided new opportunities to increase communication and share information that could support the design of processes (Davenport, 1992; Hammer and Champy, 1993).

Since the 1950's, socio-technical theory, with its principle for organisational design that provides a high quality of working life for employees, had also challenged traditional hierarchical structures and command and control management styles that inhibit the development and growth of individuals. Senge (1990) also proposed organisations where learning and creativity are encouraged and bureaucracy is criticised for preventing them.

The emphasis on new product development processes, which often include concurrent engineering techniques and cross-functional teams, and on partnerships and networks also challenged the traditional ways of structuring and managing organisations. Coombs and Hull

(1995) summarise the organisational aspects that drove the business process paradigm shift as follows:

- Competitiveness
- Entrepreneurship
- Value-chain management
- Information systems integration
- Customer focus
- Supply-chain management
- New product development/concurrent engineering
- Cross-functional teams
- Partnerships and networks
- Co-operation
- Knowledge/learning organisation

2.2.2. What is BPM?

Researchers and practitioners have referred to the study of these processes using terms such as, *'Business Process Improvement'*, *'Business Process Redesign'*, *Business Process Innovation'*, *'Business Process Management'* or *'Business Process Re-engineering'*.

This thesis adopts the term business process management (BPM), which as described by Childe et al (1996, p.4) *'places emphasis on management of structures based around processes and process managers'*. BPM is concerned with how to continuously manage processes, and not just with the one-off radical changes associated to business process re-engineering (Corrigan, 1996; Armistead and Machin, 1997). The following are the main characteristics of BPM in the context of this thesis:

- focus on managing business processes
- continuous improvement and change
- focus on customer (value adding activities)
- emphasis on human and organisational issues
- focus on cross-functional/process teams
- Focus on organisational learning

2.2.3. Implications of adopting a business process approach

BPM has impacted on the management of organisations in many different ways. As with many other change initiatives, there is general agreement (Garvin, 1995; Davenport, 1995; Mumford and Hendricks, 1995; Peltu et al, 1996) that the success of BPM lies in the effective integration of processes, technology and people.

Until the mid 90's most of the research focused on the process and technology side of BPM. However, BPM has not been an exception from other change programmes in the sense that one of the main reasons for failure of BPM has been the lack of consideration of the people affected by those change initiatives (Davenport, 1995; Mumford and Hendricks, 1995; Peltu et al, 1996, Corrigan, 1996; Zuchi and Edwards, 1999). Davenport (1995, p.71) described process re-engineering as 'the fad that forgot people', adding that:

'The rock that reengineering has foundered on is simple: people. Reengineering treated the people inside companies as if they were just so many bits and bytes, interchangeable parts of the reengineered.'

The focus of BPM must extend beyond the focus on process and technologies because human, social and political interactions are at the heart of vital changes that characterise re-engineering initiatives (Peltu et al, 1996). Childe et al (1996) and Hendricks (1995) identify a number of areas that need to be managed in order to ensure the success of BPM initiatives. These include alignment to strategy, process architecture, scope of change, human factors, information technology, performance measures and organisational structure and culture.

For this reserch, the main requirement is to study the impact of BPM on teamwork and PMS. In addition, and due to their close relationship with these two areas, it is also important to consider the impact of BPM on other areas such as organisational structure and culture, process architecture, and the role and skills of individuals.

2.2.3.1. Organisational structure and culture

One of the most important consequences of BPM is the impact on organisational structures. The business process focus of BPM means that organisations need to move from vertical/functional structures towards horizontal/process based structures. Business process structures are described as horizontal flows, cutting across organisational functions. In most of the cases, however, organisations have not adopted a complete process orientated structure, instead they have moved towards matrix structures where functional structures support the business processes (Zucchi and Edwards, 1999).

The move to process based structures means that the functional management hierarchy, which most organisations have historically used, is no longer appropriate. Structures based on end-to-end processes that cut across functional boundaries are required. These structures have led many organisations to delayering and as a result, companies using BPM tend to have flatter organisational structures.

Authors such as Schein (1985) and Lanning (2001) highlight the importance of managing organisational culture as part of change management initiatives. Corrigan (1996), Armistead (1996) and Childe et al (1996) argue that in BPM managing culture is one of the most important aspects of successful BPM initiatives.

Organisational structure and culture are closely related (Schein, 1985; Pheysey, 1993; Childe et al, 1996; Zucchi and Edwards, 1999). A change of the organisational structure demands a different way of working and therefore, it might require a change on those values and beliefs.

2.2.3.2. Business process architecture

Several definitions of business process can be found in the literature (e.g. Davenport, 1992; 1990, Childe et al, 1996). Childe et al (1996, p.6) see the concept of business process from a systems perspective and thus, they define it as *'a system comprising a set of integrated activities and flows that as a whole produces outputs that fulfil a purpose with respect to an external customer'*. It is important to mention that business processes do not only serve external customer but can produce outputs for internal customers too.

The CIM-OSA Standard Committee (1989) provides a useful structure to classify business processes into three main groups, namely *manage, operate* and *support*. The CIM-OSA framework refers to *manage processes* as those that are concerned with strategy and direction setting, as well as with business planning and control. These processes deal with the overall management activities of the organisations such as developing strategies based on the business context and customer needs, and defining and deploying strategic and operational goals and performance measures (Childe et al, 1994). *Operate processes* (also known as *core* processes) are those concerned with the realisation of the product or service that serve the external customer (Childe et al, 1994). Finally, *support processes* comprise activities required to support the manage and operate processes (e.g. information system, training, performance appraisal). Based on these processes, Figure 2.3 (Bititci and Turner, 1999) illustrates the generic business process architecture of an organisation.

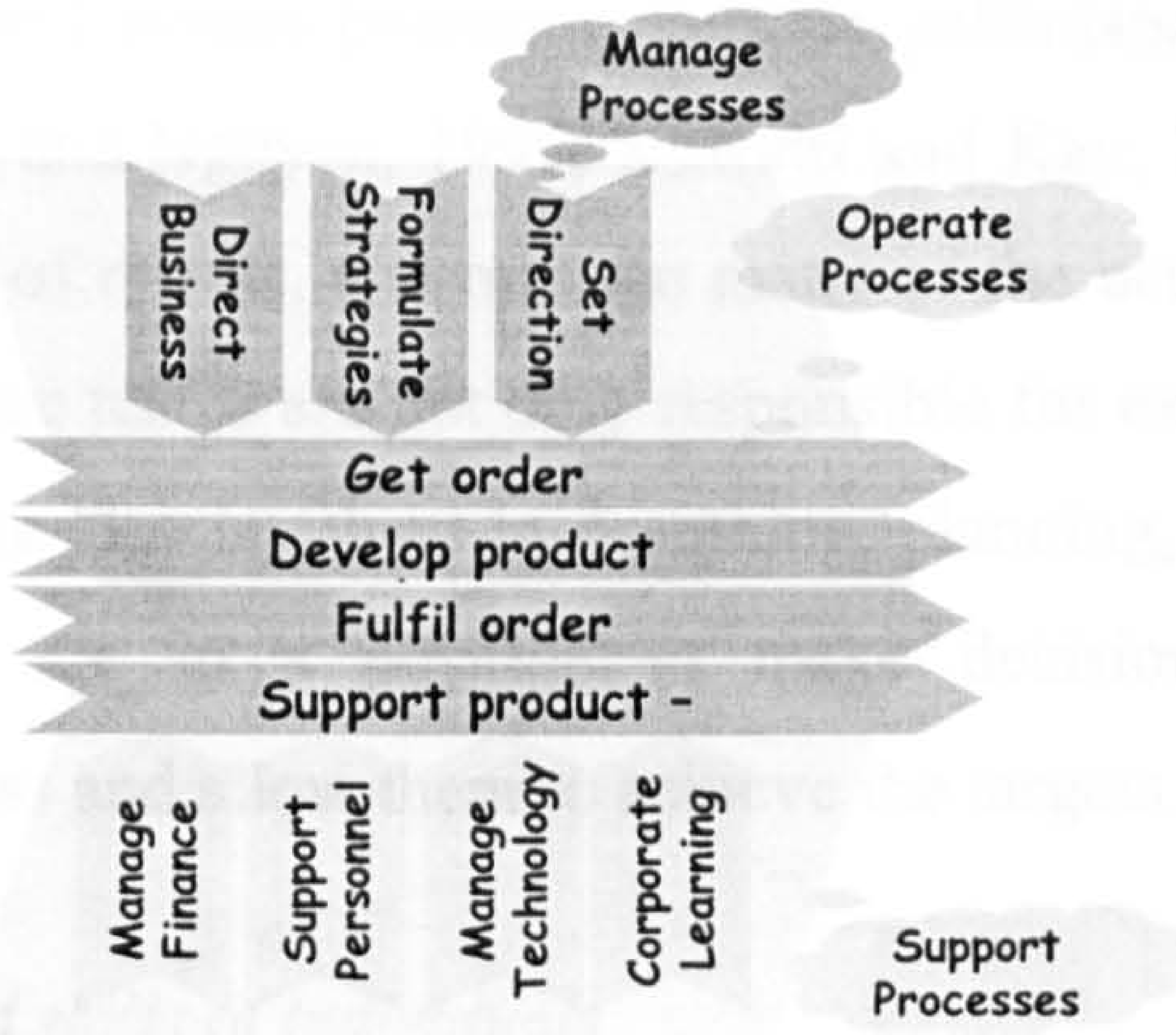

Figure 2.3: Business process architecture (Bititci and Turner, 1999)

The role of manage and support processes

A common criticism towards BPM has been that these initiatives have typically only focused on the design and management of operate processes (such as product development or order fulfilment). BPM needs to look beyond the operational level because unless manage and support processes are redesigned too, the probability of achieving the full benefits of BPM projects will considerably diminish (Garvin, 1995). This will include re-designing the way that companies design and communicate strategy, measure and compensate performance, train and develop individuals, design their facilities and provide career paths (Garvin, 1995; Hammer and Stanton, 1999).

Of particular interest to this thesis is the evolution of performance measurement systems to fit in with business process structures. This evolution will be discussed in a later section of this chapter.

2.2.3.3. Teamwork

One of the most important consequences of adopting a business process approach has been the development of customer focused cross-functional multidisciplinary teams (Davenport, 1992; Hammer and Champy, 1993; Armistead and Machin, 1997). This gives more responsibility, decision making, autonomy and flexibility at the very point where it is needed (Corrigan, 1996). Teare et al (1997) argue that the team concept is central to the development of process-based management and it is one of the few means by which large business processes can be integrated. In addition, the concept of 'team of teams' takes a significant importance as those process-based organisations take teamwork as a paradigm for managing the business (O'Brien and Wainwright, 1993).

As organisations adopt the business process structures, self-managed teams become a more common feature (Attaran and Nguyen, 1999; Kuwaiti and Kay, 2000). Self-managed teams take complete ownership of results, and manage many of the activities that supervisors and managers used to do. These teams are not only responsible for executing the work related to a business process, but are also involved in designing, planning, monitoring and improving processes. These teams are in a position to make decisions that will improve the effectiveness of the process and allow them to achieve the targets.

2.2.3.4. Roles and skills of individuals

It is widely agreed that BPM requires a change with regard to the role of individuals (Hammer and Champy, 1993; Childe et al, 1996; Peltu et al, 1996; Armistead, 1996; Corrigan, 1997). Centring around the processes makes the workforce more versatile thus eliminating the identity of workers with a specific task. As part of cross-functional multidisciplinary teams, employees require greater flexibility and decision-making power and thus, employees are multi-skilled to enable them to carry out a broader range of tasks.

BPM calls for new skills and competencies. These can be grouped under four categories (i.e. individual, team, technical and strategic) and include competencies such as problem solving, communication, team-working, customer orientation, initiative, risk management, stress management, counselling, new technology skills, planning processes and strategic thinking (Corrigan, 1997).

The role of the Managers

The radical change in the role of management is one of the major implications of BPM. Traditional command and control style of management has no place in a process organisation (Garvin, 1995; Mumford and Hendricks, 1996; Corrigan, 1997; Hammer and Stanton, 1999). Instead, managers need to acquire leadership skills to effectively build internal capabilities and link them to customer needs. Senior managers need to be re-educated in terms of strategic thinking, direction setting and teamworking. As lines of authority become less clear, managers need to negotiate and collaborate with others and to exert influence (Hammer and Stanton, 1999).

Middle managers in particular, face the biggest challenge. They have a more generalist role and their performance measures are related to how well they run the process and not the department. In these environments, middle managers take the role of facilitators and coaches, teaching the workers how to execute the process, motivating them, encouraging innovation, evaluating their skills, overseeing their development and providing assistance when necessary (Peltu et al, 1996; Hammer and Stanton, 1999).

2.2.3.5. BPM and performance measurement

Performance measurement is concerned with translating stakeholder requirements into strategic and operational measures and then deploying these throughout the organisation. PM is a key *manage process* within any organisation. In fact, research demonstrates the importance of using PMS for successfully introducing and implementing BPM initiatives (Garvin, 1995; Childe et al, 1996; Armistead, 1996; Armistead and Machin, 1997; Hammer and Stanton, 1999; Wood and Childe, 2000; Kuwaiti and Kay, 2000).

The impact that BPM has on the way that businesses are structured has also an effect on the requirements for PMS. If PMS is meant to play a key role in the successful management of process-based organisations, then traditional hierarchical PMS are no longer valid. These PMS are limited to measuring performance of business units and departments and they do not tackle the issue of cross-functional process integration. Research on BPM shows the need for alternative approaches that help in monitoring process performance and those activities or capabilities that enable to perform a given process (Meyer, 1994; Garvin, 1995; Childe et al, 1996; Hammer and Stanton, 1999). Meyer (1994) notes that traditional measurement and reward systems for governing hierarchical, functional organisations often disempower teams charged with executing cross-functional processes.

Until the early 90's performance measurement was dominated by outdated costing system and financial reports mainly focused on providing shareholder value (Maskell, 1989; Kaplan and Norton, 1992). These measures do not consider several factors that BPM brought to the forefront of the management agenda (e.g. customer satisfaction, organisational learning). If individuals are required to be more involved, have more skills and actively participate in delivering customer-focused results, then, a PMS that is able to encourage and motivate these individuals is required. A relevant PMS in the context of BPM is one that takes into account the fact that people work in teams, and actually produce a final output, for a customer (Armistead, 1996; Kuwaiti and Kay, 2000). Also, it is important for the PMS to consider the continuous learning and development factors that characterise process-based organisations. This means that the PMS has to balance a number of dimensions and to play a number of roles to enable BPM to succeed.

To summarise, the following are the PMS requirements effectively support BPM initiatives:

- Align strategy to key business processes
- Focus on end-to-end process outcomes
- Include several dimensions of performance
- Allow identification and monitoring of capabilities and drivers for performance
- Include team based measurement system
- Include customer related measures
- Include learning and development measures

Performance measurement frameworks and models developed since the early 90's take most of these requirements into consideration so that they can be effectively applied within process-based organisations. They, however, fail to provide adequate mechanisms to effectively measure team performance as this thesis will highlight in later chapters.

2.2.4. Summary of implications

BPM has had an important impact on the way that organisations operate and manage its resources. However, many of the implications of BPM were already addressed by previous literature in socio-technical systems theory, TQM and human resource management.

BPM has a great impact on the role that teams play and the way that teams are managed. Cross-functional teams have become key operational units responsible for managing end-to-end processes and they are accountable for designing, planning, executing, monitoring and improving processes. As a result, managing and measuring team performance has become a key management issue. In many cases, the design and implementation of team-based performance measurement systems is also the responsibility of the teams.

It is widely agreed that performance measurement plays a key role in the success of BPM initiatives and that traditional ways of measuring performance do not fulfil the requirements of process-based environments. However, evidence suggests that companies are still struggling to design effective TPMS in process-based environments (Hammer and Stanton, 1999; Mendibil et al, 2000).

The following section discusses the evolution of teamwork and its implications with an especial emphasis on performance measurement.

2.3. Teamwork era: Evolution and Implications

Teamwork plays an increasingly important role in modern industry, enabling companies to operate more efficiently and productively and to be flexible and responsive to technological innovations and continuous changes in customer and stakeholder requirements. Parry et al (1998, p.166) define teamwork as 'an organisational intervention around which companies can re-engineer for competitive advantage, offering the capacity for learning and continuous improvement'.

Work teams are among the most popular workplace innovations of the last decade, as shown in a survey of 694 manufacturing organisations carried out by the MIT (Hackman, 2002). This survey found that half of the companies surveyed had the majority of their employees working in teams. In a parallel survey of nearly 100 leading-edge US companies, when asked to identify the research topics that would have the greatest value to their organisations, 95 percent of the respondents gave highest priority to 'teamwork' (Hackman, 2002). That was, the MIT reported, the strongest response ever obtained on one of its surveys.

Teams have more talent and experience, more diverse resources and greater operating flexibility than individual performers (Hackman, 2002). They are specially required in those situations needing the real-time combination of multiple skills, judgements and experiences (Katzenbach and Smith, 1993). It is argued that teamwork enables the creativity, initiative and problem-solving capabilities of individuals to be effectively harnessed to the potential of integrated technologies and systems (Katzenbach and Smith, 1993, Tranfield et al, 1998). As a result, teamwork has a positive impact on organisational as well as on worker performance (Lawler et al, 1992).

2.3.1. A brief introduction to the evolution of teamwork

Figure 2.4 illustrates the evolution of teamwork starting from the early 1900's. The first research studies on modern teamwork go back to the 1920' when the Hawthorne Studies revealed that if attention is given to improve the employees' working conditions and human relation aspects, then productivity would also rise (Sundstrom, 1990). Findings from the Hawthorne Studies such as the shift of managers role from supervisors to 'coaches' and the willingness of employees to have some input and control over their working conditions and processes still remain in effect nowadays. The Hawthorne Studies are an antithesis to Taylor's 'scientific management' model that was being used by many organisations since the early 1900's. This model focused on providing employees' only with specialised knowledge so that they could continuously optimise the performance of specific tasks.

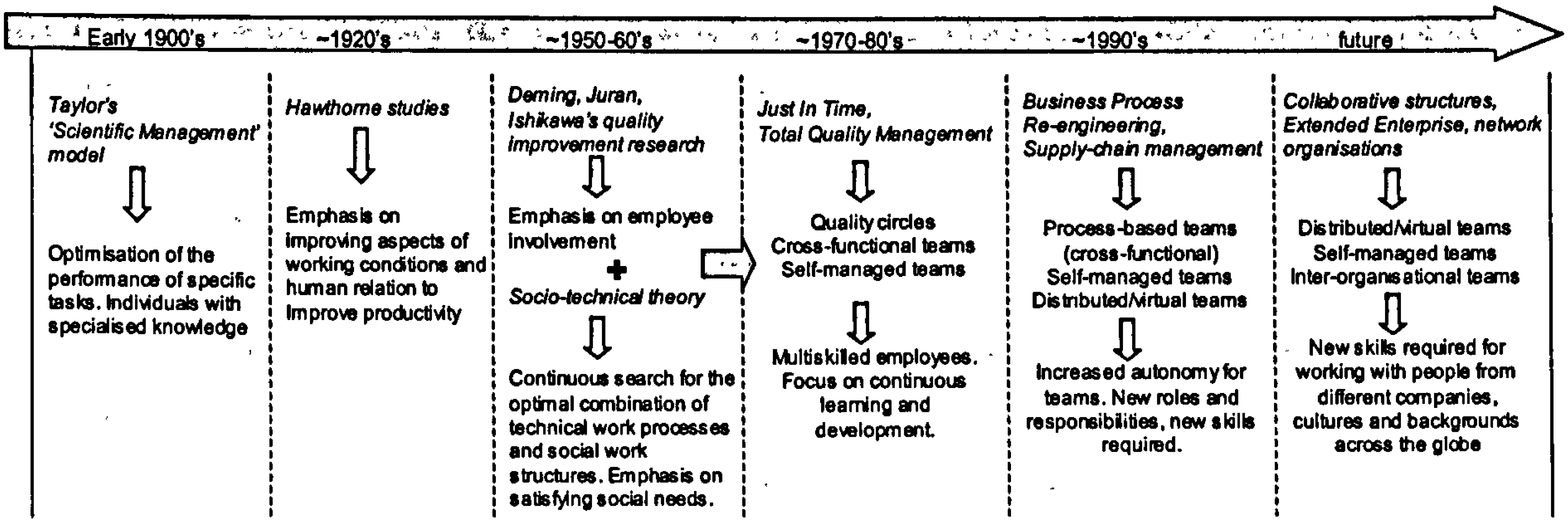

Figure 2.4: Evolution of teamwork

During the 60's the quality and productivity work of Deming, Juran and Ishikawa pointed out the positive effects of involving employees in decision-making, productivity improvement and customer satisfaction. As a consequence, the concept of 'quality circles' emerged as a way to group employees together to discuss and improve quality related issues. Quality circles had the potential to improve quality through developing employees' capabilities, encouraging creativity, improving employees' satisfaction and developing leadership. Also known as problem-solving teams, quality circles were widely used in Japan during the 60's and 70's but did not gain special attention in Europe and the US until the early 80's. It was also in the mid 80's when the concept of 'cross-functional team' was in widespread use. Philosophies such as Just In Time (JIT) and Total Quality Management (TQM) had revolutionised the management focus placing particular emphasis on satisfying customer requirements and designing efficient internal processes. It became apparent that the more successful organisations were those that cooperated across functional boundaries because of their responsiveness to changing customer demands and the ability to continuously reduce costs.

Self-managed teams are (SMT) an extension of quality circles and cross-functional teams. Although the concept of SMT did not gain much attention until the adoption of new paradigms such as TQM or BPM some of the principles of SMT's had already been recognised by sociotechnical systems theorists back in the 1950's. Originally developed by Eric Trist and his colleagues in the UK, sociotechnical system theory points out the importance of finding the joint optimisation of the interacting technical and social systems while adapting to the changing needs of the environment (Attaran and Nguyen, 1999). This theory also suggests that the work has to satisfy the social need of the worker. A well-designed job should provide conditions for learning, involvement in decision-making and opportunities for personal growth (Recardo, 1995). These principles are still valid today.

The latest form of teamwork is 'virtual teaming'. The emergence of collaborative type of business structures, such as network and extended enterprises, means that organisations increasingly need to collaborate with each other in order to remain competitive. Often teams include members who must work together from separate physical locations and across different time zones. Effective teamwork and team players will be in higher demand in order to overcome the challenges of these new infrastructures and to efficiently coach, communicate, collaborate and motivate other team members (Barekat, 2001). Lipnack and Stamps (1997) claim that because of the need for collaborative type of organisational structures 'virtual teams are the peopleware for the 21st century'.

This growing interest in teams resulted in many publications that highlight the advantages of using teams in problem solving, improvement activities and performing complex tasks. Likewise, the body of knowledge surrounding team development, team dynamics and team effectiveness has grown rapidly over the last two decades. Chapter 5 analyses in more detail some of these theories.

2.3.2. Implications for team-based organisations

In spite of the extensive research on teams, the reality is that many teams still struggle towards an unsatisfactory end (Hackman, 2002). There are several lessons that can be learned from the available research that illustrates some of the implications of moving to team-based structures. Hitchcock (2000) points out several insights on teams that summarise the main implications for team-based organisations:

It is not about teams; it is about performance

A mistake made by organisations over and over again is to emphasise on becoming a team-based organisation rather than on improving performance. Organisations using teams effectively do not promote teams for their own sake. Team are a means to an end, not the end itself. Teams are used to gain competitive advantage and improve performance results. The performance expectations of the organisation (i.e. to satisfy stakeholder requirements) will generate the challenges that give rise to teams (Katzenbach and Smith, 1993, 2001). Teams within companies with strong performance standards show higher levels of performance (Katzenbach and Smith, 1993). Consequently, it is critical to continuously focus on the outcomes of teamwork (i.e. performance results) rather than on the activities or means (i.e. to create a team-based organisation).

It is not about individuals; it is about organisational design

The shift from a traditional organisation to a team-based organisation requires a holistic approach towards the change initiative. Putting a group of people together and telling them that they are part of a team will not bring the performance results often linked to successful teams. Instead, Hackman (2002) (see also Hackman, 1990; and Hackman and Oldham, 1980) suggests that in order to increase the chances of continuously achieving high team performance it is important to create favourable conditions for teams. Hackman (2002) claims the likelihood of team effectiveness is increased when a team

(1) is a *real team* rather than a team in name only

(2) has a *compelling direction* for its work

(3) has an *enabling structure* that facilitates rather than impedes teamwork

(4) operates within a *supportive organisational context,* and

(5) has available ample *expert coaching* in teamwork

It is not about structure as much as it is about management philosophy

Team-based organisations require a change of management style. Managers need to shift from a supervisory command-and-control role to act as coaches and facilitators. Teams have the autonomy to make decisions over their area of responsibility and thus, what managers and team leaders need to do is support the team by providing them with the necessary resources to increase performance results. Table 2.1 illustrates a pattern of behavioural changes required to meet the performance challenges of the future as predicted by Katzenbach and Smith (1993):

FROM	TO
Individual accountability	Mutual support, joint accountability, and trust-based relationships in addition to individual accountability
Dividing those who think and decide from those who work and do	Expecting everyone to think, work, and do
Building functional excellence through each person executing a narrow set of tasks ever more efficiently	Encouraging people to play multiple role and work together interchangeably on continuous improvement
Relying on managerial control	Getting people to buy into meaningful purpose, to help shape direction, and to learn
A fair day's pay for a fair day's work	Aspiring to personal growth that expands as well as exploits each person's capabilities

Table 2.1: Behavioural changes demanded by future performance (Katzenbach and Smith, 1993)

It is not about empowerment; it is about responsibility and accountability

Empowering teams is recognised as a key element for achieving high levels of team performance. However, employees have to do their part too. Empowering a team can lead to unsatisfactory consequences unless the individual team members become responsible and accountable for their actions. There is a need for an agreement where the team members agree to take the responsibilities that come with empowerment. For doing so, team members have to be willing to learn about the business, think about how to make things better, and participate in decisions (Katzenbach and Smith, 1993; Hitchcock, 2000).

It is not about one type of team; it is about many forms of collaboration

Some organisations get so focused on having teams that they forget that the whole point is to foster collaboration between interdependent parties (O'Brien and Wainwright, 1993; Sundstrom et al, 2000; Hitchcock, 2000). Team-based organisations need to bring people together to collaborate in a number of ways for different purposes (e.g. to make a product, to plan a strategy, to solve a problem). Organisations need to recognise that there will be a number of teams with different characteristics collaborating with each other. This will allow them to identify the needs of each team and to provide the right conditions to enhance collaboration.

It is not new; it is natural

Hitchcock (2000) argues that if you put a small group of people together with a clear task, they will tend to self-organise, trade off responsibilities based on their interest and skills, as well as share leadership based on the needs of the situation, just like self-managed teams. It is a natural process that has been happening since the beginning of human life.

2.3.3. Teamwork and performance measurement

The changing nature of organisational structures presents several challenges, one of them being the need to develop measurement strategies for diagnosing and developing team-based organisations (Cohen and Bailey, 1997). Performance monitoring and feedback has been widely recognised as a key process for efficient teamwork (Hackman and Oldham, 1980; Pritchard et al, 1988; Argote and McGrath, 1993; Sundstrom et al, 1990, Recardo, 1995; Sundstrom et al 2000; Hacker and Lang, 2000). Pritchard et al (1988) claim that performance feedback directly enhances productivity by providing team members the knowledge of results they need to monitor and manage their ongoing performance activities. This knowledge of results also enables team learning (Hackman, 2002) and when performance feedback comes not just to individual members but also to the team as a whole, learning opportunities expand. Performance feedback, to be effective, requires dependable measures (Sundstrom et al, 1990).

Team research has also demonstrated the positive impact of establishing a common purpose and working together towards this purpose (Katzenbach and Smith, 1993; Bishop and Scott, 1997; Fitz-Enz, 1997). According to Katzenbach and Smith (1993, p.53) "transforming broad directives into specific and measurable performance goals is the surest first step for a team trying to shape a common purpose meaningful to its members". Thus, measurable performance goals, and by association, performance measures play an important role in the success of the team.

It is also widely agreed that in team-based organisations reward and recognition systems based on individual performance can be contra-productive to the whole purpose of the team. Instead team-based rewards need to be developed (Mohrman et al, 1992; Lawler and Cohen, 1992; Zobal, 1998; Cacciope, 1999). The need for team-based reward systems also calls for a performance measurement system that monitor the outcomes of the team as well as the individual team members.

From a socio-technical perspective it can be argued that performance measures applied to teams should not only be related to the performance of the main team task but also to whether individual member's needs regarding job satisfaction, learning and personal growth are fulfilled.

To summarise, the widespread use of cross-functional and self-managed teams means that teams need to have effective performance measurement systems that direct and focus every members' effort towards the common goals. As Meyer (1994, p.96) point out "trying to run a team without a good, simple guidance system is like trying to drive a car without a dashboard". The two main requirements for the performance measures implemented in team-based structures are the following:

- Measures must reflect the collective results attained by the team
- Measures must reflect the fulfilment of individual member's social needs (i.e. job satisfaction, learning and personal growth).

The following section discusses current research on performance measurement with an especial emphasis on team performance measurement (TPM) research. It identifies the research gaps and concludes by defining the first two research questions.

2.4. Performance Measurement revolution: Implications

2.4.1. Evolution of PMS research

Performance measurement has been subject of study for many decades. Evidence shows that companies were already using structured performance measurement systems at the beginning of the 20th century (Neely, 1999). Since the early the 90's, in particular, the subject of performance measurement has been at the top of the research and management agenda[3]. Neely (1999) argue that there are several reasons for this performance measurement 'revolution':

1. the changing nature of work
2. increasing competition
3. specific improvement initiatives
4. national and international awards
5. changing organisational roles
6. changing external demands
7. the power of information technology

Before performance measurement attracted so much interest, companies were mostly using traditional cost accounting systems for a long period of time. The drawbacks of these systems, however, have been well documented by several authors (Banks and Wheelwright, 1979; Johnson and Kaplan, 1987; Dixon et al., 1990; Kaplan, 1990; Eccles, 1991). Since then, there have been numerous publications emphasising the need for more relevant, integrated, balanced, strategic and improvement-orientated PMS.

Traditional cost accounting systems do not consider the real challenges that current organisations are facing in the market place. In addition, they provide very little information on those areas that are critical to increase organisational competitiveness. For example, BPM, team-based structures and knowledge-based competition have resulted in an increased emphasise on managing and improving end-to-end business processes and those intangible assets (e.g. human capital) that play a key role in the value creation process. These strategic changes will also need to be reflected in the PMS in order to improve organisational alignment. As a consequence, the attention of the research and practitioner communities has

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[3] Harvard Business Review cite the Balanced Scorecard (Kaplan and Norton, 1992, 1996) as one of the most important management tools of the last 75 years.

turned to the study of how organisations can replace traditional accounting based systems with PMS that overcome the above criticisms.

During the late 80's and 90's a number of performance measurement frameworks and models were developed aiming to overcome the problems of traditional measurement systems. These include, the Performance Measurement Matrix (Keegan et al, 1989), the SMART pyramid (Lynch and Cross, 1991); the Results and Determinants framework (Fitzgerald et al, 1991), the Balanced Scorecard (Kaplan and Norton, 1992, 1993, 1996) and the Performance Prism (Neely et al, 2002). Although they are not considered strictly as PMS frameworks, the European Foundation for Quality Management (EFQM) Business Excellence Model (EFQM, 1998) and the Malcolm Baldrige Quality Model (NIST, 1987) have also been adopted by organisations as a way of structuring their PMS. All of the above frameworks focus on defining a set of measures that reflect the strategy of the company and create a balance between financial and non-financial measures in order to encourage continuous improvement and future outlook. Also, several audit tools have been proposed to evaluate the appropriateness of a PMS. These include the Performance Measurement Questionnaire (Dixon et al, 1990) and the Integrated Performance Measurement System Reference Model (Bititci and Carrie, 1998).

Although research has demonstrated the value of such frameworks, a common criticism towards them has been that they are difficult to operationalise and provide little guidance on how to select, implement and use appropriate performance measures (Gregory, 1993; Ghalayini and Noble, 1996, Neely et al, 1997, 2000; Medori and Steeple, 2000). In an attempt to overcome this criticism, there is a body of research that focuses on the design aspect of PMS (Globerson, 1985; Maskell, 1989; Wisner and Fawcett, 1991; Eccles and Pyburn, 1992; Kaplan and Norton, 1993; Ghalayini et al, 1997; Neely et al, 1996, 1997, 2000; Hudson et al, 2001). More recent research in performance measurement is moving towards the study of issues related with the implementation of PMS (Bierbusse and Siesfield, 1997; Hacker and Brotherton, 1998; Schneiderman, 1999; Kaplan and Norton, 2001; Bourne et al, 2000, 2002; De Waal, 2002), the dynamic aspect of PMS (Kennerley and Neely, 2002) and the assessment of the impact of using PMS (Wilcox and Bourne, 2001; Nudurapati and Bititci, 2003; Bourne et al, 2003).

Research in performance measurement is being undertaken from different perspectives. There have been initiatives to develop performance measures for various business functions and processes. These include production planning and control (Kochhar et al, 1996), manufacturing (Fry and Cox, 1989; Neely et al, 1995), product development (McGrath, 1994; O'Donell and Duffy, 2002), human resources management (Zigon Performance

Group, 2002), service management (Fitzgerald et al, 1991), supply-chain management (Beamon, 1999; PRTM, 1999; Gunasekaran et al, 2001) and extended enterprise management (Kochhar, 2002; Bititci et al, 2003).

Another aspect that is having an important impact on PM research is the increased focus on intangible assets. In the current business environment, the prominence of intangibles as value and growth creators, at both the corporate and national economy levels, is widely accepted (Lev, 2002). Frigo (2002) refers to a study that reported that 85% of corporate value is based on intangible assets. By looking at the proceedings of the 2002 Performance Measurement Association conference held in Boston, it is clear that the measurement of intangibles is in the forefront of the PM research agenda. This includes the measurement of vision and values, learning, commitment, brand image/loyalty, innovation, information technology and human capital.

2.4.2. Performance measurement research in the context of teams

From an organisational structure point of view, performance measurement has also been applied at a number of levels, including organisational level (e.g. Kaplan and Norton, 1992), functional level (e.g. McGrath, 1994), process level (e.g. Brown, 1996) and individual level (e.g. Bruns, 1992). More recently teams have been added to this list.

Taking into account that teams are rapidly becoming the primary work unit across industry, organisations seek for a performance measurement system that recognises teams as a core element of the business. Traditional methods for measuring performance, such as individual appraisal systems, are less relevant in the current team-based business environment. It will only be in creating a system that integrates organisational, team and individual performance that an accurate assessment of a modern day business will be attained (Mohrman et al, 1992). In fact, the lack of alignment between strategic objectives and team and individual goals has been identified as a reason for failure of PMS implementation initiatives (Kaplan and Norton, 1996; Bierbusse and Siesfield, 1997; Schneiderman, 1999).

In spite of the vast amount of research carried out to study issues around team effectiveness, there was very little evidence of research regarding performance measurement in the context of teams until the mid 90's. Due to its increasing relevance in team-based organisations, the topic of TPM rapidly attracted the interest of practitioners and academics. The importance of TPM and the role it plays is well documented in current literature (Katzenbach and Smith, 1993; Meyer, 1994; Zigon, 1995, 1997; Viken, 1995; Brannick et al, 1997; Hunt, 1999; Hacker and Lang, 2000; Jones and Schilling; 2000), including:

- It focuses team efforts towards organisational goals
- It facilitates the design of appropriate reward and recognition systems
- It provides a common language that enables the development of shared mental models
- It increases motivation and accountability of individual employees
- It allows identifying the specific factors resulting in lower performance (i.e. problem diagnosis)
- It encourages continuous improvement
- It facilitates team development
- It encourages team and organisational learning

Hacker and Lang (2000) also argue that an effective TPMS facilitates a smoother transition between arriving and departing team members and aids in gaining local management support.

Team performance measurement can be difficult unless companies have a systematic way of analysing the work of a team and a measurement systems that can cover the wide variety of work teams undertake. Zigon (1997, p.38) highlights three main reasons why team performance measurement is difficult:

(1) *It is not always clear which result should be measured.* Most teams will use obvious measures without considering the results they should be producing or how they will know they have done a good job

(2) *Even if teams know what to measure, often they are not clear on how the measurement should be done.* Since not everything can be easily measured with numbers, teams often give up when measuring elements like "creativity" or "user-friendliness"

(3) Teams are made up of individuals and thus, *measurement must be done at both the team and individuals levels, effectively doubling the size of the measurement task.*

Until the beginning of this decade several authors argued that research was providing little guidance on the measurement of team performance (Fleishman, 1997; Baker and Salas, 1997; Hunt, 1999; Jones and Schilling, 2000). Komaki (1997, p.227) stated that knowledge of how to measure team efforts '*borders on the archaic*'. As a consequence, various research initiatives focused on fulfilling this gap in knowledge.

In order to gain a good understanding of current research on TPMS design and to identify potential gaps, the existing literature is categorised using Pettigrew et al's (1989) *content-process-context* approach. In a study that focused on analysing the processes of decision making in firms attempting to manage strategic and operational change Pettigrew et al (1989) argued that it was important to learn about the management of the *content* of a chosen strategy, the management of the *process* of change and the *context* in which change occurs. This approach also provides a useful platform for studying current TPMS development research – i.e. the *content* of TPMS, characteristics of the *process* for developing TPMS and features of the *context* in which TPMS is developed.

2.4.2.1. Content of TPMS

Most of current TPM research focuses on issues related to the content – i.e. type of measures, characteristics of measures and tools/methods for measurement. The books edited by Brannick et al (1997) and Jones and Schilling (2000) provide useful theoretical insights into the content of TPMS. The main focus of these books is to describe current knowledge and future research needs regarding the design of effective measures for team performance. Brannick et al's (1997) book also includes a series of articles that propose specific measures for evaluating different attributes of team performance (e.g. knowledge, teamwork processes, training) and describes several measurement tools that can be used when measuring those attributes. In other words, this research mainly focuses on issues regarding *how* to measure certain attributes related to team performance. Research by Senior (1997), Van der Vegt et al (1998), Cooke et al (2000), Bailey and Adiga (1997) and Castka et al (2003) evidence a very similar focus. These works describe performance measures and measurement tools for measuring team attributes such as task/outcome interdependence, team knowledge, autonomy and teamwork culture.

Even if this research identifies different variables related to team performance and their corresponding measurement strategies, these variables are only isolated elements of team performance. The relative importance of these variables varies depending on the characteristics of the team, its task and the environment in which it operates. In addition, many of these are predictor variables about the team inputs (e.g. autonomy, composition) rather that criterion variables of the team's outcomes. For a TPMS to be effective it is important to include a set of measures that provide a balanced view of team performance (Brannick et al, 1997; Hacker and Lang, 2000) and to also include measures related to performance drivers (Hackman, 1987; Meyer, 1994; Baker and Salas, 1997; Hacker and Lang, 2000). Therefore, it is critical to clearly understand the meaning of team performance as a whole – i.e. the drivers that affect and dimensions that determine team performance and their interrelationships – before developing an effective TPMS. In any case, the above research provides little guidance on how teams can decide on what measures to adopt in order to effectively monitor team performance.

2.4.2.2. Process for developing TPMS

Current research provides practical guidelines that relate to the desirable features of the process for designing PMS as well as of the outputs of the process (i.e. performance measures and dimensions of performance) (e.g. Globerson, 1985; Maskell, 1989; Wisner and Fawcett, 1991; Kaplan and Norton, 1993; Ghalayini et al, 1997; Bititci and Carrie, 1998; Neely et al, 1996, 2000; Hudson et al, 2001). These guidelines, however, are not best suited to the requirements of TPMS. Due to the unique features and nature of teams (e.g. flexible, temporal, focus on social processes) and their performance (e.g. team-based results, fulfilment of social needs) the features of a process to design TPMS will differ from those of a business-wide PMS design process.

Bader et al (1994) published one of the first guidebooks to aid teams in developing PMS. This guidebook, however, mainly focuses on issues regarding how to measure team performance rather than the process of developing the TPMS. In addition, it does not provide a clear description of the meaning of team performance nor it refers to how team performance measures should be integrated with the company's strategy and PMS.

The most comprehensive pieces of work for guiding teams in the process of developing TPMS are those carried out by Zigon (1997, 1999) and Jones and Schilling (2000). Zigon (1997) propose a 7-step process to facilitate the development of TPMS, which was later translated into a workbook format (Zigon, 1999). The aim of this process is to facilitate the development of team and individual measures while keeping alignment with the strategy of the organisation. In their book, Jones and Schilling (2000) also provide generic guidelines and principles for developing TPMS. One of the main strengths of their book lays on the way they link the TPMS with continuous improvement and reward/recognition initiatives.

An initial assessment of these two works evidences that they both make little reference to the meaning of team performance (i.e. dimensions and drivers) and thus, one could raise questions about the validity and effectiveness of the TPMS designed using these processes – i.e. TPMS might not provide a balance view of team performance. In addition, both represent consultancy type of work rather than research. They describe step-by-step processes to design TPMS with little reference to the associated learning. In other words, they do not explicitly address the features that characterise a comprehensive TPMS design process.

A comprehensive TPMS design process will facilitate the development of an effective TPMS. The latter incorporates a set of well-designed team performance measures and provides a true representation of team performance (Zigon, 1997; Jones and Schilling, 2000; Hacker and Lang, 2000). Further research is, however, required to identify the characteristics of a comprehensive TPMS design process.

2.4.2.3. Context of TPMS development

The review of the literature shows that research that focuses on studying the contextual factors that affect the development of TPMS is scarce. In fact, the analysis of the few studies on TPMS development published to date (Zigon, 1997, 1998; Jones and Schilling, 2000, Hacker and Lang, 2000) shows that these do not explicitly refer to the contextual factors and even if they do, these are based on the personal views of practitioners and not on specific research studies. As a result, further research that looks at these factors is also required.

There are a number of factors affecting the development of TPMS that can be implicitly identified in current research. These are:

- Resistance to measurement (white-collar and knowledge teams in particular) (Jones and Schilling, 2000)
- Strategic alignment (Zigon, 1997; Jones and Schilling, 2000; Hacker and Lang, 2000)
- Little experience in working as a team (Jones and Schilling, 2000)
- Use of a structured approach for designing TPMS (Bader et al, 1994; Zigon, 1997; Jones and Schilling, 2000)

Research on business PMS also highlights the importance of using a structured approach for designing PMS (Wisner and Fawcett, 1991; Kaplan and Norton, 1993; Ghalayini et al, 1997; Neely et al, 2000; Krauss, 1999; Bourne et al, 2000, 2002; Hudson et al, 2001). Bourne et al (2002) argue that by using a structured performance measurement design approach many of the implementation problems highlighted in the literature can be overcome.

There are a number of studies that focus on the factors that affect the development and implementation of strategic PMS. Some of the factors pointed out by these studies (e.g. top management commitment, perceived benefits) are well known within the change management literature (Kotter, 1996; Lanning, 2001) and can, therefore, be applied to any change project (including TPMS design). In addition, it is useful to look at the factors that affect the implementation (rather than design) of PMS as this could also provide insights for the design phase. The phases of design and implementation of PMS are conceptual (Bourne et al, 2000) in the sense that both phases will overlap as different measures are designed and implemented at different rates. As a result, one might argue that this iterative nature of PMS design and implementation means that the factors affecting one of the phases will also affect the other. In one of the few empirical investigations currently available, Bourne et al (2002) identified six key factors affecting the implementation of PMS, four of them specific for PMS implementation projects (i.e. effort required, ease of data accessibility through the IT system, consequences of performance measurement, parent company initiatives) and two generic for change initiatives (i.e. top management commitment, perceived benefits). In any case, these factors are not specific for the context of teams and thus, it is required to develop new understanding on this particular area.

2.4.2.4. Gaps in current TPMS research

The categorisation of existing TPM research using the *content-process-context* approach has allowed this researcher to identify several gaps in current research. In general terms, it is evident that current research on TPM only provides isolated findings for each of the categories and so, there is still a gap in knowledge regarding a comprehensive theory on TPMS design. In particular, current research fails to:

(1) Explicitly address issues related to the process of designing effective TPMS – i.e. describe the characteristics of a comprehensive TPMS design process

(2) Identify the factors that enable and/or constrain the development of effective TPMS

A better understanding of the characteristics of the design process and of the elements that affect this design process would contribute to current knowledge in this area. Further research in the area of TPMS design is required.

This initial review of the literature evidences two weaknesses of current research on TPM. Firstly, it is clear that **current TPM research is not adequately integrated with other research disciplines that also contribute to the field of performance measurement – e.g. operations and production management, accounting, strategic management.** Most of the existing TPM research has been done by human resource and organisational psychology specialists (e.g. Brannick et al, 1997; Jones and Schilling, 2000), in isolation from other relevant research on performance measurement. A better integration of the existing research on TPM with research from other disciplines could provide valuable learning to current knowledge. Also, it is evident that **current TPM research needs to be better linked with research on team effectiveness as this will provide the basis for understanding the meaning of team performance.**

Secondly, a common criticism towards research on TPM is the lack of empirical research (Baker and Salas, 1997, Komaki, 1997). Baker and Salas (1997, p.336) point out that "a review of the general literature on TPM suggests that a great deal of theoretical work has been completed.... However, there continues to be, in our opinion, a void with respect to actual empirical research". They add that the development of TPMS must be guided, in part, by theory and, in part, by empirical research. Concerned about the little data available regarding how companies that have had success with teams actually measure and reward their performance, Shaw and Schneier (1995) carried out a study that reported that high performing teams use certain performance measures more consistently that non-high performing teams. In any case, **there is still little evidence of empirical studies illustrating the development of TPMS** (Zigon, 1999; Jones and Schilling, 2000; Hacker and Lang, 2000 excepted). These three studies describe the specific process that teams followed for developing TPMS and the benefits they gained but make little reference to the associated learning (i.e. what are the features that make the TPMS design process successful?). Extracting these learning could provide valuable insights into the factors that enable the development of effective TPMS.

2.5. Chapter Conclusions

The key objective of this Chapter was (1) to demonstrate the research need for research and industrial communities and (2) to identify gaps in current research. Following the industrial problem identified in Chapter 1 (i.e. lack of understanding of how to design effective TPMS) this chapter described the evolution of three management phenomena (i.e. business process management, teamwork and performance measurement) that highlight the need for effective TPMS. These implications are summarised in Table 2.2.

	BPM era	Teamwork era	PM revolution
Implications for TPM	• Align strategy to key business processes • Focus PMS on end-to-end processes • Balanced view of performance (financial/non financial, external/internal) • Include team-based PMS • Measure the capabilities and drivers of performance • Include customer related measures • Include learning and development measures	• Need for team-based PMS • Need for measures that reflect the collective products attained by the team • Need for measures that reflect the fulfilment of team members' social needs	• Balanced and integrated PMS • Need to align business PMS and team performance • Need to make PMS operational for teams • Increased focus on intangible assets

Table 2.2: Summary of implications for TPM

The final section of this chapter discussed the current research on TPM and identified areas that require further investigation for advancing the knowledge in this topic. In conclusion, current research on TPM fails to:

- Identify the characteristics of a comprehensive process for designing effective TPMS
- Address the factors that enable and/or constrain the development of effective TPMS
- Integrate with research on team effectiveness and performance measurement carried out by other research disciplines
- Provide empirical studies illustrating the development of TPMS and the associated learning.

Therefore, there is a need for:

1. further investigating the area of TPMS design through better cross-disciplinary research
2. empirical research regarding the development of TPMS, in particular in process-based environments

All of the above lead to the definition of research questions 1 and 2 as follows:

RQ1. What are the characteristics of a comprehensive TPMS design process?

This research questions is concerned with the identification of the desirable features of a TPMS design process and of the outputs of this process (team performance measures and dimensions of team performance). A TPMS to be effective needs to include a well-designed set of performance measures and provide a true representation of team performance.

RQ2. What are the factors that enable and/or constrain the design of effective TPMS?

This research question will investigate the factors that affect the design of TPMS in the context in which the team operates. Understanding these factors will allow organisations to create a suitable environment for designing effective TPMS.

The next chapter discusses the methodological issues of this research. This is a critical part of this thesis because it has a key impact on the answers to the research questions and on the overall quality of the research findings.

3. RESEARCH METHODOLOGY

Science is a journey, not a destination (Gummesson, 2000, p.22)

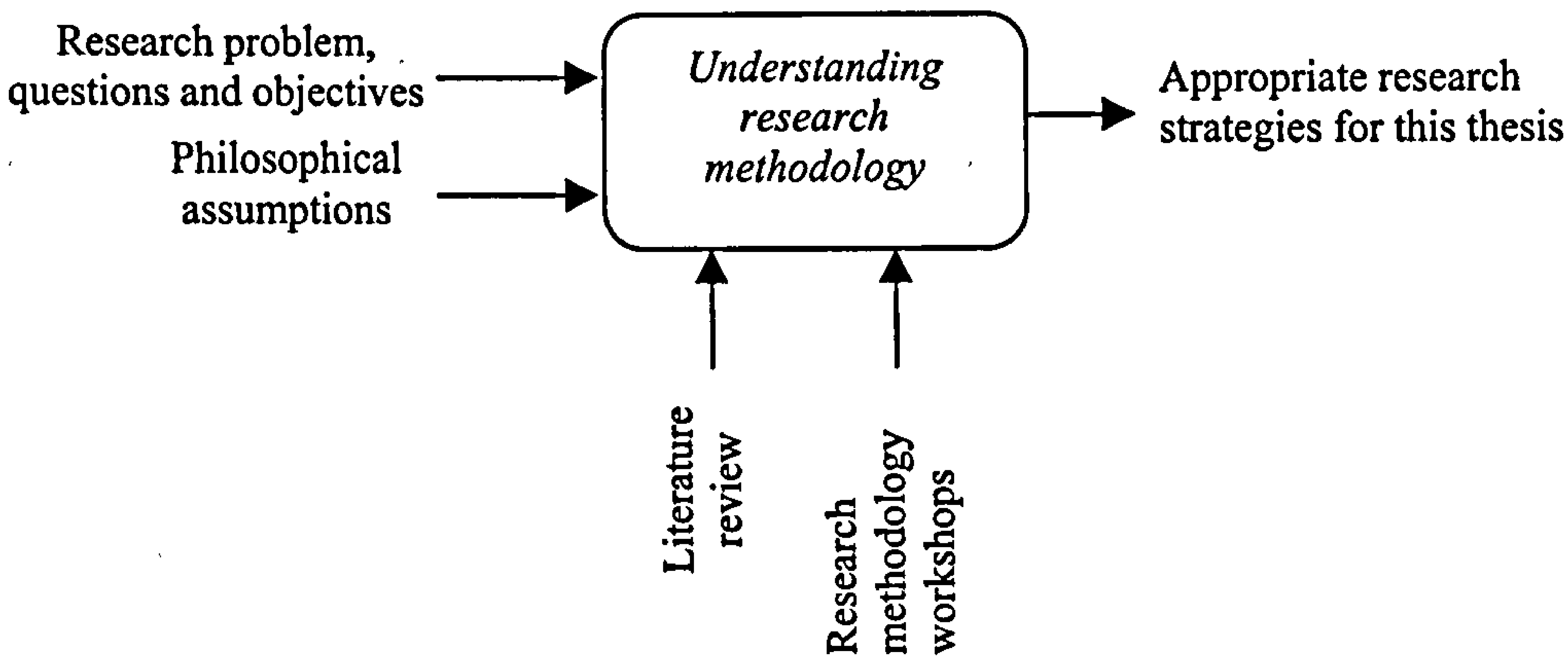

Figure 3.1: Chapter 3 input-output diagram

The following chapter plays a key role in the development of this study. Today, it is widely accepted that knowledge is valid only if it has been generated following a rigorous process, which includes a set of research strategies and tools defined in the research methodology. Even authors like Mintzberg (1979, p. 583) who criticised the 'obsession with rigor in the choice of methodology' still claimed the need for simple and systematic methodologies. Therefore, it is essential to gain a good understanding of the issues surrounding research methodology prior to going into the fieldwork.

The primary objective of this chapter is to demonstrate that an appropriate research methodology was used to tackle the research problem and to answer the research questions of this thesis. To this end, a review of the body of knowledge on areas related to research methodology is presented.

The chapter starts by making explicit the definition of certain terms related to research methodology that will be used frequently during the thesis. The topic of research methodology has suffered from the fact that a large number of different definitions have been used when referring to the same term and this has the potential to create confusion among researchers (Lehaney and Vinten, 1994).

The chapter then describes the nature of the specific phenomena studied in this thesis. This section will present the specific research problems and corresponding research questions in order to sharpen the scope of this study.

Philosophical assumptions have always been an integral part of scientific research, and this thesis is no exception. This chapter gives a critical review of the different philosophical research paradigms and describes the impact that choosing a specific research paradigm can have on designing the research methodology. The chapter concludes by describing and discussing the specific research paradigm and strategies adopted for this research.

3.1. Clarifying the terminology

Clough and Nutbrown (2002) describe a 'good' methodology as a *critical design attitude* throughout the entire research work and this serves as the basis for linking and justifying the relationships between the different phases of any research work. Demonstrating a clear, logical and reflexive relationship between research questions, field questions, literature review, data analysis and research report is a key feature of successful research (Clough and Nutbrown, 2002). These are methodological issues that need to be incorporated in all the phases of the research, not only in the 'methodology chapter'. Clough and Nutbrown (2002) also refer to the *methodologically self-conscious researcher* as a key feature in achieving a critical design attitude.

Figure 3.2 summarises the research journey of this study. This provides a valuable guidance to the reader to understand the link between the research questions and the tasks and outputs at different stages of this research work.

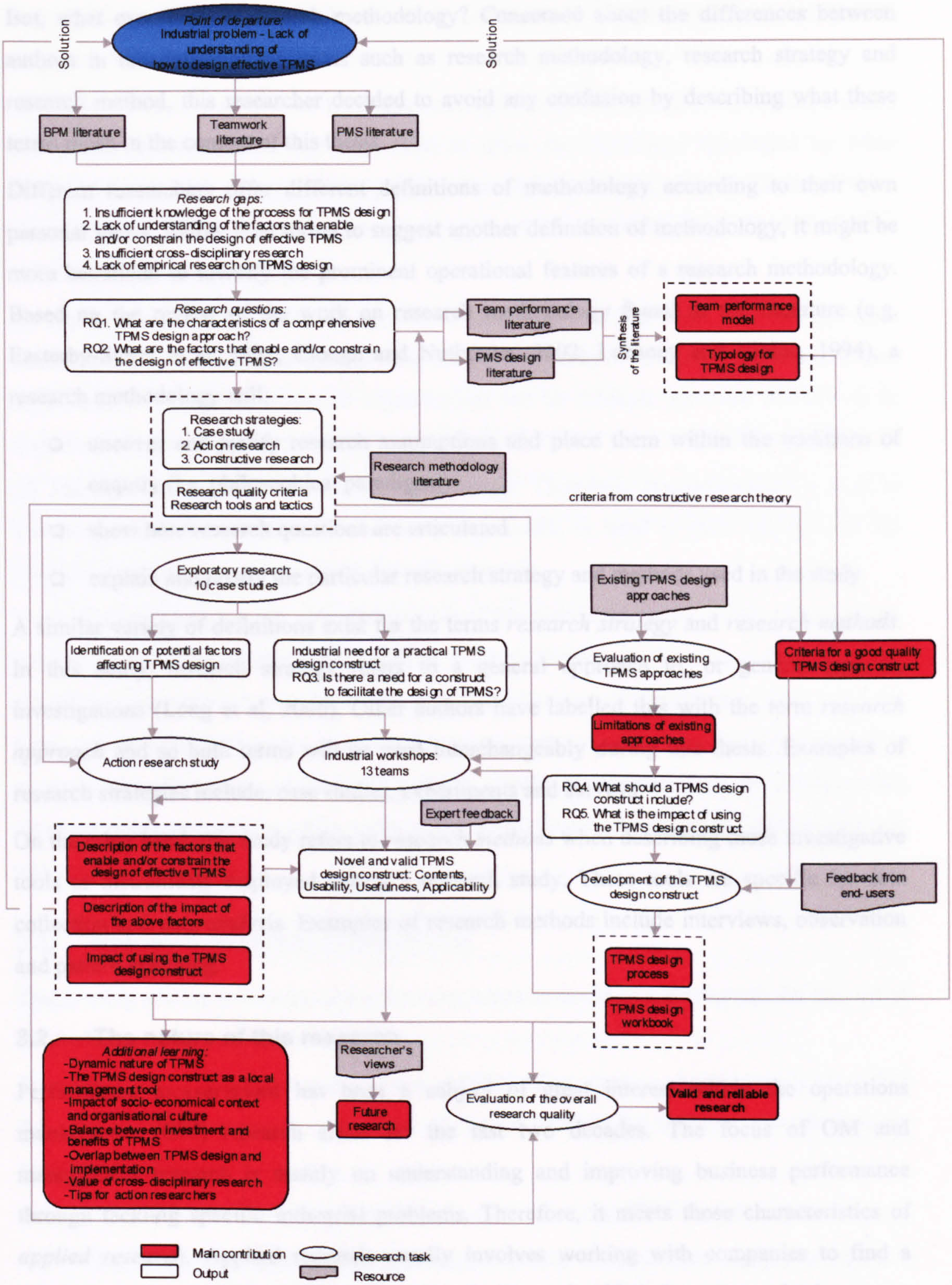

Figure 3.2: Summary of the research process

But, what exactly is a research methodology? Concerned about the differences between authors in the definition of terms such as research methodology, research strategy and research method, this researcher decided to avoid any confusion by describing what these terms mean in the context of this thesis.

Different researchers offer different definitions of methodology according to their own personal views. Rather than trying to suggest another definition of methodology, it might be more beneficial to identify the prominent operational features of a research methodology. Based on the review of the work on research methodology found in the literature (e.g. Easterby-Smith et al, 1991; Clough and Nutbrown, 2002; Lehaney and Vinten, 1994), a research methodology will:

- uncover and justify research assumptions and place them within the traditions of enquiry (i.e. philosophical paradigms)
- show how research questions are articulated
- explain and justify the particular research strategy and methods used in the study

A similar variety of definitions exist for the terms *research strategy* and *research methods*. In this study, research strategy refers to a general approach to, or general type of, investigations (Long et al, 2000). Other authors have labelled this with the term *research approach* and so both terms will be used interchangeably during this thesis. Examples of research strategies include, case studies, experiments and surveys.

On the other hand, this study refers to *research methods* when describing those investigative tools or instruments employed during a research study. These tools are specific for data collection and data analysis. Examples of research methods include interviews, observation and pattern matching.

3.2. The nature of this research

Performance measurement has been a subject of great interest within the operations management (OM) research arena for the last two decades. The focus of OM and management research is mainly on understanding and improving business performance through tackling specific industrial problems. Therefore, it meets those characteristics of *applied research.* Applied research usually involves working with companies to find a suitable solution to their problems (Easterby-Smith et al, 1991). In contrast, basic or pure research is concerned with the theoretical development and general advancement of management disciplines, which may or may not have practical implications (Gummesson, 2000; Easterby-Smith et al, 1991).

Easterby-Smith et al (1991, p.5) cite three elements that make management research distinctive from other research disciplines:

(1) The practice of management is eclectic; managers need to work across technical, cultural and functional boundaries, and they need to draw on knowledge developed by other disciplines such as sociology, anthropology, economics, statistics and mathematics. As a result, adopting a cross-disciplinary research approach is more likely to produce results that are of use to practising managers.

(2) Because managers tend to be 'powerful' and busy people, they need to see some commercial or personal advantage deriving from the research before allowing access to their organisations. Therefore, access to organisations can be difficult and time allowed to be spent in the organisations very limited.

(3) Management requires both thought and action. Therefore, research methods need to incorporate within them the potential for taking action, or need to take into account the practical consequences to be derived from the research.

These three elements are also inherent features of this piece of research. Firstly, this research aims to bring in knowledge across several research disciplines, because a lack of cross-disciplinary integration was evident during the initial review of the literature. Secondly, the thesis will describe how access to companies was gained and what strategies were adopted to maximise the efficient use of the time available. Finally, the research includes strategies that focus on doing research in action and making a practical contribution (i.e. action research and constructive research).

3.3. Research questions and purpose

This is a key section within the entire thesis as it acts as the basis and rationale for the rest of the study.

The main issue of this thesis is the design of TPMS. The previous chapter clearly identified the gaps in current research, and based on that, it defined the first and second research questions as follows:

RQ1. *What are the characteristics of a comprehensive TPMS design process?*

RQ2. *What are the factors that enable and/or constrain the design of effective TPMS?*

Stake (1995, p.15) argues that "perhaps the most difficult part of a research project is to design good research problems and questions that will direct the thinking enough and not too much". He also points out that while always keeping in mind the main research problem, the development of research problems and questions is an evolving, changing and incremental process (Stake, 1995). The research questions of this thesis also evolved and emerged as new findings were unfolding. The researcher was looking for a better understanding of the issues surrounding the design of TPMS. To achieve this, he wanted to study whether current research provides a solution to the problems that organisations are facing when designing TPMS. Finally, and if there was a gap in current research, he wanted to provide a reliable answer to the research problem.

As a result of the initial review of the literature, the generic question initially defined (i.e. *how can we help organisations design effective team-based performance measurement systems?*) evolved into the two more specific questions stated above (i.e. RQ1 and RQ2). In addition, three new research questions emerged. RQ3 emerged as a result of the exploratory research phase carried out with 10 industrial organisations (Chapter 7). RQ4 and RQ5 were defined after evaluating existing TPMS design approaches. These three research questions are as follows:

RQ3. Is there a need for a new construct to facilitate the design of TPMS?

RQ4. What should a construct for TPMS design include?

RQ5. What is the impact of using the construct in industrial organisations?

Yin (1994) suggests that, in order to identify the specific elements to study, it is also useful to define the propositions of a particular study. This enables the research to direct the attention to something that should be studied within the scope of the study. In this thesis, the research objectives are used to describe the propositions of the study. These research objectives derive from the generic objectives defined in Chapter 1 and were defined in order to solve the research problem and answer the research questions. These objectives guided the researcher in planning and structuring the research work in a logical form. The following are the specific research objectives and corresponding research questions (in brackets):

- To discuss the relevance of the research topic by achieving a theoretical understanding of current research on team performance measurement and identifying potential gaps within it
- To further explore the concept of team performance (RQ1)
- To identify the characteristics of a comprehensive TPMS design process through the synthesis of the literature (RQ1)
- To study how collaborating companies and 'best practice' organisations are measuring team performance (RQ2)

- To identify potential factors affecting the design of TPMS through comparing the collaborating and 'best practice' companies (RQ2)
- To validate and further refine the above factors through empirical research (RQ2)
- To identify existing approaches to facilitate the design of TPMS (RQ3)
- To define the criteria for assessing TPMS design approaches (RQ3)
- To assess the validity of current approaches (RQ3)
- To develop a novel construct by closing the gaps in existing approaches (RQ4)
- To test and validate the construct through empirical research (RQ4, RQ5)
- To evaluate the overall quality of the research(All RQ's)

3.4. The philosophical nature of research

Philosophical perspectives are an integral part of any research work. Hence, the use of philosophical jargon is very common when conducting or reading scientific research. Terms such as, paradigm, epistemology, ontology and positivist are found in most type of research work.

At a philosophical level, a scientific or research paradigm comprises the basic values, rules and perceptions about the world that govern the thinking and behaviour of researchers (Easterby-Smith et al 1991; Gummesson, 2000; Guba and Lincoln, 1994, Lanning, 2001). Easterby-Smith et al (1991) refer to Thomas Kung – inventor of the 'paradigm' concept – when stating that paradigms are a combination of new theories and research questions that replace the old ones. They also argue that this new research pattern might result in radical changes to the way people see the world. In addition, research paradigms will also include how the new research questions will be answered (i.e. methodological approach). The choice, effectiveness and validity of any research method ultimately depend on the philosophical assumptions a researcher holds about the nature of the elements within a particular study (Long et al, 2000).

Therefore, it is important to start the research work by studying the existing paradigms to find the one that best fits the research problem and research questions in hand. In words of Easterby-Smith et al (1991, p.21), 'failure to think through philosophical issues, while not necessarily fatal, can seriously affect the quality of management research'. Gummesson (2000, p.18) goes further by stating that 'mainstream scientists that just apply approved methods without being aware of the subjective foundation of their activities are not scientists; they are technicians'. He then borrows some words from Tornebohm when stating that the 'greater the researcher's awareness of his own paradigm, the better the research that he can carry out'.

Taking the previous comments into account, it can be argued that prior to selecting specific research strategies and research tools, it is important to have a good understanding of different philosophical paradigms. Easterby-Smith et al (1991) argue that there are three reasons why an understanding of philosophical issues is important:

1. It can help clarify research designs
2. Knowledge of philosophy can help the researcher to recognise which research design may work and which may not
3. Knowledge of philosophy can help the researcher identify, and even create, designs that may be outside his or her experience

3.4.1. The two poles of the spectrum: positivist versus phenomenological

Research paradigms are often discussed based on a spectrum with two clearly differentiated extremes, the *positivist* paradigm and the *phenomenological* paradigm. Different names have been used to identify both paradigms. The former is also known as *objectivist, traditional* or *main stream* while terms such as, *humanistic, hermeneutic, subjectivist* and *interpretative* have been used when referring to the latter.

Each of these philosophical paradigms includes *ontological* and *epistemological* assumptions. In words of Long et al (2000, p.190), *ontology* 'refers to assumptions held about the nature of the social world', while *epistemology* 'refers to assumptions about the basis of knowledge and in what manner knowledge can be transmitted to others'.

In the positivist side of the spectrum, the belief is that reality is objective and external to the individual. As a consequence, this paradigm claims that knowledge is objective or value-free and theoretically accessible to all. Some of the implications of this research paradigm are the need for the researcher to be independent from the phenomena under study, the need to look for causal explanations and fundamental laws and the need to reduce phenomena to the simplest possible elements (Easterby-Smith, 1991). The research methods used within the positivist paradigm will focus on developing and testing hypotheses. This will be done by taking large samples (Easterby-Smith, 1991) and measuring the phenomena using objective methods (i.e. quantitative) rather subjective methods like sensation, reflection, or intuition (Remenyi et al, 1998).

Researchers that adopt a phenomenological paradigm claim that the world is subjective and socially constructed, and that the individual is part of this reality. Knowledge is also subjective because is driven by human interest and individual experience. From this perspective, the researcher believes that there are multiple realities that are all equally valid. As a result, the researcher needs to immerse him/herself in each situation to understand the phenomena including its historical-contextual characteristics (Long et al, 2000). The phenomenological paradigm tries to understand and explain the phenomena, and so the research methods will focus on studying small samples in-depth over time. This will include the use of multiple methods to establish different views of the phenomena (Easterby-Smith et al, 1991). The subjective nature of the phenomenological paradigm means that the researcher will need to use qualitative methods to understand the phenomena. Table 3.1 summarises the characteristics of these two philosophical paradigms.

Personal considerations and preferences prior to starting a research project will influence the behaviour of the researcher and research methods adopted. In fact, these preferences are an important part of a research paradigm (Gummesson, 2000) and consequently, they will partially dictate which side of the philosophical spectrum the particular research paradigm falls into.

	Positivist paradigm	Phenomenological paradigm
Ontological assumptions	The world is external and objective Observer is independent	The world is socially constructed and subjective Observer is part of what observed
Epistemological assumptions	Knowledge is objective and value-free Knowledge is accessible to all	Knowledge is driven by human interest and individual experience
Researcher should	Focus on facts Look for causality and fundamental laws Reduce phenomena to simplest elements Formulate hypotheses and then test them	Focus on meaning Try to understand what is happening Look at the totality of each situation (i.e. historical-contextual characteristics) Develop ideas through induction from data
Preferred methods include	Operationalising concepts so that they can be measured Taking large samples Quantitative methods	Using multiple methods to establish different views of phenomena Small samples investigated in depth or over time Qualitative methods

Table 3.1: The characteristics of positivist and phenomenological paradigms (modified from Easterby-Smith et al, 1991)

3.4.2. Choosing a research paradigm

In 1978, Susman and Evered, claimed that there was a crisis in the field of organisational science because even if research methods and techniques had become more sophisticated, the actual output of research was increasingly less useful for solving practical problems in organisations. In words of Susman and Evered, the main cause of the gap between research and practice was a crisis of epistemology, i.e. the methods in which knowledge was generated and transferred. Organisational researchers had adopted a positivist approach for conducting and judging research. However, the value-free, logical, empirical and generalisable characteristics of this paradigm can undermine the values of organisational members. As a result, authors have argued that probably this is not the most suitable approach for applied research (Susman and Evered, 1978; Long et al, 2000; Lanning, 2001; Guba and Lincoln, 1994).

The above problems could be resolved by moving towards a phenomenological paradigm. Seeking deep understanding of the phenomena (i.e. what, how and why is it happening?) can lead to finding a solution to the problem and to generating specific knowledge (Susman and Evered, 1978;Gummesson, 2000; Stake, 1995; Eden and Huxham, 1996; Voss et al, 2002).

Regarding the choice of a specific research paradigm, a view agreed by several authors (e.g. Long et al, 2000; Clough and Nutbrown, 2002) is that decisions about placing a research work within a particular paradigm and as a consequence, the selection of specific research methods, can only be made with a clear understanding of the phenomena under study.

Although in theory the distinction between the positivist and phenomenological paradigms is clear, these are not exclusive approaches. In fact, most research work will fall somewhere in between the two poles of the spectrum. Therefore, labelling a research work under a specific paradigm is not that critical. As Clough and Nutbrown (2002, p.19) state

'the issue is not so much a question of which paradigm to work within but how to dissolve that distinction in the interests of developing research design which services the investigation of the questions posed through that research'.

Specifically, when it comes to choosing the research methods that distinction between paradigms breaks down. In fact, it is argued that mixing quantitative and qualitative methods can have a powerful synergetic effect because different types of data and perspectives are used to study the phenomena (Mintzberg, 1979; Easterby-Smith et al, 1991; Yin, 1994; Eisenhardt, 1989; Weerd-Nederhof, 2001).

Both quantitative and qualitative approaches have certain strengths and limitations, and therefore, the decision to choose one over the other should depend on the adequacy of each approach for solving the specific research problem. In addition, it will be critical to recognise the limitations of the chosen approach in order to construct a valid and reliable research design.

In summary, there are two main variables that define the characteristics of a research paradigm and consequently the approach adopted for conducting a research study; (1) the nature of the phenomena (i.e. research problem) under study and (2) the personal preferences and philosophical assumptions of the researcher. It is important to understand that placing the research under one of the two main extreme philosophical paradigms can be a difficult task because often a research work combines features of both paradigms.

3.5. Potential research strategies

Research strategy is a general approach to, or general type of, investigation. According to Yin (1994, p.1) research strategies can be compared based on three main criteria (see Table 3.2):

(1) the type of research question

(2) the control the researcher has over behavioural events, and

(3) the focus on contemporary as opposed to historical phenomena

Strategy	Form of research question	Requires control over behavioural events?	Focuses on contemporary events?
Experiment	how, why	yes	yes
Survey	who, what, where how many how much	no	yes
Archival analysis	who, what, where how many how much	no	yes/no
History	how, why	no	no
Case study	how, why	no	yes

Table 3.2: Relevant situations for different research strategies (Yin, 1994)

The previous section noted that choosing a research strategy is not only based on the nature of the phenomena but it is also important to consider the personal assumptions of the researcher. Also, each research strategy has its own advantages and disadvantages and therefore, it is important to be aware of these in order to make the most out of any of the strategies. Yin (1994) criticises the view that certain research strategies should only be used during specific phases of the research. For example, case studies are not only applicable to the exploratory phase, but are equally applicable to a explanatory or descriptive phase. This applies to the other research strategies as well. Yin (1994) argues that instead of looking at the phase of the research, the researcher should focus on the three criteria defined above when choosing a research strategy.

There are several commonalities between different research strategies and so more than one strategy could be equally applicable in a specific situation. The objective here is not to champion any particular strategy, but to ensure that the researcher does not ignore those strategies that offer more advantages for that specific situation.

Next, a description of several research strategies that could be applicable in the context of this thesis will be carried out. The proposed strategies are typically linked to the phenomenological research perspective and include only one of the strategies described in the previous table (i.e. case study research). The chapter will finish with a discussion on the research strategies that were used during this study.

3.5.1. Qualitative research

Today, much of the operations management research is still conducted using rationalist or quantitative research methods (Meredith, 1993; Voss, 2002). The explanation of quantitative findings and construction of theory based on those findings, however, requires the depth of understanding that comes from 'soft' or qualitative data (Mintzberg, 1979; Miles and Huberman, 1994; Meredith, 1998).

Qualitative research is often defined as an investigation using descriptive data, as opposed to the numerical data used in quantitative research. Stake (1995, p.37) highlights three major differences between qualitative and quantitative research: (1) the distinction between explanation and understanding as the purpose of inquiry (2) the distinction between a personal and impersonal role for the researcher, and (3) a distinction between knowledge discovered and knowledge constructed. In his book, Stake (1995) argues that a key distinction between qualitative and quantitative research is the knowledge that the researcher is looking for. While the qualitative researcher aims to understand the complex relationships within the phenomena, the quantitative researcher seeks explanation and control.

Qualitative research has its origins in the phenomenological assumptions while quantitative research has been linked to the positivist perspective. In that sense, qualitative research has an emphasis on the qualities of entities and meanings that are not experimentally examined or measured in terms of quantity, amount, intensity and frequency (Denzin and Lincoln, 2000). In qualitative research, the phenomena is studied in its natural settings and the researcher is an active part of that context. In words of Gummesson (2000), the personality of the scientist is a key research instrument in qualitative research. Several authors have highlighted this contextual or holistic view as a key feature of qualitative research (e.g. Jink, 1979; Miles and Huberman, 1994; Stake, 1995; Lanning, 2001).

Qualitative research involves analysing data collected from a variety of empirical materials such as case studies, interviews, observations and historical archives. Because of the subjective nature of qualitative research, it uses a wide range of interconnected interpretative methods (also known as *triangulation*) in order to better understand the phenomena being studied (Denzin and Lincoln, 2000).

3.5.2. Case study research

Several definitions of case study have been published but Yin's (1994) definition appears to be the most widely used. Yin (1994) defines case studies as:

- an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when
- the boundaries between phenomenon and context are not clearly evident, and
- it relies on multiple sources of evidence

Today, case studies are a major research strategy in operations management. In an era when organisations continuously need to change and rapid transfer of knowledge is required, many practitioners are highly interested in learning from other cases rather than waiting for statistical relevance from large samples (Karlsson, 2002). In addition, many of the breakthrough concepts and theories in operations management have been developed from field case research (Voss et al, 2002).

From the review of the existing literature the following are the benefits of case studies (Eisenhardt, 1989; Yin, 1994; Stake, 1995; Meredith, 1998; Voss et al, 1989):

- The phenomenon can be studied in its natural setting, which allows generating and/or testing the new theories with the ultimate end users. This increases the validity and acceptance of the research by practitioners.
- It enables the full understanding of the nature and complexity of the phenomenon. This comprehensive data analysis generates new and creative insights that can answer the *why, what* or *how* questions.
- It allows exploratory investigations where the variables are unknown and the phenomenon not at all understood

The same authors refer to a number of challenges related to case studies. These are:

- Resource requirement of direct observation (i.e. cost, time and access)
- Need for multiple methods for triangulation
- Lack of control, complications of context and temporal dynamics
- Need for good interviewing skills
- Difficulties for generalisation

The latter in particular is still an issue that generates a considerable amount of discussion within the research community. This issue will be further discussed in Chapter 11 during the evaluation of the overall quality of the research.

Stake (1995) classifies case studies into three different groups: *intrinsic, instrumental* and *collective*. *Intrinsic* case studies focus on understanding one particular case, not on learning from other cases or solving a general research problem. *Instrumental* case studies are used to answer a specific research question or solve a general research problem. *Collective* case studies are instrumental case studies that comprise several cases. These are also know as *multiple* case studies (Eisenhardt, 1989; Yin, 1994; Voss et al, 2002). In addition to single and multiple case studies, Voss et al (2002) distinguishes between *retrospective* and *longitudinal* case studies. *Retrospective* case studies collect and analyse data based on historical events while *longitudinal* case studies are particularly valuable to understand cause and effect relationships over a longer period of time.

Lanning (2001, p.47) states that although they are different, examples and qualitative methods (interviews in particular) are sometimes interpreted as equivalent to case studies. Case studies, however, require a deeper study of the phenomena in the context of each particular case. On the other hand, even if interviewing is a widely used research method in case studies, case studies typically combine interviews with other data collection methods such as, archives, questionnaires and observations. Also, it is widely agreed (e.g. Yin, 1991, Eisenhardt, 1989, Stake, 1995) that case studies can involve either or both, qualitative and quantitative methods.

Case studies can fulfil various purposes (Yin, 1994; Eisenhardt, 1989; Voss et al, 2002). This include *description, exploration, creation of theory* or *testing of theory*. In any case, case study is not a methodological choice but a choice of what is to be studied. Table 3.3 (Voss et al, 2002) illustrates a useful classification that relates the research purpose with the research questions to answer and research strategies to use.

Purpose	Research question	Research structure
Exploration Uncover areas for research and theory development	Is there something interesting enough to justify research?	In-depth case studies Unfocused, longitudinal field study
Theory building Identify/describe key variables Identify linkages between variables Identify 'why' these relationships exist	What are the key variables? What are the patterns or linkages between variables? Why should these relationships exist?	Few focused case studies In-depth field studies Multi-site case studies Best-in-class case studies
Theory testing Test the theories developed in the previous stages Predict future outcomes	Are the theories we have generated able to survive the test of empirical data? Did we get the behaviour that was predicted by the theory or did we observe another unanticipated behaviour?	Experiment Quasi-experiment Multiple case studies Large scale sample of population
Theory extension/refinement To better structure the theories in light of the observed results	How generalisable is the theory? Where does the theory apply?	Experiment Quasi-experiment Case studies Large-scale sample of population

Table 3.3: Matching research purpose with methodology (Voss et al, 2002)

3.5.3. Action research (AR)

Kurt Lewin (1946) introduced the term *action research* when referring to an approach that combined theory generation with changing the social system through the researcher acting in the social system. The aim of AR is to contribute to academic research while contributing to solving practitioners' problems. Coughlan and Coghlan (2002) argue that operations management research involves learning from application and thus, AR becomes a valid approach for this research discipline. In 1978, Susman and Evered presented AR as an important alternative to overcome the deficiencies of positivist approaches in organisational science. They used an earlier definition of Raponport (1970, p.499) to define action research:

'AR aims to contribute both to the practical concerns of people in an immediate problematic situation and to the goals of social science by joint collaboration within a mutually acceptable ethical framework'

In words of Coughlan and Coghlan (2002, p.227) AR is appropriate when the research question relates to (1) describing an unfolding series of action overtime in a given group or organisation, (2) understanding as a member of a group how and why their action can change or improve the working of some aspects of a system, and (3) understanding the process of change or improvement in order to learn from it. Susman and Evered (1978) pointed out that AR does not need to justify itself in relation to alternative research approaches. AR can be justified in its own terms, particularly those which argue that the reflection and data generation and the emergent theories cannot be captured readily by alternative approaches (Eden and Huxham, 1996; Gummesson, 2000).

In AR the research output results from an involvement with members of an organisations over a matter, which is of genuine concern to them (Eden and Huxham, 1996). Gummesson (2000, p.119) cited the following ten characteristics as relevant to AR:

(1) Action researchers take action

(2) AR always involves two goals; solve a problem and contribute to science

(3) AR is interactive in terms of collaboration between researcher and client.

(4) AR aims at developing holistic understanding

(5) AR is fundamentally about change

(6) AR requires an understanding of the ethical framework

(7) AR include all types of data gathering methods

(8) AR requires a breadth of pre-understanding of the business environment

(9) AR should be conducted in real time

(10) The AR paradigm requires its own quality criteria

AR does not seek for universal knowledge but rather puts emphasis on situation-specific knowledge generated through action (Susman and Evered, 1978; Eden and Huxham, 1996; Coughlan and Coghlan, 2002). It is similar to the case study approach in the sense that the knowledge generated is specific to the case. AR, however, mainly differs from case studies in that the researcher is actively involved in the process of change whereas in case studies the role of the researcher is to understand the case without being a change agent. Because of the depth of the study AR allows the researcher to see the 'unobservable' (Eden and Huxham, 1996; Coughlan and Coghlan, 2002).

From the outside one could argue that AR is the same as management consultancy. In fact, often consultancy projects have been labelled as AR. Coughlan and Coghlan (2002, p.237) described this as 'consulting masquerading as research'. Consultancy generally uses prescriptive approaches for implementation but tends to neglect the often vital social processes that underpin the development of any change project. The researcher needs to take this issue very seriously and to remember that the key criteria of AR is to contribute to knowledge as well as to practice. Gummesson (2000, p.185) identifies five major differences between AR and management consultancy:

(1) Demands for access and preunderstanding of the business are greater for the consultant than for the researcher

(2) Researcher needs to keep records of the change process

(3) The consultant is concerned with the results of the change process while the researcher's focus is on understanding of the means to achieve those results.

(4) Consultants work under tighter time and budget constraints

(5) Consultants require empirical justification while the researchers' conclusions require to be compared to theoretical and empirical data.

3.5.4. Constructive research

Constructive research is a research approach that aims to produce solutions to explicit problems (Kasanen et al, 1993, Kekale, 2001) and it is closely related to the concept of innovative constructivism (Meredith, 1993; Kaplan, 1998). This approach produces an innovative solution, which is theoretically grounded, to a relevant practical problem. An essential component of constructive research is the generation of new learning and knowledge in the process of constructing the solution. The quest for theoretical novelty, link to existing theory and discussion over the applicability in other situations distinguishes this research approach from product development and problem solving initiatives (Lanning, 2001).

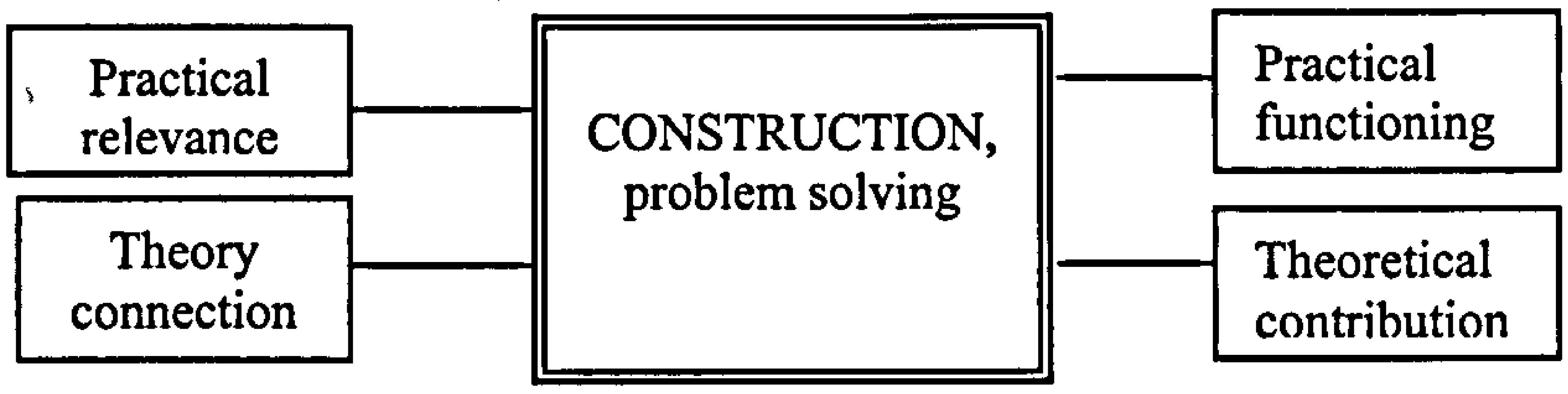

Figure 3.3: Elements of constructive research (Kasanen et al, 1993)

Constructive research can be seen as a form of applied research and as such, a key criteria for judging the quality of the research is to do with usefulness (Kasanen et al, 1993). It is important for the final output to be relevant, simple and easy to use (Lanning, 2001). This means that although rigorous research is required for enhancing credibility, there is also a need for developing standards of practical relevance. Therefore, a group of practitioners needs to be identified in order to apply the construct and receive adequate feedback.

3.6. Research paradigm and strategies of this study

This researcher's epistemological and ontological assumptions had an orientation towards the *phenomenological paradigm*. In other words, he tends to believe that people are part of their own reality and knowledge is found 'inside people's heads'. The researcher was looking for a deep understanding of the phenomena that is team performance measurement. In particularly, he wanted to learn how organisations were measuring team performance and designing TPMS, why team performance measurement was an important issue and how he could provide a solution to the industrial problem. This would enable him to gain new insights into the subject of the study and at the same time answer the research questions. The objectives were to contribute to extending current knowledge in team performance measurement systems and, at the same time, to find a practical solution to a current organisational problem.

The phenomenon of this study required to be studied in its entire context. The historical and cultural features of an organisation have an important impact on the adoption of performance measurement systems. In addition, teams and individual team members are subjective and open to different interpretations. They might have different views on what team performance means and the most appropriate ways to measure it. As a result, rather than looking for objective causal relationships, the researcher tried to better understand the problems, provide solutions and contribute to knowledge in the area, mostly through subjective interpretation.

These initial assumptions mean that characteristics of *qualitative research* will often be found throughout this thesis. Interviews, multiple realities and explanation by using words rather than numbers, are common features of this research work.

The research strategies used during this study are suited to the *applied* and *empirical* nature of this study. During the initial phase of the thesis a case study strategy was used. The purpose of these case studies was both *exploration* and *theory building.* A case study strategy was particularly appropriate because 'how' and 'why' type of questions were the main focus of this phase. The researcher wanted to study how organisations were tackling team performance measurement and why some organisations were successful in developing TPMS while others were not. This would lead him to understand the factors that enable and/or constrain the development of effective TPMS. The situation, therefore, required the researcher to become part of the case to better understand the situation's specific characteristics and context.

AR also plays a key role within this research. The decision to adopt an AR strategy came as a result of the opportunity to work with one of the industrial collaborators as an active agent of change during an improvement project. The design of a TPMS was an important part of the improvement program and thus, the researcher could actively collaborate with the team members in the development process. This would allow him to understand the factors that affect the design of TPMS and as a result, to refine and further develop the findings from the initial case studies. It would also facilitate the assessment of using a structured approach for designing TPMS while being actively involved in the change process with the team. Therefore, the objective of the AR strategy was to bring change into the organisations as well as to contribute to knowledge in the TPMS design area.

Case study and AR are the most prominent strategies of this research. As a result, the criteria and theory on both case study and action research is used to judge the quality of the research.

Due to the fact that this research develops an innovative construct, which is theoretically grounded, to solve a relevant practical problem, one could argue that this research has also a constructive research flavour. In fact, the criteria for ensuring the quality of constructive research will be consistently used within this thesis.

3.7. Chapter conclusion

This chapter discussed a number of issues related to research methodology. It started by introducing some of the terminology related to methodology that will be used in this thesis. It then defined the specific research questions and objectives that guided this study. The next section focused on the philosophical research paradigms and potential research strategies. Finally, the paradigm and strategies for this study were discussed. This research has an orientation towards the *phenomenological paradigm* and the main research strategies that will be used are *case studies, action research* and *construction research.* Table 3.4 summarises the research strategies used within this research, identifying the main features and addressing certain tactics to ensure the quality of the research outcomes.

The following section discusses research design issues and describes data collection and analysis methods used during this research as well as the criteria to evaluate the overall quality of research findings.

General characteristics	When to use?	Ensuring and judging the quality of the research
Qualitative research		
•Case and field oriented •Issues are progressively focused •Close to the real phenomenon •Researcher's personal involvement •The emphasis on observables, including the observations by informants •Includes descriptions with author's interpretations •Reporting provides vicarious experience •Knowledge is constructed, not discovered •Phenomena studies in its natural setting •Personality of the scientist is a key research instrument •Contextual and holistic assessment of the phenomena	•To understand a phenomenon, not to explain cause and effect relationships •Research problems are related with cases or phenomena	•Triangulation •Emergent and responsive research design •Sensitivity to the risks of human subjectivity •Disconfirming own interpretations
Case study research		
•Descriptive or normative in nature •Both quantitative and qualitative methods used •Hard to separate analysis and interpretation from data gathering •Analysing and interpreting subjective procedures •Knowledge is rather constructed than discovered or found •Generalising on the basis of very limited number of cases •Generalising is not making statistical inferences from the sample but to generalise through deep understanding of the phenomena •Interviews adapt to the changing situations and requirements •Captures the core meaning and feelings of the informant	•When a contemporary phenomenon within its real-life context needs investigation To gain a better understanding of complex phenomena •When a "what, "how" or "why" question is being asked about a set of events, over which the investigator has little or no control •To build a theory and to test it •To produce a description	•The use of triangulation •Proper research design •Rigorous and accurate representation of empirical data •Finding rival explanations •Do pattern matching •Use a case study protocol •Develop a case study database •Use replication logic in multiple case studies •The reader is offered a chance independently to judge the merits, the validity, and the reliability of the analysis. •Significant research outcome
Action research		
•Research in action •Researcher actively participates in the change process •Two aims: solve a problem and contribute to science •Seeks for situation-specific knowledge rather than universal knowledge •Holistic and contextual understanding of the phenomena •Requires an understanding of the ethical framework •Both qualitative and quantitative data collection methods used •Continuous cooperation between researcher and client personnel •Incremental theory building •Generalisation though conceptualisation of the particular experience and linking to theory	•When change is required to investigate about a contemporary phenomena it is real-life context •When describing an unfolding series of actions over time in an organisation •To understand as a member of a group 'how' and 'why' action can change or improve aspects of the system •To understand the process of change to learn from it •To build and test theory	•Systematic use of action research cycle •Rigorous and orderly data exploration process •Illustrate inferences with relative directly observable data •Combine advocacy with enquiry – subject assumptions to public testing •Make explicit sustainable change as a result of action research •Make explicit significance of work
Constructive research		
•Normative in nature •Typically includes case studies •Both quantitative and qualitative methods used •Produces an innovative and theoretically grounded solution for a relevant problem •Uses a limited number of research objects	•When there is a need for an innovative and theoretically grounded solution for a relevant problem •When there is a concern about "how things ought to be in order to attain goals" – not "how things are"	The research outcome: •Relevant, simple, and easy to use •Practical relevance •Practical utility •Proved to be useful •Theoretical novelty •Link to theory •Also applicable in other environments

Figure 3.4: Summary of research strategies (modified from Lanning, 2001)

4. RESEARCH DESIGN

Quality if never an accident; it is always the result of intelligent effort (John Ruskin, 1819-1900)

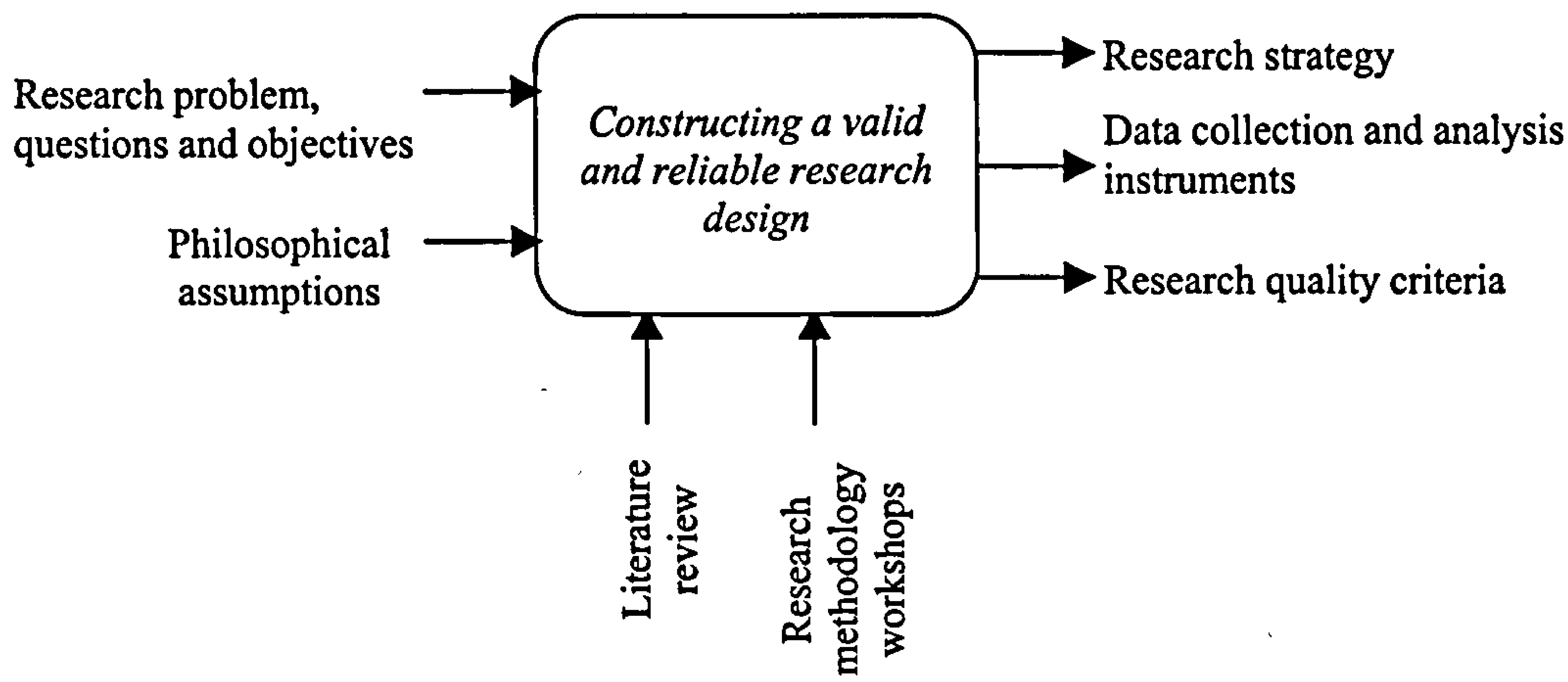

Figure 4.1: Chapter 4 input-output diagram

This chapter tackles the issue of research design in the context of this thesis. In doing so, it presents a critical review of the theory on how to design case studies, action research and constructive research studies, i.e. the three main strategies used in this study. The chapter also describes a number of data collection and data analysis instruments and gives a summary of the specific instruments used during this study.

The final part of the chapter tackles the issues of research quality. It first defines the criteria that will be used to evaluate the overall quality of the research and then identifies some of the tactics that the researcher will adopt to ensure the fulfilment of the criteria.

4.1. What is research design?

'Research design is the logic that links the data to be collected and the conclusions to be drawn to the initial questions of the study' (Yin, 1994, p.18).

The research design should not be confused with a project plan. Research design guides the investigator in the process of collecting, analysing and interpreting observations and allows one to draw inferences concerning causal relationships and to define the domain of generalisability (Yin, 1994). The main objective of the research design is to ensure that the data collection and analysis methods chosen at the different phases of the research are appropriate to answer the original research questions. Hence, one could argue that this is the most critical phase of the research since it will partly dictate the quality and validity of the research outputs generated in the latter phases of the research.

On the other hand, Stake (1995) argues that although the adoption of rigorous research methods is important to generate reliable findings, good thinking rather than good methods is the key to good research. In other words, research methods will only be useful when the researcher really understands the aims and the reasons for the study.

4.2. Phases of the research

This research was carried out in four different phases (Figure 4.2), including *Pre-understanding, Theory Building, Theory refinement and construct testing* and *Evaluating the research.*

The *pre-understanding phase* focused on identifying and selecting a relevant and novel research topic. Prior to starting this research project the researcher had been involved in several business process improvement and performance measurement projects, which highlighted the need for effective team-based performance measurement systems (Mendibil et al, 2002a). The initial review of the literature (Chapter 2, see also Chapter 1) and the initial discussions with the four industrial collaborators allowed better understanding of the research problem, identifying the gaps in current research and defining the research questions. This clearly focused the scope of the study.

The *theory building phase* aimed at gaining new insights into the factors that affect the development of TPMS. Using a case study strategy an initial list of potential factors was identified (Chapter 7). These initial findings were continuously discussed during project steering committee meetings, seminars and conferences.

During this phase new research questions emerged. The research focused on TPMS design construct and after evaluating the available approaches a new TPMS design construct was developed (Chapter 8).

The objective of the *theory refinement and construct testing phase* (Chapter 9 and 10) was to refine the knowledge regarding the factors affecting TPMS design, to evaluate the validity of the TPMS design construct and to assess its impact. Several industrial workshops and an AR study were carried out in order to achieve the above objectives. The opinion of experts in the subject (e.g. HR specialists, team leaders, management consultants) also played a valuable role in this phase.

The *validating and evaluating phase* (Chapter 11 and 12) focused on making the contribution (practical and theoretical) of this research explicit and demonstrating the validity and reliability of the research findings.

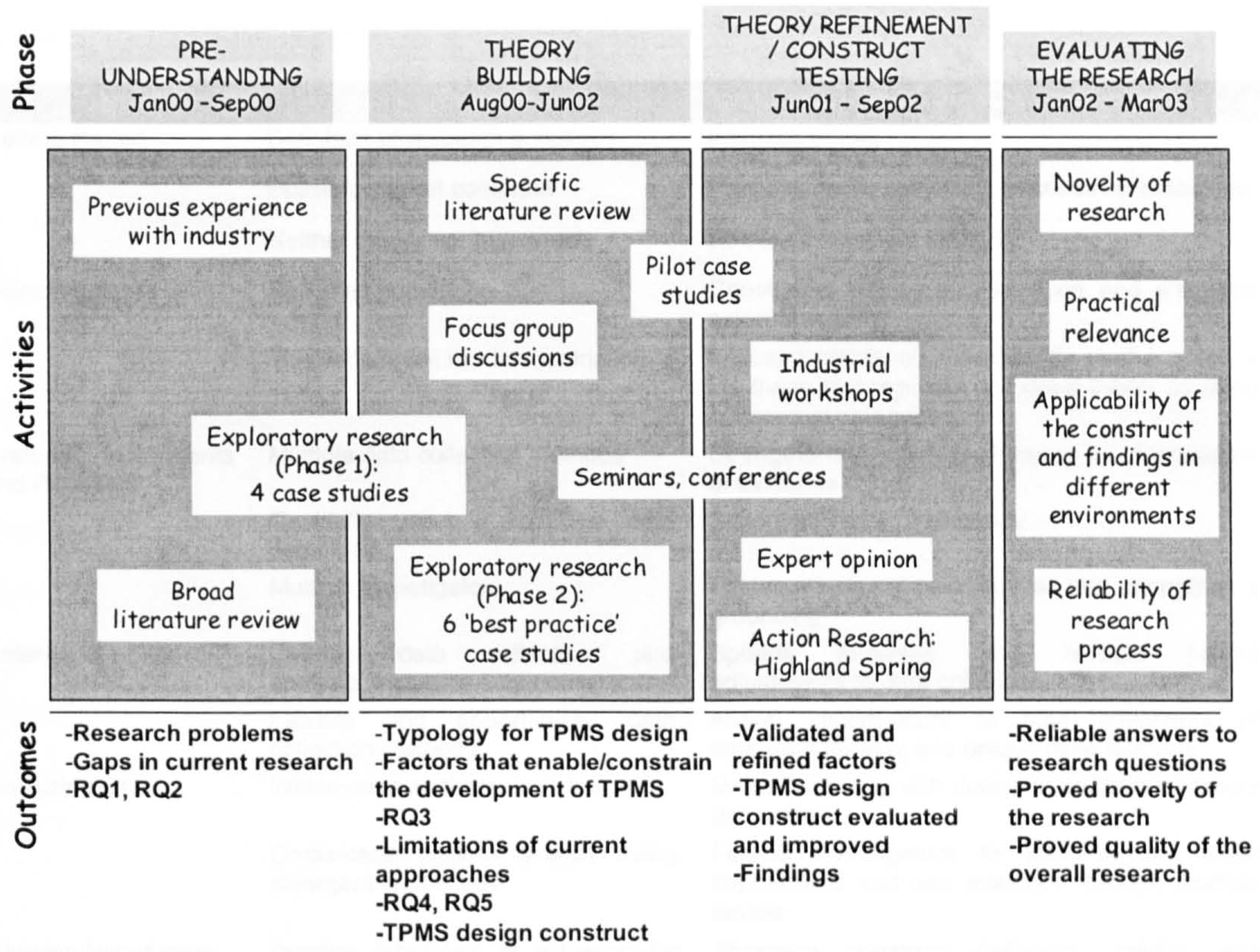

Figure 4.2: Phases of the research

4.3. Theory building and refinement

The key objective of this research is to generate new understanding about the design of TPMS. For doing so, it is essential to learn how case studies and action research (the two main research strategies within this thesis) support the development of new theory. Wacker (1998) argues that theory is made up of four components: definition of terms and variables, the domain of the theory (i.e. setting in which the theory can be applied), a set of relationships and specific predictions.

Case studies are particularly relevant for theory building (Glaser and Strauss, 1967; Eisenhardt, 1989; Meredith, 1998; Voss et al, 2002) and theory extension or refinement (Voss, 2002). Building theory through case studies is based on a grounded theory approach (Glaser and Strauss, 1967). Grounded theory emphasises the emergence of theory solely from evidence and thus, it requires large and rich amounts of primary data. Case studies are a prime source of this data (Voss et al, 2002).

Eisenhardt (1989) proposed a step-by-step process for theory building from case studies (Table 4.1) while other authors (Miles and Huberman, 1994; Strauss and Corbin, 1990; Meredith, 1993; Yin, 1994; Voss et al, 2002) have proposed a number of theory building methods complimentary to this process.

Step	Activity	Reason
Getting started	Definition of research questions	Focuses efforts
	Possibly a priori construct	Provides better grounding of construct measures
	Neither theory nor hypothesis	Retains theoretical flexibility
Selecting cases	Specified population	Constraints extraneous variation and sharpens external validity
	Theoretical, not random, sampling	Focuses efforts on theoretically useful cases – i.e. those that replicate or extend theory by filling conceptual categories
Crafting Instruments and Protocols	Multiple data collection methods	Strengthens grounding of theory by triangulation of evidence
	Qualitative and quantitative data combined	Synergistic view of evidence
	Multiple investigators	Fosters divergent perspectives and strengthen s grounding
Entering the Field	Overlap data collection and analysis, including field notes	Speeds analyses and reveals helpful adjustments to data collection
	Flexible and opportunistic data collection methods	Allows investigators to take advantage of emergent themes and unique case features
Analyzing data	Within-case analysis	Gains familiarity with data and preliminary theory generation
	Cross-case pattern search using divergent techniques	Forces investigators to look beyond initial impressions and see evidence through multiple lenses
Shaping Hypotheses	Iterative tabulation of evidence for each construct	Sharpens construct definition, validity, and measurability
	Replication, not sampling, logic across cases	Confirms, extends, and sharpens theory
	Search evidence for 'why' behind relationships	Builds internal validity
Enfolding Literature	Comparison with conflicting literature	Builds internal validity, raises theoretical level, and sharpens construct definitions
	Comparison with similar literature	Sharpens generalizability, improves construct definition, and raises theoretical level
Reaching Closure	Theoretical saturation when possible	Ends process when marginal improvement becomes small

Table 4.1: Process of building theory from case study research (Eisenhardt, 1989)

Action Research is also an appropriate research approach for theory building (Eden and Huxham, 1996; Coughlan and Coghlan, 2002). Because of its nature AR does not allow repeatable experiences (i.e. all interventions will be different) and thus, AR is not best suited for rigorous theory testing (Eden and Huxham, 1996). Still, the action researcher can be expected to use existing theory in order to refine and further develop it.

Eden and Huxham (1996) identify a number of issues related to how AR generates theory:

- AR demands an explicit concern with theory that is formed from the conceptualisation of the particular experience in ways which are intended to be meaningful to others.

- AR generates theory, in which the theory develops from a synthesis of that which emerges from the data and that which emerges from the use in practice of the body of theory which informed the intervention and research intent
- Theory building, as a result of AR, will be incremental, moving from the particular to the general in small steps

AR generates emergent theory, which in words of Coughlan and Coghlan (2002) 'emerges through the unfolding of a series of events as the designated issue is confronted, and attempts at resolution by the members of the organisation with the help of the action researcher'. During AR studies the cycle of planning / taking action / evaluation occurs several times. This continuous inquiry-reflection process that characterises AR means that learning is gained in action. Based on an earlier AR cycle suggested by Susman and Evered (1978), Coughlan and Coghlan (2002) propose a 8-step AR cycle (Figure 4.3) composed and argued that it is the enactment of this cycle that provides the framework for generating emergent theory.

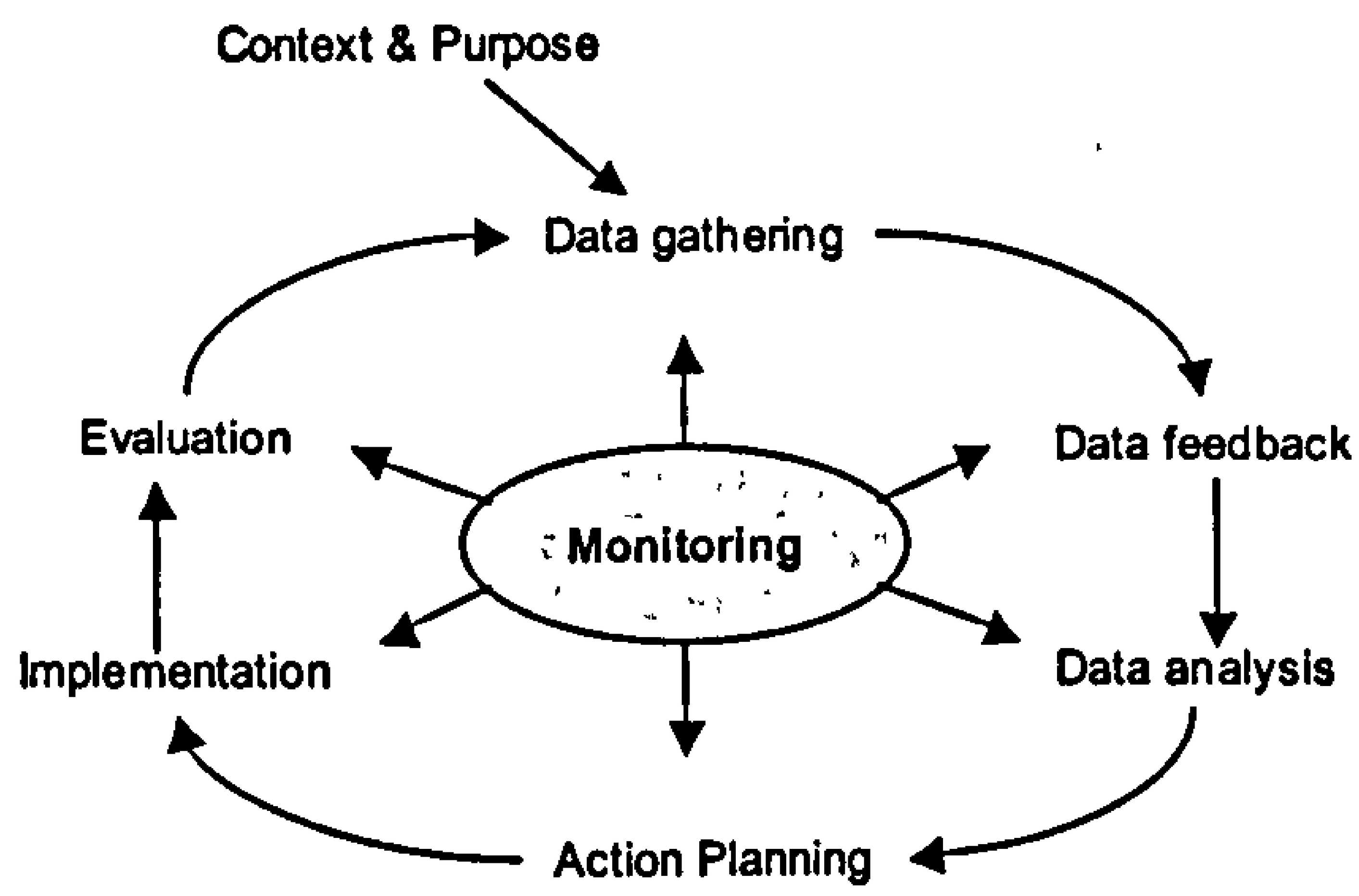

Figure 4.3: AR cycle (Coughlan and Coghlan, 2002)

AR projects are specific to the context of action and thus, they do not aim to create universal knowledge (Coughlan and Coghlan, 2002). Still, it is important to understand the implications of the findings outside the context of the AR study so that they can be useful for other organisations (Eden and Huxham, 1996; Coghlan and Brannick, 2001; Coughlan and Coghlan, 2002).

In AR studies, theory is developed through learning in action. In other words, theory is developed from the analysis and synthesis of the data collected and from using in practice the theory that formed the basis of the AR study. Therefore, it is similar to case studies in that it develops 'grounded theory' (Glaser and Strauss, 1967) for empirical data collected during the organisational intervention.

The next sections describe in more detail specific research designs for case study, AR and constructive research (including data collection and analysis methods) and they identify the specific methods used during the different phases of this research.

4.3.1. Case study research design

According to Yin (1994) five components of research design are especially relevant for case studies:

(1) a study's questions

(2) its proposition, if any,

(3) its unit(s) of analysis

(4) The logic linking the data to the propositions, and

(5) The criteria for interpreting the findings

There is a general agreement (Miles and Huberman, 1994; Eisenhardt, 1989; Yin, 1994; Voss et al, 2002) in that the starting point should be the definition of the research framework and questions, at least in broad terms. As Mintzberg (1979, p.585) noted "no matter how small our sample or what our interest, we have always tried to go into organisations with a well defined focus". The researcher should have a prior view of the general constructs and concepts that he/she intends to study, and their relationships (Voss et al, 2002). These constructs and concepts will generally be built upon the existing literature and the objectives of the study. Components 1-3 for this research were described in Chapter 1 and 3 (Section 1.2, 1.3 and 3.3 respectively).

Yin's (1994) components 4 and 5 are related to the collection and analysis of data and evaluation of the findings from the case studies. These components will be discussed later in the chapter. First, it is important to focus on two issues that researchers need to tackle when designing case study research: (1) the number of cases needed to answer the research questions, and (2) which cases to choose and which ones to discard.

4.3.1.1. Number of cases

Case study research work can involve either a single-case or a multiple-case[4] research design. The rationale behind each option is beyond the personal preferences of the researcher or the resource limitations for carrying out a particular research project. Each of these

[4] Stake (1995) uses the term collective cases studies when referring to multiple case studies (see Chapter 3)

research options have a specific purpose and thus, the selection of one approach over the other needs to be based on theoretical justification.

In words of Yin (1994), a single case study research design should be adopted when the case represents:

(1) a critical case that meets all the conditions for testing a theory

(2) a unique or extreme case

(3) a revelatory case that provides access to a situation that was previously inaccessible for investigation

Single case studies, however, have certain limitations that the researcher needs to address prior to choosing that option. Firstly, the potential for generalising the findings or theories developed from a single case is very limited (Yin, 1994; Voss, 2002). Secondly, if data from a single case study is misinterpreted this can affect the quality of the whole research work.

Although it might appear that multiple-case studies provide more robust research results, this is not the rationale behind this type of case studies. In words of Yin (1994) 'a major insight is to consider multiple cases as one would consider multiple experiments – that is, to follow a *replication* logic'. Replication logic takes place when different case studies produce the predicted results (literal replication) or when the different case studies produce contrasting results but for predictable reasons (theoretical replication). As a result multiple-case studies deepen theoretical understanding and explanation (Miles and Huberman, 1994), and increase the potential for generalising the theory. The main drawback of multiple case studies is the amount of resources required. As a consequence the depth of analysis in multiple case studies is generally less than in single case studies.

During this research multiple-case studies were used because in order to answer research question 2 (i.e. what are the factors that enable and/or constrain the design of effective TPMS?) it was required to compare companies that were using effective TPMS with companies that were not.

4.3.1.2. Selecting the cases

Multiple case study research designs demand clear choices about which cases to include within the case sample. When multiple case sampling Miles and Huberman (1994) suggest that the researchers should carry out two related activities. The first activity is to define the boundaries within which cases are selected. They state that these boundaries are determined by the conceptual framework and research questions, which also set the sampling parameters (i.e. settings, actors, events, processes) for a particular study. After identifying the boundaries, the second activity for the researcher is to build a case sampling frame (also based in the conceptual framework and research questions) to help better understand the concepts that underlie the particular study. This allows the researcher to look simultaneously at several settings and to get enough variability to increase the external validity of the study (Miles and Huberman, 1994).

In case study research the criteria used to create a sample of cases is different from traditional random sampling methods. Theoretical sampling rather than random sampling should be used when selecting cases (Eiserhardt, 1989; Yin, 1994; Voss, 2002). This is closely related to the replication logic in that only cases that are theoretically useful are chosen. As a result, when selecting cases the researcher should identify those cases that either

(1) predict similar results, or

(2) predict contrasting results but for predictable reasons

Replication logic can be used to replicate the assumptions behind a theory, extend emergent theory, fill theoretical categories or provide examples of polar types and thus, is particularly useful for theory building (Eisehardt, 1989).

4.3.1.3. Evaluating the quality of case studies

In order to evaluate the quality of case study research Yin (1994) defines four tests that must be applied. These are *construct validity, internal validity, external validity* and *reliability.* Yin (1994) also suggests a number of tactics that researchers can adopt to ensure that the research satisfactorily goes through each test. This is summarised in Table 4.2.

Tests	Case study tactic	Phase of research in which tactic occurs
Construct validity	use multiple sources of evidence establish chain of evidence have key informants review draft case study report	data collection data collection composition
Internal validity	do pattern matching do explanation building do time series analysis	data analysis data analysis data analysis
External validity	use replication logic in multiple case studies	research design
Reliability	use case study protocol develop case study database	data collection data collection

Table 4.2: Case study tactics for four design tests (Yin, 1994, p.33)

4.3.2. Action research design

Due to the uncertain nature of AR and the lack of control over the events, it is not possible to foresee what strategies and methods will be most appropriate at each phase of the study or even to distinguish what these phases are. Still, AR must demonstrate a high degree of method and orderliness in design and execution and a continuous process of reflection about the unfolding or emerging research facts (Eden and Huxham, 1996).

Current literature does not provide a generic approach to design an AR study. Instead, it provides certain guidelines and principles that the action researcher needs to consider prior to starting an AR study. In that sense, it is important for the action researcher to define right at the beginning a research framework that will serve as a platform to guide the study. This research framework needs to incorporate those elements that will ensure the quality and reliability of the final findings. This will include:

1. The *research frame*, clearly defining the scope and objectives of the AR study (Coghlan and Brannick, 2001). At this stage, it might be useful to distinguish between the organisational/practical objectives and the research objectives. The former will bring change to the organisations while the latter will contribute to generating new knowledge.

2. The *AR process,* which includes the AR cycle (Figure 4.3) and identifies the potential sources of data and data collection methods to be used during the study. The AR cycle is the basis for generating knowledge (Susman and Evered, 1978). It is important to remember that although the enactment of this cycle can be anticipated it cannot be designed and planned in advance due to the uncertain nature of AR (Coughlan and Coghlan, 2002).

3. The *operating principles.* Current research on AR suggests a number of aspects that the action researcher needs to consider to ensure the quality of the results of the study and the findings. These aspects are the operating principles and include:

- Continuously *focus on the organisational issues and context* that surround the study. AR provides a great opportunity to generate knowledge by grasping the unique contextual features (e.g. organisational culture, management style, team dynamics).
- AR is *collaborative work and research.* Creating an AR steering committee that includes the action researcher and several members of the organisation will ensure a close co-operation and will increase the potential for planning, implementing and evaluating (Gronhaug and Olson, 1999; Coughlan and Coghlan, 2002). Eden and Huxhman (1996) add that, if possible, the team should include an experienced action researcher.
- AR is an *emergent process* and generates *grounded theory* (Eden and Huxham, 1996; Coughland and Coghlan, 2002). In AR actions are planned and implemented as learning from the evaluation of previous actions is gained. Therefore, it is important for the action researcher to reflect on the actions taken and to learn from them.

- AR requires *frequent dissemination* of findings. One of the biggest threats for AR is the lack impartiality or research bias (Coughlan and Coghlan, 2002). In order to overcome this threat and ensure the validity of the findings, challenge her/his own assumptions and subject these assumptions to public testing (Argyris et al, 1985; Coughlan and Coghlan, 2002)

Chapter 9 will demonstrate how the AR study carried out as part of this thesis was designed using the three elements described above.

4.4. Developing and testing the construct

As previously mentioned, constructive research theory was used when developing the TPMS design construct. Kasanen et al (1993, p.246) suggest that a good quality construct has the following characteristics:

- Practical relevance
- Practical utility / proved to be useful
- Link to theory / theoretically grounded
- Theoretical novelty
- Applicable in other environments

From the above requirements, it is clear that the two key tasks to develop and test the TPMS design construct were (1) to do a critical review of the existing knowledge on TPMS design and related approaches and (2) to test the construct with a number of end-users. The activities related to the first task are described in Chapter 6 and 8 (Section 8.1). The testing of the construct was carried out through a series of industrial workshops (Chapter 9) and was also supported by the feedback from experts on the field.

4.5. Data collection instruments

Selecting and developing the appropriate research instruments to collect data is a key activity of the research design phase. Data collection involves two main steps: (1) preparing for data collection, and (2) collecting the data.

4.5.1. Preparing for data collection

In case study research, the validity and reliability of the data will be enhanced by developing a research protocol (Yin, 1994; Eisenhardt, 1989; Voss et al, 2002). Yin (1994, p.63) claims that a research protocol includes research instruments but it is more than that; 'it contains the procedures and general rules that should be followed in using the instrument... and is intended to guide the investigator in carrying out the case study. A research protocol will typically include several sections, including overview of the project, field procedure, case study questions and guide for case study report. As a result the research protocol (1) continuously reminds the investigator about the research questions, (2) keeps a record of the areas that need to be covered by the study and the data sources to be used, and (3) prepares the investigator to anticipate several problems (e.g. how to write the report) (Yin, 1994).

In AR, the development of the research framework plays a key role prior to the data collection phase.

When developing the research protocol, research framework and other research instruments, it is crucial to bear in mind the criteria used to judge the quality of a research design in order to ensure that the appropriate strategies for data collection are adopted. The last section of this chapter will describe in more detail the criteria used for assessing the quality of this research.

4.5.2. Collecting data

There are several available data collection instruments. For example, Yin (1994) notes that evidence from case study research may come from six different sources: documentation, archival records, interviews, direct observations, participant observation and physical artefacts. Similarly, Voss et al (2002) point out another set of methods for collecting data including, informal conversations, attendance at meetings and events and surveys administered within the organisation. In any case, it is essential that the researcher chooses those research instruments that best help us understand the case study (Stake, 1995).

4.5.2.1. Documentation

Documentation can take various forms such as, memoranda, minutes of meetings, proposals, annuals reports and newspapers. The use of documentation includes; (1) verifying small details such as, spelling and titles or names of organisations, (2) corroborating information from other sources (i.e. data source triangulation), and (3) making inferences that lead to further investigation (Yin, 1994).

Researchers should always critically examine documents because this data source is not exempted from bias and it does not necessarily contain the absolute truth (Yin, 1994; Stake, 1995; Lanning 2001; Barnes, 2001).

4.5.2.2. Interviews

Yin (1994) argues that interviews are an essential data source in case study research because case studies are about understanding human affairs. Interviews can be used to obtain descriptions and interpretations from the interviewee. They also provide the means to access multiple realities from one single case study (Stake, 1995).

Interviews can be unstructured, semi-structured and structured. In case study research interviews have generally an open-ended nature, and thus, either unstructured or semi-structured interviews are most commonly used. During these interviews, the interviewer asks questions about the facts of the matter and also about the interviewee's opinions about particular events. In fact, the purpose is not to simply get yes or no answers but rather to get descriptions of an episode and explanations of events (Stake, 1995).

During interviews, the interviewer needs to be careful not to be too influenced by the respondent's views and interpretations because the latter may include personal bias. Yin (1994) claims that using multiple sources of evidence is necessary to corroborate and increase the validity of the interpretations from the interviews.

4.5.2.3. Questionnaires

When the purpose of the interview is to gather specific information (e.g. questions such as how many or how often) rather than cover open-ended and broader topics, structured interviews are more appropriate. Often, a questionnaire that covers the areas and specific questions is used to support these interviews. Questionnaires provide an efficient approach to gather data of interest to the researcher and so these can be useful when the researcher has limited time to carry out the study. Questionnaire design requires extensive planning, reading and exploratory pilot work (Oppenheim, 1992).

4.5.2.4. Direct observation

By using direct observation the researcher can develop an understanding of the research issue within the context in which the events occur. As a result, the attraction of observation lies in its potential to generate extensive, rich and detailed data (Barnes, 2001). Because of the subjective and unstructured nature of observation, it is particularly important that when using this research instrument, the researcher continuously directs the observations towards the main research issue. It is also essential to keep a good record of the events being observed and so a careful planning of the observations and record keeping is a key part of direct observation (Yin, 1994; Stake, 1995).

Data collection during observation can range from formal to causal (Yin, 1994). Formally, even observation protocol can be developed and the researcher may intend to measure the incidence of certain types of behaviour. Less formally, observations may include comments about the climate of the organisation or the condition of workspaces. In any case, observations can provide unique features of the case under study. As with previous research instruments, a common tactic to increase the reliability of observations is to use several observers (Yin, 1994).

4.5.2.5. Participant observation

Participant observation is a special mode of observation. Here, the researcher is more than merely a passive or outside observer. Participant observers play an active role within the case under study. The main attraction of participant observation is that it provides the opportunity to access events or groups that are otherwise inaccessible and to manipulate minor events as part of the case study (Yin, 1994). This opportunity to manipulate events, however, can also produce researcher's bias and this is an issue that researchers using participant observation need to consider seriously. As with direct observation, the need to continuously keep focused on the research questions and have a good data recording method are essential components of participant observation.

Because of the role that the researcher plays during participant observation, this method is commonly used during AR studies where the researcher is an active agent of change in organisations.

4.5.2.6. Diary methods

Diary methods are useful when keeping the story line of the research (i.e. recording events, emerging ideas, personal reflections) (Easterby-Smith et al, 1991) and thus, they are specially relevant when doing action research. Diary methods are commonly used to support direct and participant observation.

4.5.2.7. Surveys

The main purpose of a survey is to obtain information from a defined set of a population and thus, they can be useful when describing and explaining aspects of that population. Surveys can be carried through personal interviews (face-to-face, telephone) and by sending questionnaires by post or email. Surveys have the potential to cover big samples size, which cannot be covered by other methods due to resources limitations. However, surveys have several limitations such as, potential ambiguity of questions, lack of depth of data low ability to understand relationships between variables (Easterby-Smith et al, 1991; Yin, 1994).

Table 4.3 illustrates a summary of several data collection methods including their strengths and weaknesses.

Source of Evidence	Strengths	Weaknesses
Documentation	• Stable-can be reviewed repeatedly • Unobtrusive-not created as a result of the case study • Exact-contains exact names, references, and details of an event • Broad coverage-long span of time, many events, and many settings	• retrievability-can be low • biased selectivity, if collection is incomplete • reporting bias-reflects (unknown) bias of author • access-may be deliberately blocked
Interviews	• targeted-focuses directly on case study topic • insightful-provides perceived causal inferences • Effective for collecting in-depth data • Opportunity for clarifying misunderstandings	• bias due to poorly constructed questions • response bias • inaccuracies due to poor recall • reflexivity-interview gives what interviewer wants to hear • Interviewing and data-analysis is time consuming
Questionnaires	• Time efficient • Opportunity for quantifying responses	• Response bias • Lack of in-depth data (unless it is supported by interviews)
Direct Observations	• reality-covers events in real time • contextual-covers context of event	• time-consuming • selectivity-unless broad coverage • reflexivity-event may proceed differently because it is being observed • cost-hours needed by human observers
Participant Observation	• (same as above for direct observations) • insightful into interpersonal behaviour and motives	• (same as above for direct observations) • bias due to investigator's manipulation of events
Diary methods	• Very appropriate to support observations • Useful to obtain insightful data into social processes	• Difficult to analyse data
Surveys	• Covers big sample size • Opportunity to quantify responses • Time efficient	• Potential ambiguity of questions • Response bias • Lack of in-depth data

Table 4.3: Sources of evidence – strengths and weaknesses (adopted and modified from Yin, 1994; Stake, 1995; Easterby-Smith et al, 1991; Barnes, 2001; Martinez, 2003)

4.6. Data collection instruments used during this study

Table 4.4 summarise the data collection methods used during the different phases of this research. A number of methods were combined during this research but rather than discussing them in this section they will be described more in detail during the corresponding chapters (Chapters 7, 9 and 10).

It is important to mention that apart from the data collection methods illustrated in the Table 4.3 there were other avenues that showed to be very useful for getting feedback and refining the findings. These included project steering committee meetings, industrial seminars, conferences and the annual research presentation day held within the University[5].

[5] Department of Design, Manufacturing and Engineering Management, University of Strathclyde

Theory building	Theory refinement	Construct development and testing
Research protocol Questionnaire Semi-structured interviews Documentation Steering committee meetings Observations Informal discussions	Questionnaire Semi-structured interviews Participant observation Personal notes Company meetings Informal discussions	Workshop questionnaire Expert feedback form Observations Design team management questionnaire Informal discussions

Table 4.4: Summary of data collection instruments for this study

4.7. Data analysis

Analysing data is the heart of most research work, but it is also the most difficult and least codified part of the research process (Eisenhardt, 1989). Miles and Huberman (1994) and Eiserhardt (1989) suggest that the qualitative researcher should develop a research design that interweaves and overlaps data collection and data analysis. The main advantage of adopting this approach is that it allows the researcher flexibility to make adjustments during the data collection phase in order to collect new data or test hypotheses that emerge during data analysis. It also allows an earlier start to the data analysis phase and thus, by the time data collection is finished a considerable volume of data is reduced, which in turn simplifies the phase of drawing conclusions (Miles and Huberman, 1994). According to Miles and Huberman (1994) data analysis consists of 3 main activities; data reduction, data display, and conclusion drawing and verification.

4.7.1. Data reduction

It is widely agreed that one of the risks of qualitative research is drowning in huge amounts of data. Therefore, it is essential that the researcher reduces the data in a structured and coherent way so that data can be more easily understood and interpreted. Documentation and coding are two forms of data reduction that will be described in the following lines.

4.7.1.1. Documentation

After collecting data through site visits the first step is to create a detailed report of the site visit. The format of this report can be the same as the structure of the research protocol so that data is organised in a coherent and structured format. Keeping such a standard format also helps in comparing data across several cases. Ideally, this task of documenting should be carried out as soon as possible after the site visits in order to maximise recall and enable to fill gaps in data (Voss, 2002).

Miles and Huberman (1994) describe several methods for documenting qualitative data from fieldwork. These include contact summary sheets, document summary forms, site analysis meetings and interim site summaries. In essence, the function of these methods is to organise the data using a coherent format and to make explicit what the researcher knows about the particular case and what is still left to find.

4.7.1.2. Coding

Coding refers to associating specific codes or numbers to a segment of words. This allows the researcher to reduce data into categories (Miles and Huberman, 1994; Glaser and Strauss, 1967). When coding, incidents of phenomena (e.g. settings, acts, activities, relationships, meanings) in the data are coded into categories and then, each incident is compared with previous incidents in the same category. This allows the researcher to identify patterns of data, which can lead to theoretical developments (Miles and Huberman, 1994; Voss, 2002).

Miles and Huberman (1994) describe three methods for creating codes. With the first method the researcher creates a provisional list of codes prior to fieldwork. This list of codes derives from the conceptual framework of the study, the research questions, research problems and other variables that the researchers considers as important. Thus, it forces the researcher to link the key components of the study with data. The second method is most commonly used when taking a more inductive or "grounded" approach. In here, the researcher does not create codes until data is collected so that during data analysis a more open-minded and context-sensitive approach can be adopted (Miles and Huberman, 1994). The third method for creating codes is a mixture of the first two. In other words, the researcher does not create specific codes but instead she or he defines areas of general domain in which codes can be developed inductively in later stages.

Finally, Miles and Huberman (1994) argue that researchers should be open to redefine, modify, or discard those codes that might not be that appropriate as the study goes on.

4.7.2. Data display

Miles and Huberman (1994) strongly recommend the use of displays for describing and explaining particular cases. They define displays as 'a visual format that presents information systematically, so the user can draw valid conclusions and take needed action'. In other words, they allow the researcher to view a full data set (condensed from the field notes) in the same location and arranged systematically in order to answer the research questions of the study. Displays can take the form of event listings, critical incident charts and matrixes (Miles and Huberman, 1994).

4.7.3. Analysing data and drawing conclusions

Most commonly, authors (Eisenhardt, 1989; Yin, 1994; Miles and Huberman, 1994; Voss, 2002) make a distinction between within-case and cross-case data analysis for analysing data during qualitative studies. This section also discusses the concept of *triangulation*, which is a recognised method for drawing conclusions and increasing the validity of the research findings.

4.7.3.1. Within-case analysis

The objective of within-case analysis is to gain a good understanding of a particular case and to identify those unique patterns that emerge before generalising patterns across cases (Eisenhardt, 1989). It focuses the researcher on looking for explanations and causalities within the case (Miles and Huberman, 1994; Yin, 1994). Miles and Huberman (1994) suggest four methods for looking for explanation, causality and drawing conclusions. These include explanatory effect matrixes, case dynamic matrixes, causal networks and making and testing predictions. An *explanatory effect matrix* can be considered as the first step to finding explanations and causes. *Case dynamic matrixes* display a set of forces for change and trace the consequential processes and outcomes (Miles and Huberman, 1994). On the other hand, a *causal network* is a display of the most important independent and dependent variables in a field study and of the relationships among these variables. Finally, the last method for analysing the data is to make predictions and to use data from the cases studies to test them.

4.7.3.2. Cross-case analysis

Cross-case analysis seeks for patterns amongst several cases. This is essential to increase the internal validity and the potential to generalise the research findings. As Eisernhardt (1989, p.540) states, people are poor processors of information and thus, they tend to leap to conclusions based on limited data, overly influenced by other individuals, ignoring basic statistical properties or inadvertently dropping disconfirming evidence. Cross-case analysis allows overcoming these problems by looking at data in different ways.

Eisenhardt (1989) and Miles and Huberman (1994) propose a wide variety of methods for cross-case analysis. Maybe the most common one is to first construct a chart containing an array of case study data and then to select a category or dimension and to seek for similarities and differences within the category. Another method is to select pairs of cases and to look for similarities and differences between cases. Other methods include partially ordered matrices, which display the cross-case data with not too much internal order, and matrixes ordered by concept, case or time.

4.7.3.3. *Triangulation*

Triangulation is widely recognised as a way of providing enhanced research validity and reliability. This is achieved through deploying more than one research method and/or tool so that the findings of the study are not biased and as a mean to increase validity and richness of the data collected and also the confidence of the researcher with the results (Jick, 1979; Yin, 1994; Stake, 1995; Eden and Huxham, 1996; Denzin and Lincoln, 2000). In any case, the application of triangulation goes beyond the confirmation of a single set of findings in that it enables one to look for additional interpretations and understanding (Jick, 1979; Stake, 1995). There are four main forms of triangulation that researchers can use to increases the validity and reliability of the research. These are *data source triangulation, investigator triangulation, theory triangulation* and *methodology triangulation* (Stake, 1995). *Data source triangulation* refers to the analysis of the consistency of different data sources through studying a phenomenon using different data sources, at different times, in other spaces, or on different occasions (Lanning, 2001). *Investigator triangulation* is used when different researchers study the same phenomenon, data or interpretation. A common approach to this form of triangulation is by presenting individual observation to a panel of experts in order to discuss alternative interpretations (Stake, 1995). A very similar form of triangulation to the latter is the *theory triangulation.* Theory triangulation also uses multiple observers to interpret data but in this case, these observers have different theoretical backgrounds. In any case, even two observers with the same theoretical background will always have different viewpoints about the same phenomenon and thus, the separation between investigator and theory triangulation is not clear (Stake, 1995). In the case of (4) *methodological triangulation* the researcher uses several research methods (e.g. interviews, direct observation, documentation) to study a particular case.

4.8. Data analysis instruments used during this study

Table 4.5 summarises the data analysis instruments used at each phase of this study. As with the data collection instruments, each of these instruments will be described in more detailed during the corresponding chapters (chapter 7, 9 and 10).

Theory building	Theory refinement	Construct development and testing
Documentation Within-case analysis Explanatory matrixes Cross-case analysis Pattern matching	Documentation Coding Explanatory matrixes Cross-case analysis Pattern matching Causal network	Documentation Data displays (tables and graphs)

Table 4.5: Summary of data analysis instruments for this study

4.9. Evaluating the research

It is important to define the research quality criteria early in the process in order to ensure that the appropriate tactics are adopted (Yin, 1994; Martinez and Albores, 2003). This section defines the specific criteria and corresponding research tactics adopted by the researcher.

This research combines case studies with action research and it also includes features of constructive research. It is, therefore, important to consider the criteria for judging the quality of these three approaches when assessing the final research outcomes (see table 4.6).

Case study research	Action research	Constructive research
Construct validity	Internal validity	Practical relevance
Internal validity	External validity	Practical utility
External validity	Practical relevance	Link to existing theory
Reliability	Bring sustainable change	Theoretical novelty
Contribution to knowledge	Contribution to knowledge	Applicability in other environments

Table 4.6: Quality criteria for 3 research approaches

Making a clear *contribution to knowledge* is the main criteria to assess the quality of a PhD thesis (Easterby-Smith et al, 1991; Philips and Pugh, 2000). This theoretical novelty is also a key criteria when evaluating the outcomes of case studies (Yin, 1994; Voss et al, 2002), action research (Eden and Huxham, 1996; Coughlan and Coghlan, 2002) and constructive research (Kasanen et al, 1993; Kekale, 2001; Martinez, 2003).

In case study research there are a number of controls that the researcher should take into account. These include *construct validity* (Yin, 1994; Easterby-Smith, 1991; Martinez and Albores, 2003), *internal validity* (Eisenhardt, 1991; Yin, 1994; Miles and Huberman, 1994; Meredith, 1998; Easterby-Smith et al, 1991; Martinez and Albores, 2003), *external validity* (Eisenhardt, 1991; Yin, 1994; Miles and Huberman, 1994; Stake, 1995; Meredith, 1998; Easterby-Smith, 1991; Martinez and Albores, 2003) and *reliability* (Yin, 1994; Miles and Huberman, 1994; Easterby-Smith et al, 1991; Martinez and Albores, 2003). Each of these controls will be described in more detail when doing the final evaluation of this research in Chapter 12.

AR uses similar criteria to case studies for assessing the quality of the research. The main difference is that in AR studies it is critical to *bring sustainable change* to the organisation where the study takes place (Eden and Huxham, 1996; Reason and Bradbury, 2001; Coughlan and Coghlan, 2002). Yet, it is important to remember that AR needs to have a clear concern for developing new theory. Otherwise, it will be considered as consultancy and not research. *Internal validity* and *external validity* play also an important role in AR.

The *practical contribution* is also a key criterion to judge the quality of a AR and constructive research studies (Eden and Huxham, 1996; Kasanen et al, 1993; Kekale, 2001; Martinez, 2003). The research must demonstrate the *practical relevance* and *usefulness* of the construct. In fact, all organisational sciences should focus on issues that are relevant for industrial practitioners (Susman and Evered, 1978; Mintzberg, 1979; Thomas and Tymon, 1982).

Table 4.7 summarises the criteria that will be used to evaluate the quality of this research. Note that some of the criteria are common for the three research approaches.

Criterion	Reference
1. Contribution to knowledge	Kasanen, 1993; Yin, 1994; Eden and Huxham, 1996; Easterby-Smith et al, 1991; Philips and Pugh, 2000; Kekale, 2001; Martinez, 2003
2. Rigor of the research design and process	
2.1. Construct validity	Kasanen et al, 1993; Yin, 1994; Easterby-Smith et al, 1991; Kekale, 2001; Martinez and Albores, 2003
2.2. Internal validity	Eisenhardt, 1991; Yin, 1994; Miles and Huberman, 1994; Eden and Huxham, 1996; Easterby-Smith et al, 1991; Martinez and Albores, 2003
2.3. External validity	Eisenhardt, 1991; Yin, 1994; Miles and Huberman, 1994; Stake, 1995; Eden and Huxham, 1996; Meredith, 1998; Easterby-Smith, 1991; Kasanen et al, 1993; Kekale, 2001; Martinez and Albores, 2003
2.4. Reliability	Yin, 1994; Miles and Huberman, 1994; Easterby-Smith et al, 1991; Martinez and Albores, 2003
3. Contribution to practice -i.e. practical relevance and usefulness	Kasanen et al, 1993; Miles and Huberman, 1994; Kekale, 2001; Martinez and Albores, 2003
4. Sustainable change	Eden and Huxham, 1996; Reason and Bradbury, 2001

Table 4.7: Criteria for evaluating the quality of this research

4.10. Chapter conclusions

This chapter has discussed the design features of the research strategies adopted during this research study – i.e. case studies, action research and constructive research. In doing so, the chapter described a number of methods and instruments for data collection and data analysis and identified those chosen for the purpose of this study.

The final section of the chapter presented the criteria that will be used to evaluate the quality of this research. Once these controls are clearly defined it is important to identify the tactics that the researcher is going to use to ensure that the research fulfils the criteria. Table 4.8 summarises the tactics for ensuring the quality of the research used while doing this research. Each of these tactics will be discussed in more detail during the final assessment of the research quality in Chapter 12.

Research activity	Tactics	Stage	Why?
Research design	Theory replication logic in multiple case studies	PR	To increase *external validity* of the factors that affect the development of TPMS
	Selection of multiple data collection techniques	PR	To ensure quality of data and increase *construct validity*
	Definition of quality criteria	PR	To increase *reliability* of the research
	Methodological triangulation	DA	To increase *internal validity.*
Case studies	Data source triangulation	DA	To increase *construct validity*
	Case study database	DC	To increase *reliability* of the research
	Case study protocol	DC	To increase *reliability* of the research
	Within/cross case analysis and pattern matching –rigorous and accurate representation of empirical data	DA	To find explanations and increase *internal validity* and *reliability* of the study
	Finding rival explanations	DA	To increase *internal validity*
	Coding	DA	To increase *internal validity*
	Structured reporting	RE	To make findings explicit and subject to public. Increase *internal validity* and *reliability.*
	Rigorous and accurate representation of data	RE	To increase *internal validity* and *reliability*
	Enfolding literature	CO	To compare findings with similar and conflicting literature and demonstrate the novelty of the findings. Increase *construct, internal* and *external validity.*
Action Research	Develop research framework	PR	To ensure the overall quality of the study. Increase *internal validity.*
	Collaborative work / research – create an AR team	DC DA	To have different perspectives and strengthen grounding. To increase *internal validity* of findings, make a *contribution to practice* and *bring sustainable change.*
	Conscious and deliberate enact of the AR cycle	DC DA	To increase *internal validity*, make a *contribution to practice* and to *bring sustainable change*
	Subject assumptions to public testing	DA RE	To minimise subjectivity and lack of impartiality and increase *internal validity.*
	Structured reporting	RE	To clearly describe the story of the study and make the explanations explicit. It subjects the study to public testing.
Developing and testing the construct	Data source triangulation	DC	To increase *construct, internal and external validity* and demonstrate *practical relevance*
	Investigator triangulation	DC	To increase *construct validity*
	Case study database	DC	To increase *reliability* of research
	Enfolding literature	DE CO	Increase *construct, internal, external validity* and show novelty of the construct.
PR: Preparation, DC: Data collection, DA: Data analysis, CO: Concluding, RE: Reporting, DE: Development			

Table 4.8: Methods used to ensure the validity and reliability of the research

5. UNDERSTANDING TEAMS AND THEIR PERFORMANCE

Team performance measurement research must be based on sound teamwork theories (Baker and Salas, 1997, p.334)

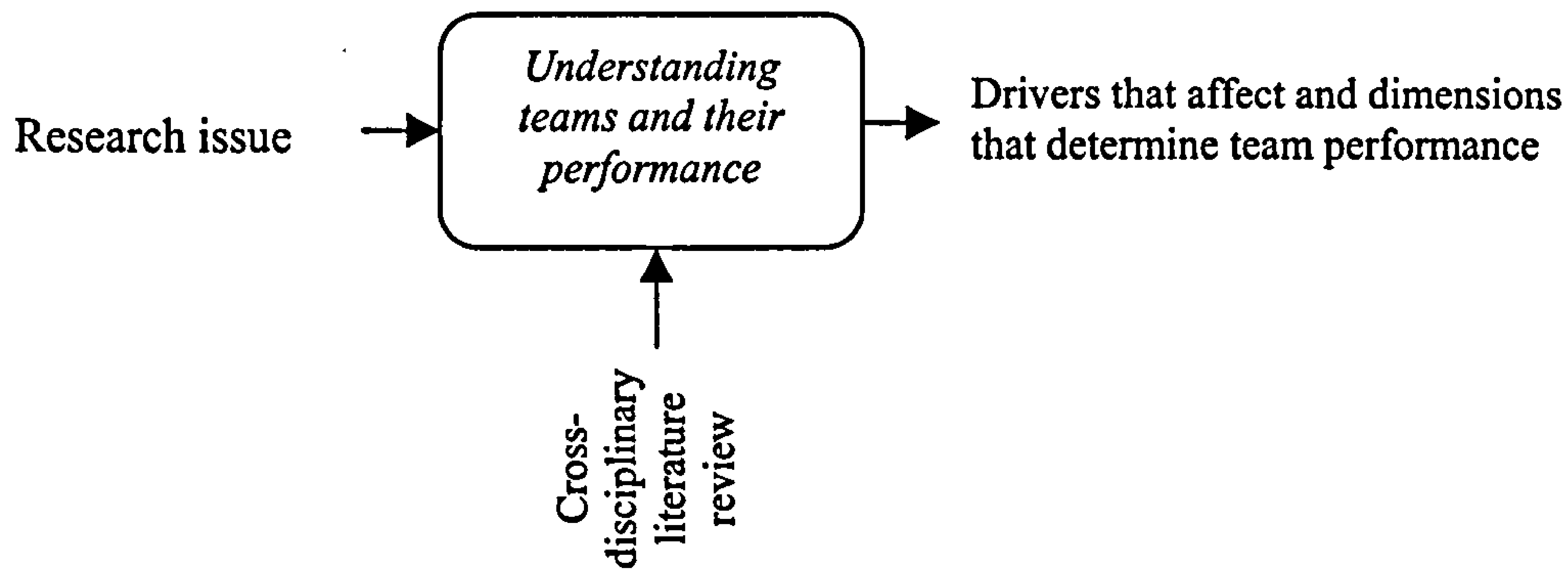

Figure 5.1: Chapter 5 input-output diagram

The objective of this chapter is to gain a deep understanding of the meaning of team performance, which is the unit of measurement that this research is concerned with. In this chapter, theories and models of team effectiveness are critically reviewed. As a result, it clearly identifies and describes the drivers that affect and dimensions that determine team performance. The chapter concludes by illustrating a generic model of team performance that synthesises current research.

The specific review of the literature described in this chapter is the first activity of the theory building phase.

5.1. What is a team?

There is a wide range of definitions of teams in the literature[6]. Two of the most widely accepted definitions of a team are those proposed by Katzenbach and Smith (1993) and Hackman and Oldham (1980) (later refined by Hackman, 1990). In their popular book, *The Wisdom of Teams*, Katzenbach and Smith (1993, p.45) define a team as 'a small number of people with complementary skills who are committed to a common purpose, performance goals, and an approach for which they hold themselves mutually accountable'.

Hackman (1990, p.4) describe a team as having the following characteristics:

1. They are intact social systems, complete with boundaries, interdependence among members, and differentiated member roles.

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[6] When referring to teams many authors use the term 'work group'

2. They have one or more tasks to perform. The group produces outcomes for which members have collective responsibility and whose acceptability is potentially assessable. The group's outcome can be identified as a product that should be theoretically possible to measure and evaluate.

3. They operate in an organizational context. This means that the group, as a collective, manages relations with other individuals or groups in the larger social system in which the group operates. This social system is frequently the parent organization that created the group, but in occasion the salient context is outside the group's own organisation.

The defining element of a team remains the common purpose and the focus on performance. In fact, it is by addressing and understanding the performance challenge of the team that the team can be most effectively shaped and managed (Katzenbach and Smith, 1993).

In his definition, Hackman (1990) views teams as systems. Hunt (1999) argues that a systems perspective recognises the fact that teams' net value must exceed the sum of individuals members' contribution, that the team receives inputs in the form of information, resources and skills, and produces outputs. It also recognises that teams operate within a larger system in which they interact with other teams and systems.

The team and its context

The above definitions make reference to several elements that form the context of the team. These are the *task* that the team is responsible for, the *characteristics of the team* itself, and the *organizational context* in which the team operates. In addition, the 'approach' to which Katzenbach and Smith (1993) refer relates to those *teamwork processes* used for achieving the team objectives. If team performance is to be maximised these four components need to be adequately managed.

- *Task characteristics*

The team task refers to the specific business process or set of interrelated activities that the team is responsible for executing. Team task can include processes such as, new product development, customer order fulfilment, training and development or strategy formulation.

- *Team characteristics*

The team itself is responsible for managing those elements that are important for achieving the team goals. This will include managing the structure (e.g. size, roles, goals, approach) and the composition of the team (e.g. knowledge, skills, attitudes).

❑ *Teamwork processes*

Those processes executed for achieving the team goals. Teamwork processes will also include processes to manage the relationships with the organizational context that is external to the team boundaries.

❑ *Organisational context*

Teams need to be analysed taking into account the organisational context in which they operate (Hackman and Oldham, 1980; Goodman, 1986 et al; Sundstrom et al, 1990). Features of the organisational context that affect teams will include team stakeholders –e.g. customers, suppliers, parent organisation-, organisational support –e.g. rewards, training, information systems-, and external environmental factors – e.g. technology, markets, industry.

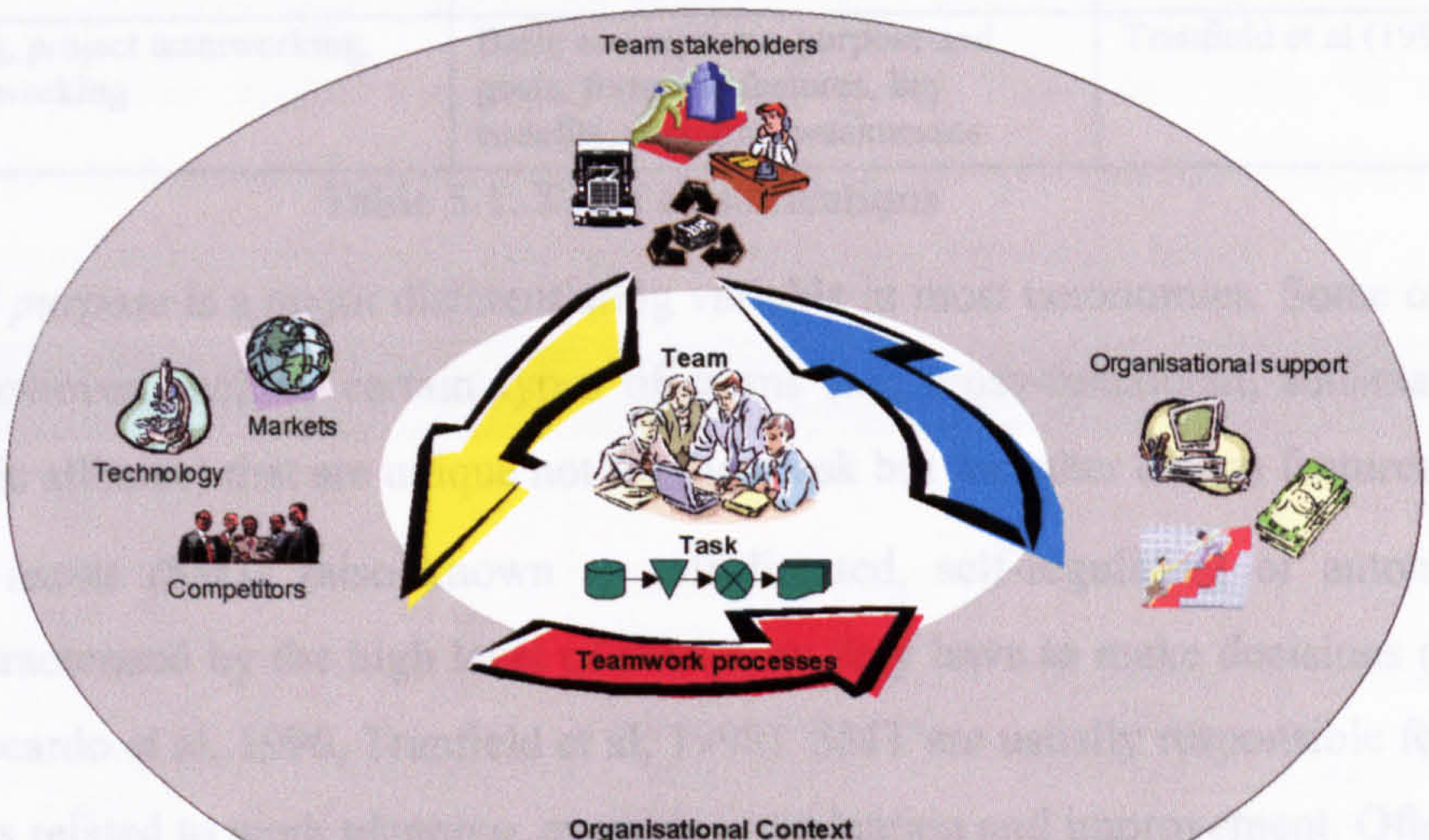

Figure 5.2: The team context

5.2. Types of teams

Identifying a comprehensive classification of team types is not an easy task. Current literature provides a wide range of taxonomies (Table 5.1) and this has the potential to cause confusion. All taxonomies have their own unique characteristics but there are many common and overlapping areas. The only taxonomy that clearly differs from the rest is that proposed by Katzenbach and Smith (1993) based on the level of performance of the teams.

Team types	Differentiating variable	Source
Advice and involvement teams, production and service teams, project and development teams, action and negotiation teams	Team task and purpose	Sundstrom et al (1990)
Work teams, parallel teams, project teams, management teams	Team task and purpose	Cohen and Bailey (1997)
Functional, lightweight, heavyweight, autonomous	Team design and structure, purpose	Wheelwright and Clark (1995)
Work groups, pseudo teams, potential teams, real teams, high performance teams	Performance	Katzenbach and Smith (1993)
Simple problem-solving teams, task forces, cross-functional teams, self-directed work teams	Purpose/task, culture, resource requirements, technology, workforce characteristics, organizational alignment	Recardo et al (1996)
Work teams, parallel teams, project and development teams, management teams, ad hoc teams	Continuity, design, task/purpose, influence	Mankin et al (1996)
Lean teamworking, project teamworking, self-directed teamworking	Basic assumptions, purpose and goals, form and features, key benefits, strengths, weaknesses	Tranfield et al (1998)

Table 5.1: Team classifications

Team *task and purpose* is a major differentiating variable in most taxonomies. Some of these taxonomies, however, include certain types of teams (i.e. cross-functional, self-managed, virtual, strategic alliance) that are unique not for their task but for other design features.

Self-managed teams (SMT) (also known as self-directed, self-regulating or autonomous teams) are characterised by the high level of autonomy they have to make decisions (Cohen et al, 1996; Recardo et al, 1996, Tranfield et al, 1998). SMT are usually responsible for most of the activities related to work planning, execution, evaluation and improvement. Often they also have control over organisational processes, policies, work practices and even rewards and incentives (Cohen et al, 1996; Recardo et al, 1996). As Tranfield et al (1998, p.381) argue SMT "engage commitment, motivation and creativity by maximising discretion and autonomy close to the point of action". The purpose of SMT and the tasks to perform can considerably vary. SMT are used to perform a variety of tasks ranging from permanent and stable work processes (e.g. car assembly team) to one-off projects (e.g. factory lay-out re-design) and strategic planning activities. Therefore, regardless of the task, a team can also take the form of a SMT.

A similar thing occurs with the concept of *cross-functional teams.* This concept has most commonly been used with project teams and parallel teams (Cohen and Bailey, 1997; Recardo et al, 1996; Tranfield et al, 1998). In process-based organisations, however, most of teams, regardless of the task in hand, will have a level of cross-functionality. A cross-functional team can also have the characteristics of a SMT.

In more recent years *virtual teams* (also known as distributed teams) have strongly emerged in the academic literature as well as in the industrial workplace. The uniqueness of the virtual teams is that they face the challenge of coordinating and integrating tasks, processes and communications across temporal, geographic and organizational boundaries (Lipnack and Stamps, 1997). Virtual teams are generally cross-functional and can also include the features of a SMT.

As a result of collaborative type of business structures and strategic alliances (e.g. network or extended enterprises) that aim to integrate the capabilities of individual companies *strategic alliance or extended teams* emerged. The unique feature of this type of team is that they cut across company boundaries and include members from different organisations working as part of the same team. Due to the nature of the relationship, team members from each company provide unique capabilities to the team. They can exist at several organisational levels depending of the phase and nature of the relationship. They are cross-functional in nature and generally will also have the features of a virtual team.

Team type	Team task	Cross-functional	Self-managed	Virtual	Strategic alliance/extended
Work team	Continuous output of products and services	The team includes members from several organisational functions or departments	The team has a high degree of autonomy and decision making authority. Roles and responsibilities might include planning, execution, monitoring, improvement activities as well as managing other organisational processes (e.g. training, recruitment, reward systems)	The team is distributed across space, time and organisations. Teamwork is supported by advanced CSCW and communication technologies	Members of several organisations that collaborate with each other form the team. Members from each organisation provide unique capabilities to the team.
Project and development team	Produce well defined one-time outputs				
Parallel team	Problem solving and improvement activities				
Management team	Coordinate and provide direction, monitor and manage performance				
Ad hoc team	Diverse, shared interest, collaboration				

Table 5.2: Variations of team types

The purpose of Table 5.2 is to illustrate that regardless of the task they perform, teams can be cross-functional, self-managed, virtual and/or strategic alliance/extended. Teams might fulfil the unique characteristics of one, several or even all of the above varieties of teamwork. Traditionally, teams performing certain tasks have been linked to specific forms of teamwork. For example, work teams often show the features of a SMT and project teams those of cross-functional and virtual teams. There are, however, many exceptions and so it is important not to rule out any of the possible variations of teams.

Team taxonomies are a useful tool for understanding the generic characteristics of teams. They also contribute to creating a common language for identifying types of teams and their corresponding unique qualitites. Teams, however, can take a wide variety of forms and creating a comprehensive taxonomy covering all these variations is therefore a complex task. It is important to study teams individually rather than categorising them using existing taxonomies.

5.3. What is performance?

The study of the meaning of performance has attracted the attention of many researchers. While some authors have focused on organisational performance (e.g. Kaplan and Norton, 1996) or business process performance (e.g. Brown, 1996), others have studied the performance of functions such as, design (e.g. O'Donell and Duffy, 2002), manufacturing (e.g. Neely et al, 1995), or research and development (e.g. Cordero, 1989). There is also a body of research that has focused on studying the performance of individuals (e.g. Bruns, 1992) and teams (e.g. Hackman, 1990), the latter being the main unit of analysis of this thesis.

Several definitions of performance can be found in the literature but the literature is characterised by a lack of consistency in defining the key elements of performance (O'Donell and Duffy, 2002). Two terms – *effectiveness* and *efficiency* – have been used to define the performance of different organisational areas (e.g. Neely et al, 1995; O'Donell and Duffy, 2002). In all cases, effectiveness is related to the achievement of goals and efficiency to the resources utilised when working towards those goals.

So, how can we define performance in the context of teams? The literature shows that authors use the terms performance, effectiveness, productivity and success interchangeably when referring to teams. In this thesis the term *team performance* will be mostly used but occasionally, when referring to specific research works, the terms used by the authors will appear.

5.4. Theory of team performance

There is a huge amount of literature on team performance research. By the mid 60's McGrath and Altman (1966) claimed that research on small groups had gotten 'out of hand' because, despite hundreds of studies about teams, there were still few generic theories on team performance. In the decades that followed, several team performance theories were developed.

Team performance has been tackled from a number of research perspectives. In order to gain a full understanding of the meaning of team performance, it is necessary to carry out a cross-disciplinary review of the literature. This will include disciplines such as social psychology (e.g. McGrath, 1964; Steiner, 1972), organizational psychology (e.g. Gladstein, 1984; Hackman and Oldham, 1980; Shea & Guzzo, 1987; Sundstrom et al, 1990), socio-technical theory (e.g. Cummings, 1978; Kolodny and Kiggundu, 1980), human resource management (e.g. Armstrong, 1994; Shaw and Schneier, 1995), change management (e.g. Katzenbach and Smith, 1993, 2001) and operations management (e.g. Tranfield et al, 1998; Hacker and Lang, 2000).

Current research identifies a large number of variables related to team performance. While some of the research focuses on studying the impact of specific variables (e.g. training, team size) on team performance, there is a body of researchers who criticise this approach (Shea and Guzzo, 1987; Hackman, 1990; Cohen et al, 1996). They state that, because of the complexity of team dynamics, analysing the impact of specific variables on team performance should not be done in isolation. Hackman (1990, p.8) argues that 'to try to sort out the effects of each possible determinant of team effectiveness can lead to the conclusion that no single factor has a very powerful effect'.

5.4.1. Models of team performance

In an attempt to overcome this problem, several models[7] describing the nature of the relationships between different factors and team performance have been suggested. Some of the most influential models of team performance come from the social psychology (McGrath, 1964; Steiner, 1972), organisational psychology (Hackman and Oldham, 1980,; Hackman, 1987, 1990; Gladstein, 1984; Shea and Guzzo, 1987; Sundstrom et al, 1990, Campion et al, 1993; Cohen et al, 1996) and socio-technical systems (Cummings, 1978; Kolodny and Kiggundu, 1980) arena. Most of these models, however, remain at a theoretical level.

Katzenbach and Smith (1993) suggest a simple model based on three main factors: skills, accountability and commitment. When compared to other models, this appears to be over simplistic and, to an extent, incomplete. The success of this model, however, is not in the

[7] Appendix A compiles several of these models and defines their origin and the specific drivers and dimensions of team performance that they identify

design and content of the model but in the practical recommendations for putting the model into practice.

All of the above team performance models are unique to an extent. The drivers and dimensions of team performance identified and described vary between models. Even if it appears that there is disagreement among different authors, it is clear that there are many overlapping areas and in general terms, commonalities far outweigh differences.

From the review of the literature, it is evident that there are several reasons why developing a comprehensive and standardised model of team performance can be difficult including:

(a) Teams are complex socio-technical systems. The large number of influencing factors and the multiple relationships between these factors makes teams difficult to study (Cummings, 1978; Kolodny, 1980; Hackman, 1990; Hunt, 1999).

(b) Teams evolve and adapt in complex ways over time. As a result, team performance models must also capture the dynamic effects of team development on performance variables (Cohen and Bailey, 1997; Hunt, 1999)

(c) Teams exist within dynamic organisational contexts, which influence their behaviour (Sundstrom, 1990; Hackman, 1990).

(d) Teams are open systems with respect to information, ideas and influence. Like any other social system, they develop and enact their own versions of reality, and then behave in accordance with the environment they have helped to create. Understanding the process by which groups create and redefine reality will be critical to any research that aspires to advance understanding about the determinants of group effectiveness (Hackman, 1990).

(e) There are many different ways a group can behave and still perform work well and there are even more ways for it to be non-productive. There is no single performance strategy that will work equally well for different groups – even groups that have identical official tasks (Hackman, 1990).

Having a good understanding of team performance is not only about knowing the final outputs of the team. It is also important to know the drivers that affect those outputs. All team performance models make a clear distinction between the drivers that affect and the dimensions that determine team performance. These are described in more detail in the next section.

5.4.2. Drivers of team performance

In a review of work group studies carried out between 1980 and 2000, Sundstrom et al (2000) conclude that all the factors suggested within the different team performance models can be classified under five broad categories: *organizational context, group composition and size, group work design, intragroup processes* and *external group processes* (Table 5.3).

Category	Description
Organizational context	Systems or features of the host organization affecting multiple groups, such as training, reward, measurement, information systems, and facility, and external environment factors, such as industry, technology, markets, and competitors.
Group composition and size	Number of members and mix of their traits – ability, personality, demographic characteristics – and collective expertise, ability, diversity, heterogeneity, and stability or fluctuation of membership.
Group work design	Features of the work, such as equipment, task characteristics, and reporting relationships, including group autonomy, decision-making authority, degree of self-management, and features of reporting relationships designed into groups' roles, including performance feedback and goal setting.
Intragroup processes	Interactions and relationships among members, such as communication, coordination, conflict, and collaboration; intermember relationships involving status and roles; and group characteristics such as cohesion, social integration, collective efficacy or perceived potency, and group norms.
External group processes	Interactions of a work group's representatives directed outside the group with peers, managers, suppliers, and customers, and associated variables such as external integration, coordination, and communication.

Table 5.3: Categories of factors of team performance (Sundstrom et al, 2000)

The categories proposed by Sundstrom et al (2000) are equivalent to the four components of the team context (i.e. task characteristics, team characteristics, teamwork processes and organisational context) described at the beginning of this chapter (Section 5.1). What they define as *organisational context* differs from this researcher's description of organisational context in that they do not include the stakeholder concept. They do clearly state within the *external group processes* category, however, that the interaction processes with peers, managers, suppliers and customers outside the team are an important element affecting team performance. *Work group design* is closely related to the characteristics of the task characteristics that the team is responsible for. *Group composition and size* relates to the team characteristics. Finally, *intragroup processes* and *external group processes* are categories that are integrated within the teamwork processes component.

The next section of this chapter analyses the specific team performance drivers by reference to each of the four components of the team context:

5.4.2.1. Team task characteristics

The positive impact of task characteristics on team performance are highlighted in several research studies (Campion et al, 1993; Ganster and Dwyer, 1995; Cohen et al, 1996).

Motivational theorists such as Manslow (1954), Herzberg (1959) and McGregor (1960) argue that the key elements affecting employee satisfaction are factors intrinsic to the task to be done. Hackman and Oldham (1980) argue that the motivational structure of the group task affects the amount of effort group members put into their work. They conclude that team member's motivation would be increased under the following conditions:

1. *Skill variety* - The group task requires the use of many different skills for successful completion
2. *Task identity* – The group task is a whole and meaningful piece of work
3. *Task significance* – The outcomes of the group's work on the task 'make a difference' to other people either inside or outside the organisation
4. *Autonomy* – The group task provides substantial latitude for members to decide together how they will carry out the work, including the methods to be used, the assignment of priorities to various subtasks, the pace of the work, and so on.
5. *Feedback* – The group as a whole receives trustworthy information, preferably from doing the work itself, about the adequacy of group performance

Other features of the team task that can affect team performance are *task interdependence* and *uncertainty.*

<u>Task interdependence</u>

Interdependence is often the reason why teams are formed in the first place and it is a defining characteristic of teams (Campion et al, 1993). Task interdependence refers to the level to which team members interact and depend on one another to accomplish work. Task interdependence has been related to increased motivation, members' satisfaction and team effectiveness because it enhances the sense of responsibility for other team members' work (Campion et al, 1993). It also facilitates processes like cooperation and learning (Wageman, 1995).

The nature and characteristics of the task will determine the level of interdependence, which will also determine other variables that will have a key impact on team performance (e.g. a task with a high degree of interdependence requires effective communication processes).

Uncertainty

Several authors (Kolodny and Kiggundu, 1980; Gladstein, 1984) consider that uncertainty is an important factor affecting team performance. Kolodny and Kiggundu (1980), for example, found that *environmental uncertainty* (i.e. weather conditions, tree size and species mix, camp location, conditions of equipment, government regulations) had a considerable impact on the performance of woodland harvesting teams.

5.4.2.2. Team characteristics

This relates to the *structure and composition* of the team and includes the following variables: *team type, relative size, heterogeneity, roles, clarity of goals, norms,* and *members' skills, knowledge and attitudes.* Looking at each in turn:

Team type

The variables affecting team performance and their inter-relatedness vary depending on the type of team (Cohen and Bailey, 1997; Tranfield et al, 1998). Researchers have studied the impact of certain variables on specific types of teams such as self-managing teams (Cohen et al, 1996) or project teams (Hacker and Lang, 2000). Also, in recent years, several studies have examined multiple types of teams with the aim of identifying consistent cross-team predictors of performance (e.g. Edmondson, 1999; Ganster and Dwyer, 1995; Cohen and Bailey, 1997). It is important to consider the characteristics of each specific type of team in order to identify the key drivers that need to be managed.

Relative size

Team size (i.e. the number of individuals that form the team) is a variable that affects group processes and outcomes. Cohen and Bailey (1997) found that the relationship between size and performance is different depending on the type of team and features of the organisational context. In any case, it is widely agreed that while teams need to be large enough to accomplish the task they should have the minimum number of members required (Steiner, 1972; Goodman et al, 1986; Hackman, 1987; Sundstrom et al, 1990).

Heterogeneity

Variables such as, gender, background, origin and, skills, abilities and experience can be used to describe team heterogeneity. The positive impact of heterogeneity in terms of skill, abilities and experiences has been seen in several studies (Gladstein, 1984; Goodman, 1986; Hackman, 1987). This is especially true when the team task requires a wide range of competencies. The relationship between heterogeneity in terms of gender, background and origin and team performance, however, has not been widely studied to date.

Roles and responsibilities

It is important to clearly define roles and responsibilities so that they are visible and well understood by all team members. Roles and responsibilities ensure that the work gets done. A critical determinant of team performance is the quality of the people that make up the team. For this reason, finding the right mix of individuals in a team has become an important issue for management professionals (Partington and Harris, 1999). The concept of team roles is not new. Several researchers have described the key roles necessary to build a successful team. Works by Belbin (1993), Margerison and McCann (1990) and Thomas International (1990) have especially contributed to identifying and describing the features of the different team members' roles. An interesting framework for identifying role behaviours in teams is that proposed by Lumsden and Lumsden (1993). They identify not only those roles that are necessary to achieve team success but also roles that can jeopardise team performance (i.e. *process blockers*).

As teams evolve over time, the required mix of skills changes. This suggests that the importance of a given team role will increase or diminish depending on the development stage of the team and the project. Also, for a given task, some team roles will contribute more to team performance than others.

Clarity of goals

It is widely agreed that a successful team needs to have a clear purpose and performance goals (Gladstein, 1984; Hackman, 1990; Sundstrom et al, 1990). Teams develop direction, momentum, and commitment by working to shape a meaningful purpose (Katzenbach and Smith, 1993). Teams have to transform broad directives into specific and measurable goals. Campion et al (1993) found that goal interdependence (i.e. the degree to which team members share common goals and these are aligned to individual members' goals) has a positive impact on managers' judgements of team performance.

Norms

Cohen and Bailey (1997, p.257) define group norms as "standards shared by group members which when crystallized, that is, highly agreed upon by group members, permit the group to regulate member behaviour". Norms include features related to how the task in hand gets done as well as the social aspects of the team. They are also related to the wider organisational culture (Sundstrom et el, 1990). In a previous study, Cohen et al (1996) found that norms have a positive relationship with behavioural measures of organisational commitment, trust in management and satisfaction.

Members' skills, knowledge and attitudes

In order to achieve the performance objectives, the team must develop the right mix of skills. Katzenbach and Smith (1993) argue that the skills required by a team fall into three categories: (1) *technical or functional expertise, (2) problem-solving and decision-making skills* and (3) *interpersonal skills.* In addition, team members also need to have specific knowledge and show certain attitudes or behaviours to achieve high levels of performance (MacDuffie, 1995; Cannon-Bowers and Salas, 1997). Table 5.4 compiles a set of team competencies in the form of knowledge, skills and attitudes required to meet the environmental conditions.

Knowledge	Skills	Attitudes
• Cue/strategy associations • Task-specific team-mate characteristics • Shared task models • Knowledge of team mission, objectives, norms • Task sequencing • Accurate task models • Accurate problem models • Team role interaction patterns • Understanding team work skills • Knowledge of boundary spanning role • Team-mate characteristics	• Adaptability, flexibility, dynamic reallocation of function, compensatory behaviour • Shared situational awareness • Mutual performance monitoring and feedback self-correction • Leadership/team management, conflict resolution, assertiveness • Co-ordination and task integration • Communication • Decision making, problem solving and metacognition	• Team orientation • Conflictive efficacy • Shared vision • Team cohesion • Interpersonal relations • Mutual trust • Task-specific teamwork attitudes • Collective orientation • Importance of teamwork

Table 5.4: Team competencies (Cannon-Bowers and Salas, 1997)

Accountability

Katzenbach and Smith (1993, pp. 60) stated that "team accountability is about the sincere promises we make to ourselves and others, promises that underpin two critical aspects of teams: commitment and trust". Accountability is closely related to the degree to which the team members accept and agree a common purpose, goals and approach that will sustain them as a team.

Commitment

Commitment reflects how an individual identifies with and attaches to the team's and/or organisation's goals (Bettenhausen, 1991) and has a strong positive impact on team performance (Bettenhausen, 1991; Katzenbach and Smith, 1993; Scott and Townsend, 1994; Bishop and Scott, 1997).

Cohesion

It is claimed in the literature that there is still confusion with defining, operationalising and measuring cohesion (Bettenhausen, 1991). In general terms, cohesion refers to the degree to which team members are attracted to each other and are motivated to stay in the team.

Research has demonstrated that cohesion has a positive impact on team members' satisfaction and productivity (Bettenhausen, 1991; Scott and Towsend, 1994).

5.4.2.3. Teamwork processes

Teamwork processes are a collection of activities, strategies, responses and behaviours used to accomplish the team objectives. Several authors classify teamwork processes distinguishing between *internal* and *external* processes (Sundstrom, 1990, 2000; Argote and McGrath, 1993; Cohen and Bailey, 1997; Mathieu and Day, 1997). Internal teamwork processes deal with the interactions and relationships among team members to organise, coordinate and execute team efforts. External processes refer to how the team manages the relationships in the organisational and environmental context within which it is embedded (Argote and McGrath, 1993). This will include interactions with external teams or individuals who provide inputs and absorb outputs, i.e. team stakeholders.

Managing both, internal and external teamwork processes is an essential aspect of managing teams. Table 5.5 summarised the key teamwork processes.

	Process	Reference
Internal team processes	Communication	McGrath (1964), Gladstein (1984), Campion et al (1993), Dickinson and McIntyre (1997), McIntyre and Salas (1995), Mathieu and Day (1997), Toquam et al (1997), Prince et al (1997), Sundstrom et al (2000)
	Coordination	Dickinson and McIntyre (1997), McIntyre and Salas (1995), Fleishman and Zaccaro (1992), Mathieu and Day (1997), Argote and McGrath (1993), Sundstrom et al (2000)
	Leadership	Dickinson and McIntyre (1997), McIntyre and Salas (1995), Mathieu and Day (1997), Prince et al (1997), Bettenhausen (1991), Argote and McGrath (1993), Gladstein (1984); Cohen and Bailey (1997)
	Monitoring	Dickinson and McIntyre (1997), McIntyre and Salas (1995), Fleishman and Zaccaro (1992), Mathieu and Day (1997), Prince et al (1997), Argote and McGrath (1993)
	Backup	Campion et al (1993), Dickinson and McIntyre (1997), McIntyre and Salas (1995), Mathieu and Day (1997), Prince et al (1997), Sundstrom et al (2000), Gladstein (1984), Cohen and Bailey (1997)
	Feedback	McIntyre and Salas (1995), Dickinson and McIntyre (1997), Ancona et al (1996), Sundstrom et al (2000)
	Team orientation	Dickinson and McIntyre (1997), Fleishman and Zaccaro (1992), Toquam et al (1997), Bettenhausen (1991), Argote and McGrath (1993), Campion et al (1993), Sundstrom (2000)
	Decision-making	McIntyre and Salas (1995), Mathieu and Day (1997), Edmondson et al (2001), Argyris and Schon (1996)
	Conflict resolution	Gladstein (1984), Bettenhausen (1991), Cohen and Bailey (1997); Sundstrom (2000), Kraiger and Wenzel, 1997
	Learning	Argote and McGrath (1993), Hunt (1999)
External	Cooperation	Mathieu and Day (1997), Sundstrom et al (2000)
	Coordination	Mathieu and Day (1997), Sundstrom et al (2000)
	Communication	Mathieu and Day (1997), Cohen and Bailey (1997), Sundstrom et al (2000)
	Integration	Mathieu and Day (1997), Sundstrom et al (2000)
	Monitoring	Argote and McGrath (1993)

Table 5.5: Critical teamwork processes

(1) Internal processes

Internal processes do not only aim to accomplish the team task but also to strengthen and regulate the well-being of the team and to develop team learning (Gladstein, 1984; Ancona et al, 1996; Argote and McGrath, 1993). Key internal processes are as follows:

- Communication

Communication involves the active exchange of information between two or more members of the team in a prescribed manner and using proper terminology (Dickinson and McIntyre, 1997). This exchange of information needs to be reliable, accurate and comprehensive for communication to be effective

- Coordination

Coordination is closely related to the interdependence of individuals and tasks. It refers to team members executing their activities in an efficient, timely and integrated manner (Dickinson and McIntyre, 1997).

- Leadership

Leadership means providing direction, structuring, supporting, mentoring, coordinating and motivating the team members (Argote and McGrath, 1993; McIntyre and Salas, 1995; Dickinson and McIntyre, 1997; Prince et al, 1997). These tasks do not necessarily have to be carried out by only one individual. They can also be carried out by several team members. Other authors have highlighted certain processes that are an integral part of leadership, including goal setting (Gladstein, 1984; Bettenhausen, 1991; Cohen and Bailey, 1997; Sundstrom, 2000) or providing performance direction (Mathieu and Day, 1997).

- Monitoring

Monitoring refers to observing the activities and performance of the team and other team members, thus, enabling effective feedback and intervention. Other authors refer to situational awareness (McIntyre and Salas, 1995; Prince et al, 1997) and evaluation (Mathieu and Day, 1997), both of which are closely related to monitoring behaviours. Therefore, designing and managing a TPMS will be a key element of this process.

- Backup

Backup behaviour refers to the individual team members' willingness and ability to support one another as the need arises (Hunt, 1999; Dickinson and McIntyre, 1997; McIntyre and Salas, 1995). Many terms have been used to describe variables with similar meaning, including task coverage (Mathieu and Day, 1997), adaptability (Prince et al, 1997), collaboration (Sundstrom et al, 2000), supportiveness (Gladstein, 1984), and cooperation (Cohen and Bailey, 1997).

- Feedback

Giving, seeking and receiving effective *feedback* is a critical component of teamwork because teams must adapt and learn from their performance in order to be successful

(Ancona et al, 1996; McIntyre and Salas, 1995; Dickinson and McIntyre, 1997; Sundstrom et al, 2000). Team performance heavily depends on accurate and timely feedback (Kolodny and Kiggundu, 1980; Sundstrom et al, 1990).

- Team orientation

Dickinson and McIntyre (1997) refer to *team orientation* as the attitudes that team members have toward one another and the team task. This includes collective efficacy (or the general belief in the team's ability to achieve its goals), acceptance of team norms, goal accountability, commitment to team purpose and team cohesiveness (Fleishman and Zaccaro, 1992; Toquam et al, 1997; Katzenbach and Smith, 1993; Bettenhausen, 1991; Sundstrom et al, 2000; Campion et al, 1993).

- Decision making

Decision-making refers to the capability of the team members to be flexible and to adapt their working styles to changing circumstances (e.g. the ability of the team to provide a quick solution to an unexpected problem) (McIntyre and Salas, 1995; Mathieu and Day, 1997).

- Conflict resolution

Conflict is closely related to the concept of shared mental models. Shared mental models represent shared knowledge about the team and its objectives, as well as common information about team roles, behaviour patterns, and interaction patterns (Kraiger and Wenzel, 1997). Conflict has typically been separated into relationship and task conflict (Bettenhausen, 1991; Cohen and Bailey, 1997). Relationship conflict relates to interpersonal incompatibilities leading to tension and annoyance, while task conflicts refer to disagreement among team members about task content.

- Learning

Successful teams adapt quickly to new ways of working (Edmondson et al, 2001). Senge (1990, p.236) describes team learning as "the process of aligning and developing the capacity of a team to create the results its members truly desire". It is closely related to the acquisition of new capabilities (i.e. skills, knowledge, technologies, tools, procedures, behaviours) in response to changing conditions (Senge, 1990; Argyris and Schon, 1996; Argote and McGrath, 1993). Team learning is influenced and influences other processes such as leadership, monitoring, communication and feedback. Edmondson et al (2001) argue that team learning is fostered by designing a team for learning, framing the learning challenge and creating an environment of psychological safety.

(2) External processes:

Process behaviours that teams require to exhibit in order to effectively handle relationships with the stakeholders outside the team boundaries include *cooperation, coordination, communication, integration* and *monitoring.*

- Cooperation

Cooperation refers to the degree of support and collaboration between team members and their external stakeholders (Mathieu and Day, 1997; Sundstrom et al, 2000).

- Coordination

Coordination relates to the sequencing of activities between the team and its external stakeholders (Mathieu and Day, 1997; Sundstrom et al, 2000).

- Communication

Communication refers to the active exchange of reliable, accurate and comprehensive information between the team and its external stakeholders (Cohen and Bailey, 1997; Sundstrom et al, 2000)

- Integration

Integration refers to the extent to which the team and its external stakeholders use rules, procedures and standard methods for coordinating activities (Mathieu and Day, 1997; Sundstrom et al, 2000).

- Monitoring

Teams need to keep track of what is happening in the external environment (Argote and McGrath, 1993). Team performance is directly affected by the relations with its external environment and thus, it is important to identify external changes. *Monitoring* also relates to assessing the quality of the relationships between the team and its external stakeholders.

5.4.2.4. Organisational context

Organisational context factors are among the least studied predictors of team performance. They are, however, critical factors because context becomes more important as teams take more responsibilities in the workplace (Sundstrom et al, 2000).

Stakeholders

Teams achieve their goals by satisfying stakeholders needs through the execution of specific teamwork processes. In other words, they need to deliver value to their stakeholders in order to remain competitive (Sundstrom and McIntyre, 1996; Sundstrom, 2000). Team stakeholders are individuals or groups that can affect or are affected by the team outcomes. Hunt (1999, p.51) identifies team stakeholders as those individuals or groups:

(1) who are most affected by the team's process or performance

(2) whose knowledge, skills or services are necessary to the team process, or

(3) whose commitment to or satisfaction with the teams performance will determine team success

Team stakeholders will generally include customers (internal and/or external), suppliers (internal and/or external), the parent organisation and team members. These stakeholders will be specific for the team, but there might be other stakeholders that are common to the parent organisation. These can include stakeholders such as, shareholders, society, environment and government.

The relationship of the teams with stakeholders is bidirectional. In other words, teams deliver value to the stakeholders but they also demand contributions from the stakeholders. Consider, for example, the parent organisation as a key team stakeholder. In order to satisfy the parent organisation, the team might need to keep low production costs and increase the flexibility of its workforce. At the same time, the parent company will have to provide adequate equipment and technology, training and rewards to the team. Therefore, it is important for a team to clearly identify its key stakeholders, their needs and what is required from them.

Organisational support

The more responsibilities a team has, the more external support it requires to accomplish their tasks. Therefore, organisational support plays a key role in the success of teams. Organisational support factors include rewards, training, physical environment, technology, information systems, transfer of 'best practices', people, performance measurement and strategic alignment. These factors can augment team performance by providing the resources needed to achieve the team goals and continued viability of the team (Sundstrom et al, 1990).

- Rewards

Rewards have an important impact on team performance, especially on the satisfaction of team members (Gladstein, 1984; Wageman, 1995; Campion et al, 1993; Cohen et al, 1996; Armstrong and Murling, 1998). Wageman (1995) found that teams with group rewards perform better than teams with individual based rewards. This could be because the former encourage the teams to execute the required teamwork processes while the latter creates a more individualistic environment.

- Training

Teams need to develop their skills in order to continuously accomplish their objectives and thus, extensive training is required. Several studies found that training had a positive impact on team performance, especially on team members' satisfaction (Gladstein, 1984; Campion et al, 1993). Sundstrom et al (2000) suggest that the relationship of training with team performance varies with the type of team and the particular dimension of team performance.

- Physical environment

The organisational distribution of team members can have an effect on variables such as inter-member communication and cohesion. The physical environment can reinforce group boundaries and foster or inhibit external exchange (Sundstrom et al, 1990). For example, teams whose processes are continuously disrupted may need an enclosed working area to improve performance.

Virtual teams face a bigger challenge due to being dispersed across time and geographical and cultural boundaries. The absence of face-to-face interaction can create barriers for effective team building and development. Key elements such as commitment to common goals, and shared accountability can also require more time and effort than with other type of teams. Technology plays a key role in facilitating basic team processes (e.g. communication, coordination) for virtual teams.

- Benchmarking and transfer of best practices

Internal benchmarking and transfer of best practices[8] are tangible evidences of knowledge management and organisational learning. Teams can gain great benefits by learning from others. Therefore, companies need to create an appropriate environment to facilitate the identification and transfer of best practices.

- Information system

Teams and individuals require timely, accurate and reliable information in order to achieve performance goals. Of particular relevance is the strategic and performance related information. Therefore, the company needs to provide appropriate systems to ensure that teams at all levels can easily access the required information (e.g. through the intranet system).

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[8] O'Dell and Grayson (1998) define best practices as any practice, knowledge, know-how, or experience that has proven to be valuable or effective within one organization that may have applicability to other organizations

- Autonomy

Very much related to the term *empowerment*, team autonomy can de defined as the level of decision-making authority of a team. Sundstrom et al (1990) state that team autonomy depends on the role of the leader and on how authority is distributed.

Hackman (1987) argues that autonomy increases ownership and provides a sense of responsibility, which in turn motivates the team members. Autonomy allows team members to effectively deal with task and environmental demands by making decisions in the process of doing the work (Cohen et al, 1996) and allocating resources efficiently with changes in work conditions (Cummings, 1978).

External environment factors

External environment factors refer to those aspects affecting the team that are outside the team's and organisation's boundaries and scope of influence. These factors will include the markets that the teams serve, the type of industry in which they operate, the competition that they face or the technology they use (Sundstrom et al, 2000). Although teams might not be able to control these factors, it is important for them to gain a good understanding of the characteristics of these factors so that they can define their strategy and goals accordingly.

Now that the drivers that affect team performance have been described, it is necessary to discuss the dimensions that determine team performance.

5.4.3. Dimensions of team performance

Team performance is determined through the combination of a number of dimensions. The view that team performance is only related to the output (i.e. product, service or information) of the team's primary task has been widely criticised. Hackman (1980, 1990, 2002) argues that even for teams that output can be quantitatively counted, this dimension rarely tells the whole story about their effectiveness. It does not consider the fact that the team might 'burn itself up' in the process of performing the task, which could result in a lack of willingness from the team members to work together in the future. Hacker and Lang (2000) found that using a TPMS that is balanced across multiple dimensions enhances the performance of a virtual project team. This is consistent with the research on performance measurement that argues that has found that only focusing on financial measures can jeopardise future business performance (Keegan et al, 1991; Kaplan and Norton, 1992, 1996; Neely et al, 2002). In recent times we have witnessed how organisations (e.g. ENRON, WORLDCOM) can even violate rules and policies for the sake of short-term financial measures.

Table 5.6 illustrates a number of dimensions of team performance proposed by different authors.

Author and source	Dimensions of team effectiveness
McGrath (1964)	• Task Performance • Group development • Effects on group members
Hackman and Oldham (1980), Hackman (1990, 2002)	• The degree to which the group's productive output (product, service, or decision) meets the standards of quantity, quality, and timeliness of the people who receive, review, and/or use that output. • The degree to which the process of carrying out the work enhances the capability of members to work together interdependently in the future. • The degree to which the group experience contributes to the growth and personal well-being of team members
Gladstein (1984)	• Performance output • Member satisfaction • Ability of the group to exist over time
Sundstrom et al (1990)	• Performance (acceptability of output to customers within or outside the organization) • Viability (member satisfaction, participation, willingness to continues working together)
Campion et al (1993)	• Productivity • Satisfaction • Manager Judgements
Katzenbach and Smith (1993)	• Performance results • Collective Work Products • Personal Growth
Recardo et al (1995)	• Output performance (timeliness, quantity, quality, cost, customer satisfaction) • Viability (i.e. would team members participate on another team?)
Sundstrom and McIntyre (1996)	• Performance (task results) • Member satisfaction • Team learning • Outsider satisfaction
Cannon-Bowers and Salas (1997)	• Output performance • Teamwork process performance
Cohen and Bailey (1997)	• Performance outcomes • Attitudinal outcomes • Behavioural outcomes
Hunt (1999)	• Task performance • Growth • Effectiveness – team processes

Table 5.6: Dimensions of team performance suggested in the literature

Despite the differences between authors, analysing these dimensions leads to identification of several commonalities. Repeating core themes include (1) outcomes related to the technical purpose or task of the team (which is focused on the external stakeholders' requirements), (2) the characteristics of the teamwork processes, (3) team learning and growth aspects and (4) the team members' satisfaction. Team performance, therefore, can be viewed as the combination of the following four dimensions:

(1) Effectiveness: The degree to which task/process results satisfy external team stakeholders' requirements (Hackman, 1990; Sundstrom and McIntyre, 1996; Cohen et al, 1996; Kaplan and Norton, 1996; Hunt, 1999; Meyer, 1994).

(2) Efficiency: The degree to which teamwork processes support the achievement of process results, team learning and growth and team member satisfaction (Dickinson and McIntyre,

1997; Cannon-Bowers and Salas, 1997; Hackman, 1990; Sundstrom, 1990; Sundstrom and McIntyre, 1996; Hunt, 1990).

(3) Team learning and growth: The degree to which the capabilities that ensure current and future competitiveness of the team are being developed (Hackman and Oldham, 1980; Hackman, 1990, 2002; Sundstrom et al, 1990; Sundstrom and McIntyre, 1996; Kaplan and Norton, 1996; Katzenbach and Smith, 1993; West, 1994; Recardo et al, 1995; Baker and Salas, 1997; Hunt, 1999).

(4) Team member satisfaction: The degree to which teamwork contributes to the personal wellbeing of team members (Hackman, 1990; Sundstrom and McIntyre, 1996; Cohen et al, 1996; Hacker and Lang, 2000).

5.5. Balanced model of team performance

Previous sections described in detail the drivers and variables that affect and the dimensions that determine team performance. By this stage the reader should have a clear understanding of the meaning of team performance. Figure 5.3 illustrates the team performance model that summarises this learning.

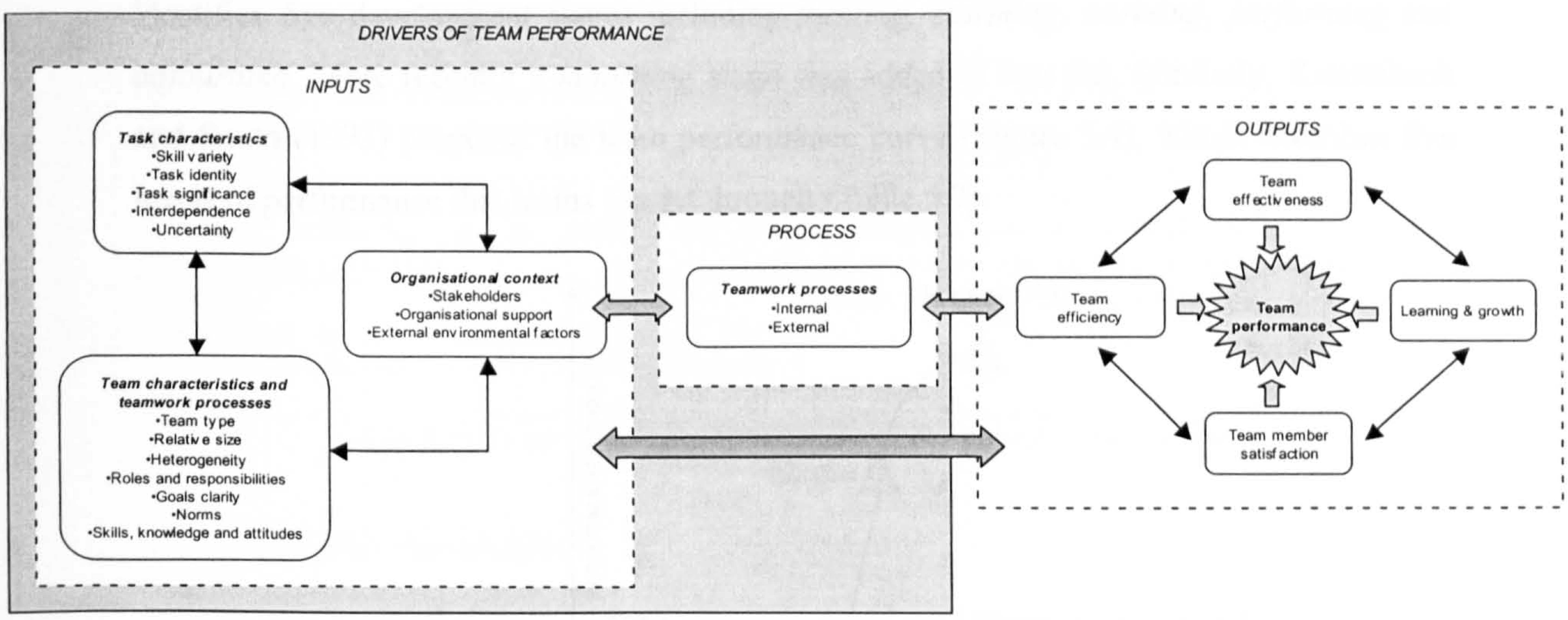

Figure 5.3: Balanced model of team performance

The following are some key learning points that emerged while studying the meaning of team performance:

- Due to the complex inter-relationships between the different drivers and team performance it is not possible to develop a model that describes all these relationships.
- The level of impact of each performance driver and the importance of each of the four dimensions that represent team performance will vary depending on the task

characteristics, type of team and team member characteristics. This suggests that, while understanding the theories and models of team performance, each team should be studied independently.

- Teams have a dynamic nature. They are continuously developing and evolving. This means that the requirements of the team will be in constant change. In order to gain a good understanding of the teams and the key drivers affecting team performance, it is critical to consider the development stage of the team.

5.6. Team development and effectiveness

Teams go through a sequence of stages over their lifetime. Several models of team development have been proposed (Tuckman and Jensen, 1977; Blanchard et al, 1991) and research suggests that all teams go through a similar sequence of stages. The duration of each stage, however, varies depending on the team and on the drivers previously described. It is important to discuss these models because the stages of team development will be mentioned several times in the next chapters.

One of the more familiar models is that suggested by Tuckman and Jensen (1997). It identifies five development stages including *forming, storming, norming, performing* and *adjourning.* More recently a *mourning* stage was added to that list. Similarly, Katzenbach and Smith (1993) proposed the team performance curve (Figure 5.4), which describes five levels of performance that teams can go through (Table 5.7).

Figure 5.4: Team performance curve (Katzenbach and Smith, 1993)

There are several areas that overlap between the team development stages (Tuckman and Jensen, 1977) and the team performance curve (Katzenbach and Smith, 1993). *Pseudo teams* do not overlap with any of the development stages because they take place before the *forming* stage occurs. As soon as the *forming stage* occurs, *pseudo teams* become *potential teams*. The *forming, storming* and *norming* stages will take place with a *potential team*. The *performing* stage corresponds to *real* and *high performing teams*. The *adjourning* and *mourning* stages happen at the end of the team's life cycle.

These two team development models suggest that any team should try to reach the *performing* stage or *real team* performance level in the shortest possible time.

Team development stages (Tuckman and Jensen, 1997)	Team performance curve (Katzenbach and Smith, 1993)
Forming Concerned with orientation, anxiety and confusion, curiosity and hesitant team members. There is a concern for external norms and the attitude of team members.	*Working group* A group for which there is no significant incremental performance need or opportunity that would require it to become a team
Storming Characterised by individual rivalries, aggression, resistance, frustration, rebellion and anger.	*Pseudo-team* A group for which there could be a significant incremental performance need or opportunity, but it has not focused on collective performance and is not really trying to achieve it
Norming Characterised by the beginning of a cohesiveness that results in common goals, a clear working approach, increased trust and crystallisation of norms.	*Potential team* A group for which there could be a significant incremental performance need, and that is trying to improve its performance impact. Typically, it requires more clarity about purpose, goals and more discipline in hammering out a common working approach.
Performing Characterised by a having clear goals, and increased commitment, , interdependence, trust and cohesiveness. The team operates at a high performance level.	*Real team* A small number of people with complementary skills who are equally committed to a common purpose, goals, and working approach for which they hold themselves mutually accountable
Adjourning Concerned termination of the project and the disengagement of the team	*High-performing team* A group that meets all the conditions of a *real team*, and has members who are also deeply committed to one another's personal growth and success
Mourning Characterised by the feeling of individual team members after the positive and/or negative teamwork experience	

Table 5.7: Team development stages and team performance curve

5.7. Chapter conclusions

This chapter detailed the issues surrounding team performance by providing a detailed description of the drivers that affect and the dimensions that determine team performance. These were summarised in the team performance model in Figure 5.3.

The main contribution of this chapter is the identification of the four dimensions that need to be measured to provide a comprehensive assessment of team performance. These dimensions are *effectiveness, efficiency, learning and growth, team member satisfaction*. Their corresponding drivers have also been identified. This provides the basis for measurement of the TPMS.

An important conclusion of this chapter is that, when studying the performance of a particular team, it is important to remember that generic team classifications and models will not provide a complete solution. Each team needs to be studied independently. This will allow the team members to identify the specific performance drivers and to identify the most critical dimensions that determine their performance.

The following chapter describes the development of a typology for TPMS design by integrating the team performance research described in this chapter with the theory of TPMS design.

6. DEVELOPMENT OF THE TYPOLOGY FOR TPMS DESIGN

There is nothing so practical as a good theory (Kurt Lewin, 1890-1947)

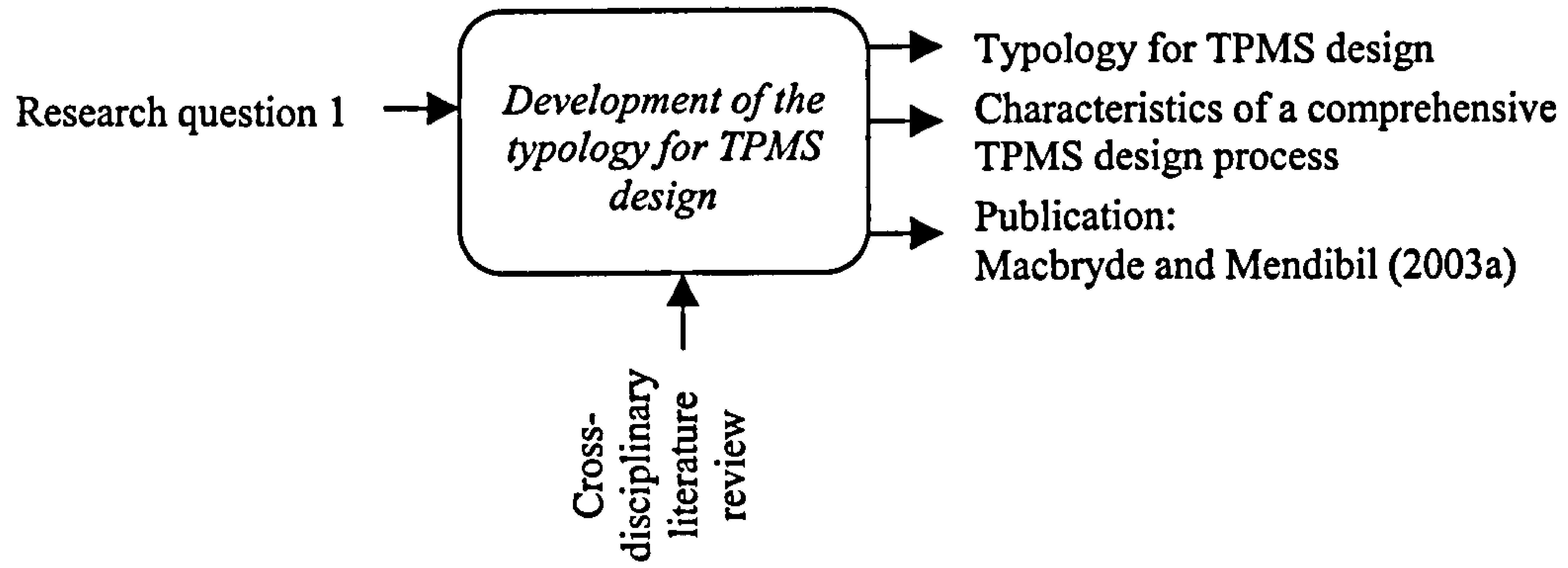

Figure 6.1: Chapter 6 input-output diagram

The objective of this chapter is to gain a deeper understanding of the issues surrounding the design of TPMS and to answer RQ1 (i.e. *What are the characteristics of a comprehensive TPMS design process?*).

A comprehensive TPMS design process will facilitate the development of an effective TPMS. To do so, the process will need to

(1) have the desirable features of a TPMS design process and

(2) develop a set of well-designed team performance measures that provide a true representation of team performance

This chapter discusses in detail the theory on TPMS design and proposes, through a synthesis of the literature, a typology for TPMS design that describes the characteristics of a comprehensive TPMS design process. This typology contributes to current theory and bridges the gap between theory and practice.

This chapter has also a cross-disciplinary nature and combines research from the human resource management and organisation psychology arena with other disciplines such as strategy management, operations management and accountancy.

6.1. TPMS development research

Chapter 2 (Section 2.4.2.2) highlighted the fact that current research provides practical guidelines to design PMS. These guidelines relate to the process for designing PMS as well as the output of the process (e.g. Globerson, 1985; Maskell, 1989; Neely et al, 1996, 2000, Hudson et al, 2001). Hudson et al (2001) have developed a useful typology that identifies the desirable characteristics of a business-wide TPMS design process (Table 6.1).

Development process requirements	Performance measure characteristics	Dimensions of performance
Need evaluation/existing PM audit	Derived from strategy	Quality
Key user involvement	Clearly defined/explicit purpose	Flexibility
Strategic objective identification	Relevant and easy to maintain	Time
Performance measure development	Simple to understand and use	Finance
Periodic maintenance structure	Provide fast, accurate feedback	Customer satisfaction
Top management support	Link operations to strategic goals	Human resources
Full employee support	Stimulate continuous improvement	
Clear and explicit objectives		
Set timescales		

Table 6.1: Typology for the evaluation of strategic PMS development approaches (Hudson et al, 2001)

This typology, however, is not best suited to the context of TPMS design. The unique features of teams, their context and their performance call for a TPMS design process that is suited to their specific requirements.

Current research on TPM fails to provide a typology that explicitly addresses the characteristics of a comprehensive TPMS design process. Such a typology would provide new insights into the process of developing TPMS while increasing the probabilities of successful design and implementation of TPMS. It would also facilitate the evaluation of current TPMS approaches. The following section describes the development of a typology for TPMS design through the synthesis of the literature.

6.2. TPMS development process requirements

It is essential to identify the features of an effective development process in order to design a TPMS. Without them, it will not be possible to operationalise the concept of TPMS. Current research on TPM does not adequately address this issue and so a detailed review of current PMS and TPMS design literature is required.

Since the late 80's, several authors have contributed to the identification of the features of the process for designing PMS (Keegan et al, 1989, Wisner and Fawcett, 1991; and Kaplan and Norton; 1993; Neely et al, 1996; Hudson et al, 2001). There are also a number of sources (Jones and Schilling, 2000; Zigon, 1997, 1998; the Tarkenton Productivity Group, 2000; Bader et al, 1994; Hunt, 1999; Bellwether Learning Center, 2000) that provide useful guidelines regarding specific features of a TPMS design process. From the current research, the key features for effective management of the TPMS design process can be identified as follows:

Starting point of a TPMS

PMS design literature argues that the starting point for a measurement system design process is to carry out an audit and evaluation of the existing system (Blenkinsop and Davis, 1991; Hudson, 2001). It also highlights that the initial step should be to identify the

- company's strategy (Keegan, 1989; Wisner and Fawcett, 1991; Kaplan and Norton, 1993, Neely et al, 1996) and
- stakeholder requirements (Bititci and Carrie, 1998; Neely et al, 2002)

TPMS design literature agrees with this in that the design process should start with the identification of company strategy (Zigon, 1997; Jones and Schilling, 2000) and team stakeholder requirements (Sundstrom and McIntyre, 1996; Hunt, 1999; Hacker and Lang, 2000).

In summary, the starting point of the TPMS design process should:

(1) Review and evaluate existing TPMS

(2) Enable the identification of the company's strategic objectives

(3) Enable the identification of the team stakeholders' requirements

Focus on the team's area of accountability

It is widely agreed within the team management literature that teams need to have a clear and common understanding of their purpose. As a consequence, when designing a TPMS the process should facilitate the identification of the team's strategy (Jones and Schilling, 2000; Tarkenton Productivity Group, 2000). This is consistent with Wisner and Fawcett's (1991) view that when designing PMS it is essential to develop an understanding of each functional area's role in achieving the various strategic objectives. A TPMS should also focus on the areas for which the team is accountable (Baker and Salas, 1997; Jones and Schilling, 2000; Tarkenton Productivity Group, 2000). To focus on aspects that the team cannot affect will undermine the potential of the TPMS and the morale of individual team members. Komaki (1997) found a lack of responsiveness to performance measures on theatre teams when they were evaluated against criteria that was not under the control of the team (i.e. tickets sales).

Enable the development of performance measures

Facilitating the definition of specific performance measures is a key part of the TPMS development process. Processes by Zigon (1999) and Jones and Schilling (2000) provide guidance in deciding what to measure in relation to team performance. Similarly, Neely et al's (1996) approach guides organisations to choose appropriate performance measures.

In order to avoid a diluting effect on team goals, only those measures that are critical should be adopted by the team (Jones and Schilling, 2000). There is therefore a need to prioritise the performance measures that will form the TPMS (Zigon, 1997; Hunt, 1999).

Involve key users of the TPMS in the design process

The process of defining specific performance measures crystallizes the team purpose and builds commitment and accountability towards team goals. It forces teams to be explicit about their performance priorities and the relationships between them (Neely et al, 2000).

It is important to involve all the key users of the TPMS in the design process (Jones and Schilling, 2000). This view is consistent with the PMS literature (Globerson, 1985; Lynch and Cross, 1991; Neely et al., 1996; Hudson, 2001).

Have management and team member support

As with any other change initiative, total support and commitment from top management and team members is an essential ingredient of an effective measurement system (Blenkinsop and Davis, 1991; Hudson, 2001). Bourne et al (2002) found that top management commitment was a key enabler of successful design and implementation of measurement systems. They also found that continuously making explicit the purpose and benefits of the measurement system enhanced the chances of success. In addition, since the design of the TPMS is also a change project, the team needs to set specific timescales for the different stages of the project (Hudson et al, 2001).

Provide a maintenance and review structure

The provision of a maintenance and review process supports the development of effective TPMS. Measurement systems should be dynamic (Maskell, 1989; Wisner and Fawcett, 1991; Ghalayini and Noble, 1996; Bititci et al, 2000, Kennerley and Neely, 2002). In other words, measures should change as circumstances (e.g. stakeholder requirements, competitive environment) change. Measures that include a scheduled review process are more effective in driving performance than those without a review system (Hacker and Brotherton, 1998).

Facilitate the identification of key drivers of team performance

Although the main focus of the measurement system is to improve the visibility of the final dimensions that determine team performance, it is also important to clearly identify the key drivers of team performance in order to support a more proactive management style (Meyer, 1994; Kaplan and Norton, 1996; Katzenbach and Smith, 2001).

Facilitate the understanding of causal relationships

Understanding the relationship between drivers and performance provides the team with an appropriate platform to manage and improve team performance (Meyer, 1994; Katzenbach and Smith, 2001). Only when the cause and effect relationships between drivers and team performance are adequately understood will the team apply measures against these drivers.

Defining the relationships between different measures is a critical step towards clearly understanding a strategy (Kaplan and Norton, 1996, 2001; Suwignjo et al, 2000). Kaplan and Norton (1996) highlight that a measurement system should make explicit the relationships between (1) the various objectives and measures and (2) the outcome measures and the performance drivers of those outcomes.

Assign individual responsibility

In order to enhance the accountability over the measurement system, it is important that individual team members have responsibility over specific measures (Hunt, 1999; Jones and Schilling, 2000). Specific individuals will not always be directly responsible for the results of the measures but they will be in charge of acquiring the measurement data, presenting and communicating it to the rest of the team, and proactively leading the team in problem-solving and improvement activities. A single person will not always be able to collect all the information related to team performance, especially where there are several measures that require observing the interactions between team members.

Be flexible and require low resource consumption

Hudson et al (2001) found that existing PMS design approaches are too resource intensive and too strategically orientated for SMEs. This finding concurred with the limited resources and the more dynamic and emergent strategy styles found in SMEs. Similarly, the dynamic nature of teamwork calls for design processes that are flexible and require minimum resources.

Often, teams will carry out certain tasks for a limited period of time and then the team will move on to another task or disintegrate as a team with individual members joining other teams. In addition, teams evolve over time and so do their requirements. Team performance measures capture these changes and, as a result, it is essential that the TPMS design process is flexible. Also, in order to be able to frequently re-design, the TPMS the design process must require minimum resources. The dynamic nature of teamwork does not allow the team to use a resource intensive design process.

Table 6.2 synthesises the above review of the literature listing the main requirements for a TPMS development process:

TPMS development process requirements
1. Review and evaluate existing TPM system
2. Enable identification of company's strategic objectives
3. Enable identification of team stakeholders' requirements
4. Enable the identification of team strategy/purpose
5. Enable development of performance measures
6. Focus on areas that the team is accountable for
7. Enable goal prioritization
8. Involve key users of the TPMS
9. Provide a maintenance and review structure
10. Have top management support
11. Have full team members support
12. Clear and explicit objectives
13. Set timescales for design and implementation of TPM system
14. Facilitate the identification of key drivers of team performance
15. Facilitate the understanding of causal relationships
16. Assign individual responsibilities for the measurement, communication and improvement tasks associated with each goal
17. Be flexible and require low resource consumption

Table 6.2: Requirements of the TPMS development process

6.3. Characteristics of team performance measures

There are various research works detailing the characteristics of effective business and team performance measures. Most of the desirable characteristics of business performance measures addressed in current literature are also applicable to team performance measures. These include:

- Clearly defined and explicit purpose (Globerson, 1985; Neely et al, 1997; Jones and Schilling, 2000)
- Relevant and easy to maintain (Maskell, 1989; Lynch and Cross, 1991; Jones and Schilling, 2000)
- Simple to understand and use (Maskell, 1989; Lynch and Cross, 1991; Neely et al, 1997; Jones and Schilling, 2000)
- Provide fast, accurate feedback (Globerson, 1985; Dixon et al, 1990; Maskell, 1989; Neely et al, 1997; Hunt, 1999; Jones and Schilling, 2000)
- Stimulate continuous improvement (Lynch and Cross, 1991; Maskell, 1989; Neely et al, 1997; Hunt, 1999; Jones and Schilling, 2000)
- Clearly defined data collection and methods of calculating the level of performance (Globerson, 1985; Neely et al, 1997; Zigon, 1997)
- Clearly defined frequency of measurement (Meyer, 1994; Hunt, 1999; Jones and Schilling, 2000)

Most of the literature in the area is consistent with the view that performance measures should derive from strategy (Globerson, 1985; Maskel, 1989; Dixon et al, 1990; Lynch and Cross, 1991; Wisner and Fawcett, 1991; Neely et al, 1997; Zigon, 1999; Jones and Schilling, 2000). However, several authors (Bititci and Carrie, 1998; Neely and Adams, 2002) argue that since strategy should be based on stakeholders' requirement, then, performance measures should also directly derive from those requirements while informing about strategy. This view is also transferable to the team context where team performance measures should derive from the requirements of the stakeholders represented within the team membership (Sundstrom and MacIntyre, 1996; Hunt, 1999; Hacker and Lang, 2000).

There are also a number of research studies that focus on the unique characteristics of team performance measures. Of particular interest are the books by Brannick et al (1997) and Jones and Schilling (2000). They both highlight a number of criteria to design valid and reliable team performance measures.

The following are the specific requirements for team performance measures deducted from the literature:

Applied at team and individual level

In most cases, team performance can be measured independently from individual considerations. However, some team level performance criteria (e.g. team member satisfaction) can only be measured though the aggregation of individual level measurements (Hunt, 1999). Also, there are certain capabilities required for accomplishing the team goals that can be found and developed at the individual level (Cannon-Bowers and Salas, 1997). Effective communication, for example, might be considered as a key teamwork skill but this is a skill held at the individual level. Zigon (1997) argues that it is important to identify and monitor the individual accomplishments that support the overall team goals. While team measures build mutual accountability and provide a holistic view of team performance, individual measures reinforce individual accountability (which is aligned with the team goals) and provide the necessary feedback for further coaching and developing team members.

Related to outcomes and process (or drivers) of team performance

Current research recognises that a balanced PMS should have a mix of outcome measures and performance drivers (Kaplan and Norton, 1996; Neely et al, 1996). This creates a better integration and alignment between objectives and activities.

Similarly, in order to obtain an accurate indication of team performance, both the output from the team and the process followed should be measured (Hackman, 1987; Meyer, 1994; Zobal, 1998; Cannon-Bowers and Salas, 1997; Hunt, 1999). A critical team management activity is related with ensuring that key drivers of team performance are properly monitored and managed (Hacker and Lang, 2000).

Output measures (also known as *static* or *lagging* measures) are collected after carrying out the task in hand and provide information only on what the team produced. As a result, they are of primary interest for external stakeholder such as management and customers. These measures can be directive and motivational for the team but they are not informative and diagnostic. In other words, they do not provide an insight into how the team results were achieved, neither they do indicate the underlying causes of performance variability (Cannon-Bowers and Salas, 1997).

Process measures (also known as *dynamic* or *leading* measures) are predictive, informative and diagnostic. They focus on those activities and capabilities that enable the team to perform a given process (i.e. drivers of team performance). As a consequence, they provide a basis for remediation by giving the required feedback for identifying the causes of performance variability. They also provide a valuable approach for continuous team performance improvement (Meyer, 1994; Katzenbach and Smith, 2001). Process measures will often be related to behavioural variables. In fact, Baker and Salas (1997) argue that a full understanding of team performance requires behavioural, cognitive and attitudinal-based measures.

Capture the dynamic nature of teamwork

Like any other social system, teams are dynamic systems in nature because they evolve over time. They go through different stages of development and these stages occur at different rates for different teams and individual members. Performance measures provide a valuable feedback to individual members regarding team performance and, as a result, they facilitate the team development process. Team performance measures, therefore, need to capture the dynamic nature of teamwork by evolving together with the team (Baker and Salas, 1997).

Not everything can be measured with numbers

The fact that it is not possible to numerically measure every desired outcome of teams is recognised by Zigon (1997) as one the main difficulties of measuring team performance. In addition, trying to quantify everything can result in meaningless measures. Whether numerical or not, good measures are those that can be verified and observed by others (Zigon, 1997) and influenced by the team (Jones and Schilling, 2000). Due to the nature of the team outcomes, numeric measures are often combined with descriptive ones. In particular, measures related to teamwork processes as well as behavioural, attitudinal and cognitive features will mainly use words to track and describe performance. Both types of measures (i.e. numerical and descriptive) should have clearly recognisable conditions of achievement (Katzenbach and Smith, 2001). As a result, the team needs to define what are the specific numerical values and/or observations that will determine if the team is meeting expectations.

As data for descriptive measures is usually gathered through observation, the team needs to identify the person that is going to be responsible for judging the performance related to those measures.

Reliability of measures

The reliability of a measure refers to the repeatability of the measurement responses from one instance to another. Reliability has also been defined as "a measure's freedom from measurement error" (Dickinson and McIntyre, 1997, p.33) and "corruption resistance" (Jones and Schilling, 2000, p.31). Sources of measurement error include several variables like *time period of measurement, raters* and *measurement content.*

Attributes that are static can be considered free from the time sources of measurement error (Dickinson and McIntyre, 1997). Consider for example *OEE (Overall Equipment Efficiency).* The variables that determine OEE (i.e. capacity, quality and performance) remain the same over time. Consider now *Customer Satisfaction.* The specific factors that satisfy customers will change over time (e.g. from *price and quality* to *service and responsiveness*). This is a dynamic attribute and it is not exempt of measurement error. Measures need to consider the dynamic nature of the attribute and change accordingly. Due to the dynamic nature of teams, many of the attributes that determine team performance will change over time. This means that there is an increased potential for time period measurement error.

Objective measures tend to be more reliable than subjective measures. The latter depend on the subjective evaluation of raters and so inter-rater measurement error is more likely to occur (Dickinson and McIntyre, 1997). For a measure to be reliable, it must reflect consistency between the responses of independent raters (Komaki, 1997; Baker and Salas, 1997).

Validity of measures

Validity of measures refers to the inferences that can be made about an attribute from its measures (Dickinson and McIntyre, 1997). For assessing validity, both content of the measurement and measured construct need to be considered. *Content validity* refers to the adequacy of the measurement procedure (e.g. survey) and specific measures in any situations that the team might face. It reflects that the measure can be used to obtain adequate scores of an attribute (e.g. backup behaviour) in all relevant situations. *Construct validity* refers to the empirically studied relationships between an attribute and its measures.

Acceptability of measures

Developing reliable and valid measures does not mean that these measure will be accepted by the team members. In order to effectively implement measures, the individuals who use the measures and are accountable for their performance need to accept them (Dickinson and McIntyre, 1997; Jones and Schilling, 2000). Many of the characteristics of performance measures described within this section contribute towards increasing the acceptability of the measures. In particular, those characteristics related to the usability, relevance and accuracy of the measures have a major impact on acceptability. Other features that affect acceptability include:

- Fairness, i.e. does the measure provide a fair assessment of team performance?
- Observable behaviours, i.e. Is the variable related to the measure obvious and is data gathering easy?
- Disruption, i.e. Does completing the measure regularly disrupt the team activity?
- Cost of measurement, i.e. Is it worth providing resources for measurement?

Table 6.4 summarises the desirable characteristics of team performance measures described in the above lines.

Characteristics
1. Derive from the requirements of stakeholders represented within the team membership
2. Clearly defined/explicit purpose
3. Relevant and easy to maintain
4. Simple to understand and use
5. Provide fast, accurate feedback
6. Stimulate continuous improvement
7. Clearly defined data collection and methods of calculating the level of performance
8. Clearly defined frequency of measurement
9. Applied at team and individual level
10. Related to outcome, process and drivers of team performance
11. Capture the dynamic nature of teamwork
12. Reliable, valid and acceptable

Table 6.4: Desirable characteristics of team performance measures

6.4. Dimensions of team performance

The TPMS needs to include a set of measures that provide a balanced view of team performance. These measures should relate to each of the four dimensions that determine team performance, i.e. effectiveness, efficiency, learning and growth, and team member satisfaction. These dimensions were described in Chapter 5 (Section 5.4.3).

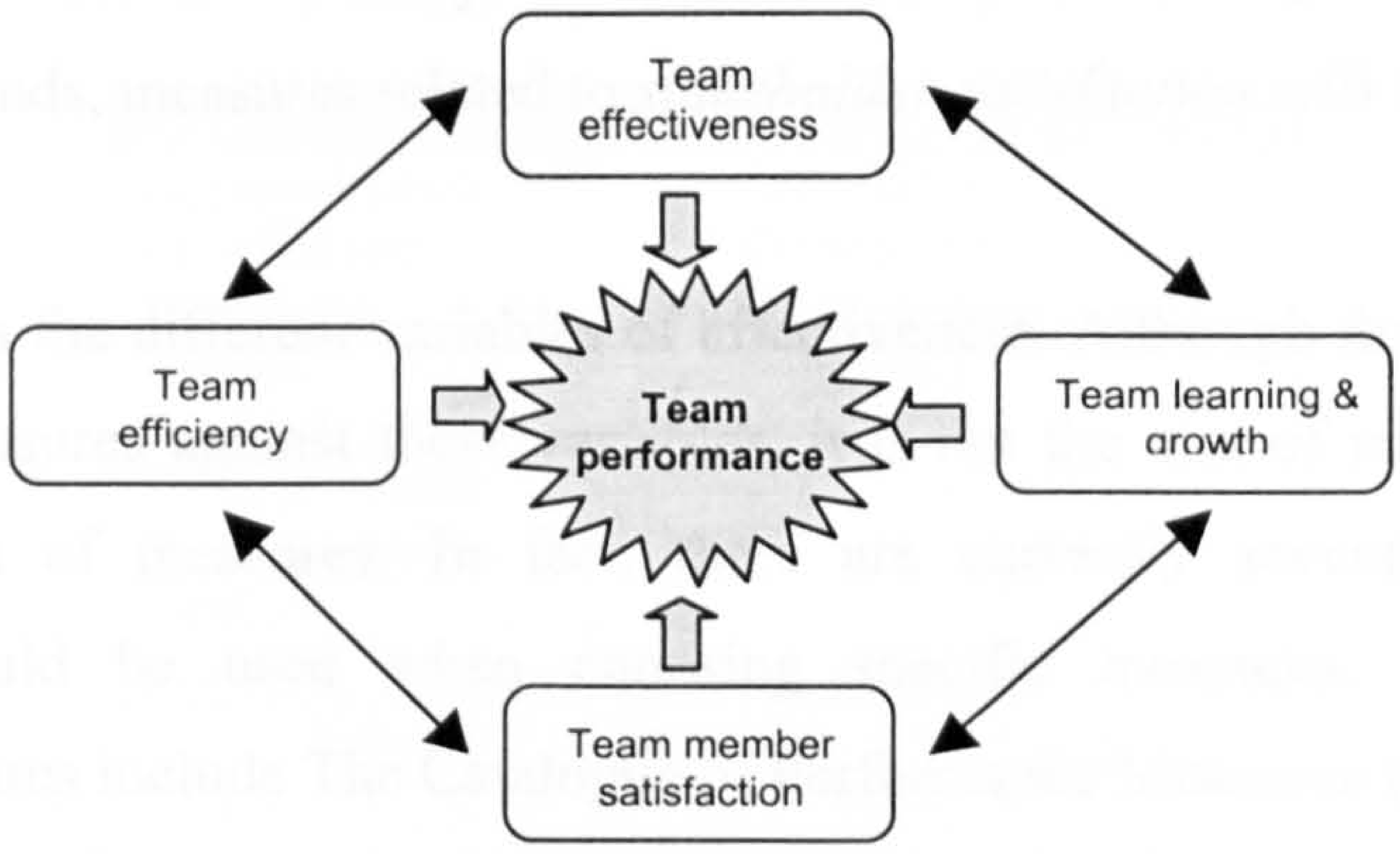

Figure 6.2: Dimension of team performance

6.4.1. Effectiveness

Effectiveness relates to the degree to which the team outcomes satisfy external team stakeholders' requirements. External team stakeholders include those that are specific to the team and those that are common with the parent organisation. Specific stakeholders include customers (internal and/or external[9]), suppliers (internal and/or external[10]) and management (of the organisation where the team belongs to). Common stakeholders with the parent organisation can include the environment, society and government. The team, however, will not always be concerned with satisfying the requirements of the common stakeholders. Only where the team task has an important impact on any of the common stakeholders should the team then develop appropriate measures. For example, a team responsible for the design and development of car engines needs to take into account environmental concerns about emission levels and so a measure related to emission levels should be included in its TPMS.

In general terms, the performance measures used to determine team effectiveness will be objective measures related to the outcomes of the process or task that the team is responsible for. In the TPM literature *quantity, quality, cost (finance),* and *timeliness* are commonly cited

[9] External customer might also be stakeholders of the parent organisation.

[10] External suppliers will also be stakeholders of the parent organisation

as the main operational dimensions (Meyer, 1994; Zigon, 1997; Jones and Schilling, 2000). *Flexibility* is also considered as a key dimension of performance in the PM literature (Lynch and Cross, 1991; Neely et al , 1995, 1996; Medori and Steeple, 2000; Hudson et al, 2001). In the case of a team, flexibility is related to the ability to (1) cope with widely ranging demands (different products and/or tasks), (2) quickly respond and adapt to changing demands and (3) innovate. Finally, and since the primary objective of is to fulfil stakeholders' demands, measures related to *stakeholder satisfaction* will also determine team effectiveness.

Table 6.6 illustrates the different variables of effectiveness. Although the team still needs to define specific measures against these variables, it is not the aim of research to provide a comprehensive list of measures. In fact, there are currently several classifications of measures that could be used when choosing specific measures. Useful sources of performance measures include The Catalogue of Performance Measures (Centre for Business Performance, 2000), the European Foundation for Quality Management (EFQM, 1998), Jones and Schilling (2000), and QuickMeasures (Zigon Performance Group, 2002). The former two sources are noted for providing business orientated measures but they also include measures related to business processes, people and stakeholder satisfaction that could be adopted by teams. The Catalogue of Performance Measures (Centre for Business Performance, 2000) uses a classification based on the structure of the Performance Prism (Neely et al, 2002) PMS framework while the list of measures provided by the EFQM is based on the EFQM Business Excellence Model (1998). The other two sources suggest measures that are specific to the type of task that the teams and individuals carry out. Jones and Schilling (2000) suggest a list of measures related to 15 functional areas and QuickMeasures (Zigon Performance Group, 2002) is a database that includes over 8000 measures related to 429 job families from 22 different industries.

Quantity	Quality	Cost/Finance	Timeliness	Flexibility	Stakeholder satisfaction
Volume	Performance	Running cost	Lead time (manufacturing / service / delivery)	Volume mix / delivery flexibility	Management satisfaction
Rate	Reliability (product/service)	Service cost	Due date performance	New product introduction	Customer (internal/external) satisfaction
	Conformance	Manufacturing cost		Product/process innovation	Supplier (internal/external) satisfaction
	Delivery reliability	Value added		Resource utilisation	Other stakeholders satisfaction
		Profitability		Rate of adaptation to changes	
		Overhead cost			
		Efficiency			

Table 6.6: Dimension of effectiveness

6.4.2. Efficiency

Efficiency relates to the degree to which teamwork processes support the achievement of team effectiveness, learning and growth and member satisfaction. Teamwork processes include those activities, strategies, responses, skills and behaviours required for achieving the team objectives. Table 6.7 illustrates teamwork processes as previously described in Chapter 5.

Internal processes	External processes
Communication	Cooperation
Coordination	Coordination
Monitoring	Communication
Backup	Integration
Feedback	Monitoring
Team orientation	
Decision-making	
Conflict	
Learning	

Table 6.7: Teamwork processes

Measures for teamwork processes are generally behavioural and attitudinal-based. In order to be measurable, each process variable must have clearly recognisable conditions of achievement. The team needs to define the criteria (i.e. conditions or behavioural statements) for identifying behaviours and attitudes associated with a particular teamwork process. Table 6.8 illustrates this with an example.

Key teamwork processes: Communication and Leadership

1. *Communication*: refers to the active exchange of information between two or more members of the team in a prescribed manner and using proper terminology

   Criteria: - Notifies instantly of scheduling changes to other team members

   - Acknowledges the receipt of information

2. *Leadership*: involves activities related to providing direction, structuring, supporting, mentoring, coordinating and motivating team members.

   Criteria: - Clearly explains and describes to all team members the objectives and activities during a project

   - Actively listens to other team members suggestions and concerns
   - Continuously recognises and praises good performance

Table 6.8 Example of teamwork processes and criteria for measurement

Measuring teamwork processes generally requires observer(s) to evaluate whether the expected criteria and conditions and being met. Observers can include, team members, team leaders, peers and expert observers (coaches, off-site experts). Also, current literature suggests several measurement methods or tools that can be used to gather data related to teamwork processes. Amongst the most popular are behavioural scales, questionnaires, surveys and interviews. Table 6.10 identifies a number of methods used for measuring different variables of team performance.

6.4.3. Team learning and growth

Team learning and growth refers to the degree to which the capabilities that ensure current and future team competitiveness are being developed. It is mainly a direct consequence of the team learning process and it is related to both, team and individual learning. It refers to how the team uses its own process-execution activities as a basis for embedding knowledge in team members, tools, technology, procedures and management activities (Argote and McGrath, 1993). This embedded knowledge is related to those capabilities for future competitiveness of the team.

Team learning and growth can be found codified in knowledge artefacts such as, team knowledge (tacit/explicit), skills, innovations, documented learning, best practices, tools, methods and process improvements.

Team learning and growth also refers to the viability of the team or the willingness of team members to continue working together in the future. Viability incorporates behavioural variables that reflect the capability of the team and its members to continue working together. Variables such as participation, commitment, cohesion and accountability are key predictors of the team's future viability (Hackman, 1990; Sundstrom and McIntyre, 1996; Katzenbach and Smith, 1993; Baker and Salas, 1997; Hunt, 1999). Figure 6.2 illustrates the variables that affect team learning and growth.

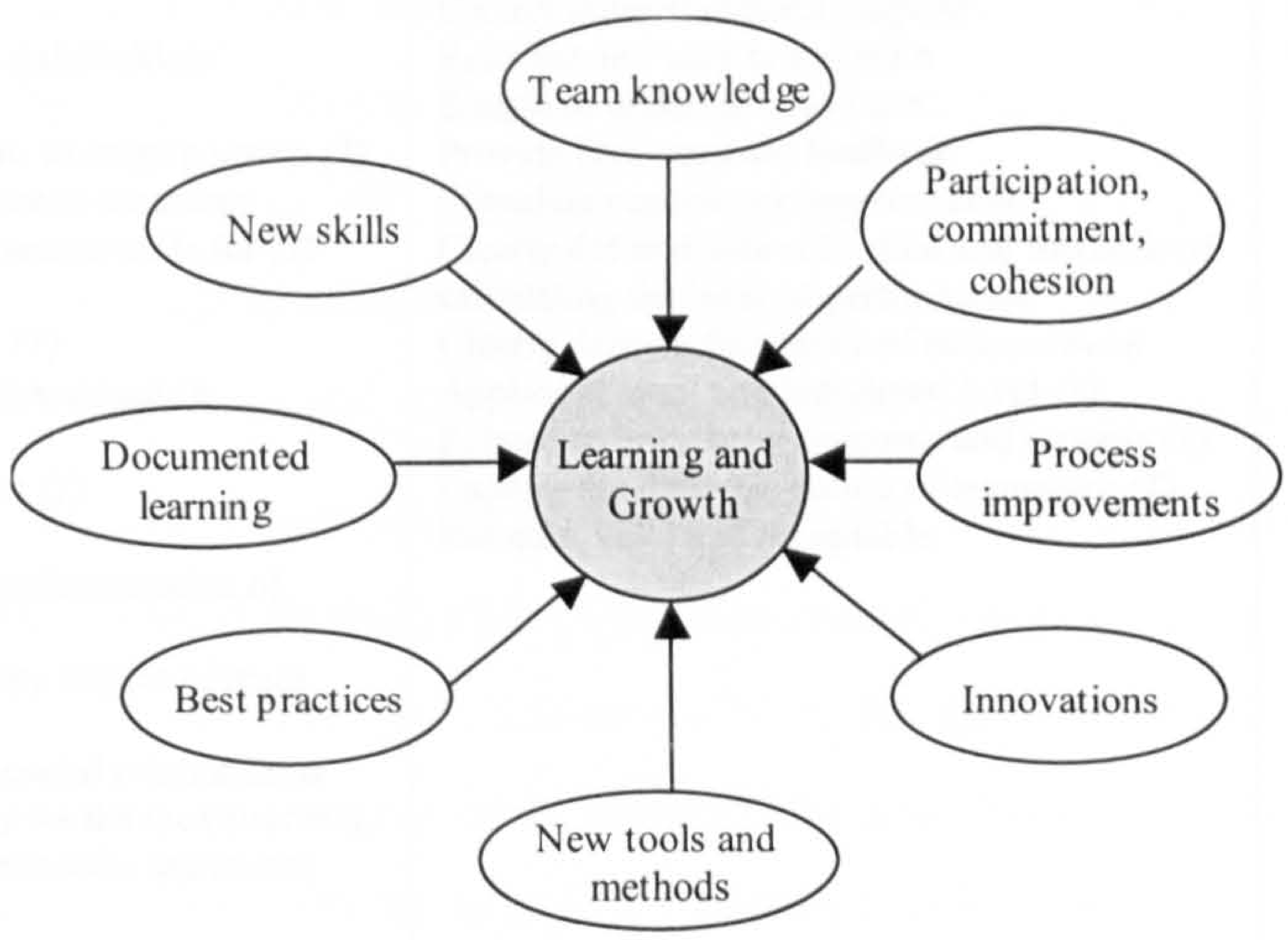

Figure 6.2: Dimensions of team learning and growth

6.4.4. Team member satisfaction

Team member satisfaction refers to the degree to which teamwork contributes to the personal wellbeing of team members. Team members are also key stakeholders of the team but in this case internal rather than external.

This dimension reflects the level of satisfaction of team members with variables such as, work content, training and development, career progression, rewards and recognition, management style, pay, working conditions, safety, equality, and contribution to the community and the environment.

Typical methods for collecting data related to employee satisfaction are employee satisfaction surveys and interviews with team members.

6.5. Typology for TPMS design

Table 6.9 presents the typology for TPMS design deducted from the literature. This typology identifies the characteristics of a comprehensive TPMS design process. These characteristics relate to the desirable features of a TPMS design process as well as to the outputs of the process (i.e. team performance measures and dimension of performance). As a result, this typology provides an answer to research question one.

RQ1. What are the characteristics of a comprehensive TPMS design process?

Answer: The characteristics of a comprehensive TPMS design process are contained in the typology for TPMS design (Table 6.9)

Development process requirements	Team performance measure characteristics	Dimensions of team performance
Review and evaluate existing TPMS Enable identification of company's strategic objectives Enable identification of team's stakeholders' requirements *(T)* Enable the identification of team strategy/purpose *(T)* Enable development of performance measures Focus on areas that the team is accountable for *(T)* Enable goal prioritization Involve key users of the TPMS *(T)* Provide a maintenance and review structure Have top management support Have full team members support *(T)* Clear and explicit objectives Set timescales for design and implementation of TPMS Facilitate the identification of key drivers of team performance *(T)* Facilitate the understanding of causal relationships Assign individual responsibility for the measurement, communication and improvement tasks associated with each goal *(T)* Be flexible and require low resource consumption *(T)*	Derive from the stakeholders represented within the team membership *(T)* Clearly defined/explicit purpose Relevant and easy to maintain Simple to understand and use Provide fast, accurate feedback Stimulate continuous improvement Clearly defined data collection and methods of calculating the level of performance Clearly defined frequency of measurement Applied at team and individual level *(T)* Related to both, team outcome and process *(T)* Capture the dynamic nature of teamwork *(T)* Reliable, valid and acceptable	Effectiveness *(T)* Efficiency *(T)* Team learning and growth *(T)* Team member satisfaction *(T)*
Note: Those requirements marked with a *'(T)'* are unique to the context of TPMS		

Table 6.9: Typology for TPMS design

This typology contributes to current knowledge in TPMS design. It also provides a sound theoretical basis to evaluate existing approaches for TPMS design, as well as to construct new ones.

The last section of this chapter briefly discusses issues related with measurement strategies.

6.6. Measurement strategies

A key aspect of measuring team performance is the selection of appropriate sources and methods for gathering performance related data (providing an answer to the question of how to measure team performance). Although this thesis does not aim to develop specific measurement methods, these will be an integral part of the TPMS and it is therefore important to review different measurement strategies.

There are a number of strategies that can be used for measuring team performance. In any case, the choice between strategies depends on the nature of data, the source of information, and the method of measurement.

Data can be qualitative or quantitative in nature and this will affect the choice between appropriate sources of data and measurement methods. Quantitative data can be obtained through explicit analytical measurement, statistical quantification of survey responses or available process related data (archival documentation). Qualitative data will be mainly gathered through interviews, surveys/questionnaires and observation.

6.6.1. Data sources

Data sources refer to where the required information comes from. Data sources might include organisational records, team members (including the team leader), peers (i.e. other teams), management, customers, suppliers and other external observers (e.g. community members, expert observers). Research shows that different types of teams rely on different data sources. Sundstrom et al (2000), for example, point out that while studies on production teams draw heavily on organisational records of output and quality, studies of service teams draw mostly on team members and studies on project teams rely on data from managers.

A common source of data for assessing team performance is the team members themselves. The use of team members is usually the most economical way to collect data (Hallam and Campbell, 1997), partly because team members have the best access to information about team functioning and member's reactions, behaviours and feelings. It is, however, argued that measurements based on team members' perceptions lack objectivity (Tesluk et al, 1997; Prince et al, 1997). This is why combining a numbers of sources will provide a more holistic and reliable assessment of team performance. Each source of data has unique strengths and weaknesses and they all provide relevant and meaningful yet different information (Tesluk et al, 1997).

It is important to remember that the data source can influence the validity, reliability and even the acceptability of individual measures. From an acceptability point of view, the best source of data is the existing organisational information systems (e.g. project plans, minutes, production data) because it is easy to access and has low added cost. However, data sources should not be chosen at the expense of reliability and/or validity (i.e. without demonstrating the equivalence of the sources) (Prince et al, 1997, Toquam et al, 1997).

6.6.2. Measurement methods

The method of measurement specifies how data related to team performance is collected. Measurement methods can include interviews, surveys, questionnaires and observations. When choosing a particular method of measurements a key factor to consider is the nature of the team task and the specific variables that are being measured. For instance, when measuring *coordination* it might be possible to carry out interviews with team members during action. This might not, however, be possible in a highly intensive environment (e.g. operating theatre). In this case, interviews will happen after action or a different measurement method (e.g. observation) will be adopted.

Different measurement methods can be combined to gather data on team performance. Combining the use of multiple measurement methods with multiple sources of data (i.e. multitrait-multimethod approaches) can provide valuable information for selecting the appropriate measurement strategy (Prince et al, 1997; Tesluk et al, 1997). Table 6.10 depicts a sample of measurement strategies to measure several variables related to team performance.

Measurement variable	Data sources	Measurement method
Team processes –e.g. communication, orientation, leadership, monitoring, feedback, backup, coordination, decision making, information exchange	Expert observers (internal or external), team leaders, team members	Behavioural observation scale, behavioural summary scale, behavioural events, , interviews, questionnaires (Dickinson and McIntyre, 1997; Prince et al, 1997), generalizability theory (Mathieu and Day, 1997)
Team performance / effectiveness	Team members, observer (e.g. managers, peers, customer)	Team effectiveness survey (Katzenbach and Smith, 1993), repertory grid technique (Senior, 1997), Campbell-Hallan Team Development Survey (TDS) (Hallan and Campbell, 1997)
Interdependence	Team members	Task and outcome interdependence survey (Van der Vegt, 1998)
Team knowledge / share mental models	Expert observers (internal or external), team members	Card sort technique, protocol analysis, link weight networks (Pathfinder), attitudinal surveys, observation, interviews, multidimensional scaling (Kraiger and Wenzel, 1997; Cooke et al, 2000)
Team autonomy	Expert observers (internal or external), manager, team members	Autonomy measurement instrument (Bailey and Adiga, 1997), Gulowsen scale
Team training effectiveness	Expert observers, managers	Observational scale, expert ratings, content analysis, protocol analysis, decision analysis, policy analysis, automated performance recording (Cannon-Bowers and Salas, 1997, TARGET methodology (Dwyer et al (1997)
Team workload	Team members, managers	NASA task load index (TLX), Subjective Workload Assessment Technique (SWAT) (Bowers et al, 1997)
Teamwork culture	Team members, managers	Team model (Castka et al, 2003)

Table 6.10: Sample of measurement strategies

6.6.3. Aggregation

Certain team performance measures that relate to a collective variable (e.g. team cohesion) require the combination of ratings across team members to produce a measure that is representative of the team as a whole. There are many ways of data aggregation, including averaging individual data, using the median value, taking the sum, the minimum and maximum value, or the range. There is, however, no definitive method for aggregating individual data (Cooke et al, 2000). The effectiveness and appropriateness of a particular aggregation method will vary depending of the measurement variable and its relation with team performance (Tesluk, 1997).

6.7. Chapter conclusions

This chapter described the development of a typology for TPMS design (Table 6.9) and provided an answer to research question 1; i.e. RQ1 *What are the characteristics of a comprehensive TPMS design process?*

This chapter has highlighted that a comprehensive TPMS design process needs to have the desirable features of a TPMS design process and needs to develop a set of well-designed team performance measures that provide a true representation of team performance.

Indeed, the typology presented in this chapter identifies the desirable

(1) features of a TPMS design process

(2) features of team performance measures and

(3) dimensions of team performance

The development of this typology provides new insights into TPMS design, further extends current knowledge and bridges a gap between theory and practice. This typology provides a more comprehensive theory on TPMS design as it was developed following a cross-disciplinary review of the literature and integrating research on team performance and PMS design. Previous research on TPMS design (e.g. Meyer, 1994; Brannick et al, 1997; Zigon, 1997, 1999; Jones and Schilling, 2000; Hacker and Lang, 2000) does not do so and only presents isolated findings regarding each of the three areas of the TPMS design process (i.e. development process, characteristics of team performance measures, dimensions of team performance). In addition, and as identified in Chapter 2, current research does not effectively integrate the two critical research areas related to TPMS (i.e. team performance and PMS design).

This chapter has also provided a detailed description of team performance. It does not only describe each of the dimensions that determine team performance but it also identifies the specific variables related to each of the dimensions (Section 6.4). Previous research (e.g. Hackman, 1987, 2002; Campion et al, 1993; Katzenbach and Smith, 1993; Recardo et al, 1995; Sundstrom and McIntyre, 1996; Cannon-Bowers and Salas, 1997; Cohen and Bailey, 1997; Zigon, 1997; Jones and Schilling, 2000; Hacker and Lang, 2000) discusses some of the dimensions but it does not identify to this level of detail the specific variables that determine each of the dimensions. This research fills that gap and provides the necessary detail.

The following chapter describes an exploratory study that compares TPM practices in industry. The aim of the chapter is to find an answer to research question 2.

7. EXPLORATORY RESEARCH: COMPARATIVE STUDY OF TPMS IN INDUSTRY

The knowledge of the world is only to be acquired in the world, and not in a closet (Lord Chesterfield, Letters to His Son, 4th October 1746)

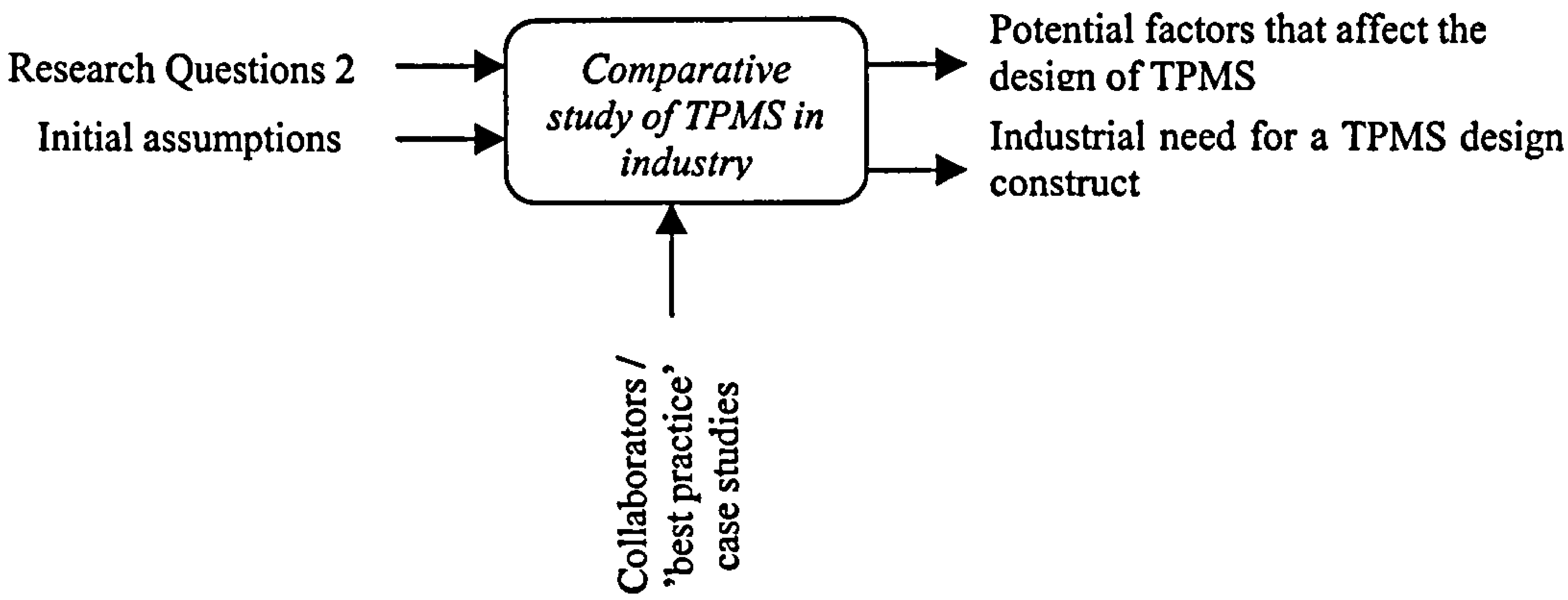

Figure 7.1: Chapter 7 input-output diagram

The aim of this chapter is to explore current practice regarding the development and use of TPMS. A case study based approach is adopted because this allows the researcher to *explore* in more detail the specific problems that companies are facing when designing TPMS and to *explain* the factors that affect the design of effective TPMS. By doing so, this chapter aims to provide an answer to the second research question, i.e. RQ2. *What are the factors that enable and/or constrain the design of effective team-based performance measurement systems (TPMS)?* During this phase the researcher studied the development and use of team performance measurement system within ten industrial organisations. These were seven companies based in Scotland and three companies from the Basque Country (north of Spain).

In order to find an answer to RQ2 the findings from the cross-case study are compared and contrasted with the conclusions from the literature. The cross-case analysis also allows the researcher to compare team management practices between two countries. The findings from this study were presented in an article within the *IEE Manufacturing Engineer* magazine (Little and Mendibil, 2001), which was awarded with the IEE 2002 JD Scaife Best Paper Award.

7.1. Phases of the exploratory research

Table 7.1 illustrates the phases of the exploratory research. The first activity was to critically review the existing literature, which has been described in Chapter 2, 5 and 6. Details of the other activities are given in the following sections.

Phase 1	Phase 2	Phase 3	Phase 4	Phase 5
• Literature review • Selecting case study organisations • Designing research instruments	• Initial case studies: exploratory research • Individual company reports • Data reduction – contact summary sheet	• 'Best practice' case study interviews • Individual company reports • Data reduction – contact summary sheet	• Cross-case analysis • List of potential factors that enable and/or constraint the design of effective TPMS • Definition of research question 3	• Feedback report to collaborators

Table 7.1: Phases of the exploratory research

7.2. Selecting the case studies

As previously mentioned, this research study started as part of an industrially led project. Four industrial organisations were participating in the project and this researcher was responsible for carrying out the research activities that would lead to the accomplishment of the project objectives.

The following were the four industrial collaborators:

- Applecross Properties– Edinburgh based national construction company
- Highland Spring – international natural mineral water producer
- IBM Greenock – multinational organisation dedicated to the design and manufacturing of IT equipment
- Rolls-Royce Hillington – multinational organisation dedicated to the manufacturing of components for jet engines

All the collaborators were struggling with the issue of team performance measurement and management. They all had started applying process re-engineering concepts within their organisations. As a consequence they had identified some key business processes and were looking for better ways of managing the performance of the teams that were responsible for managing these processes.

The next stage was to identify and analyse 'best practice' organisations that claimed to excel in managing their teams. The key criteria for identifying 'best practice' companies were the following:

- Companies need to be interested in team performance management
- Companies need to have some degree of process re-engineering
- Companies that are quoted in current literature (both academic and industrial) as being successful at re-engineering projects and team management initiatives.
- Companies that have been accredited with quality awards

The first two criteria acted as 'qualifiers'. Firstly, companies that were not interested in team management practices would not see any possible benefits to be gained from the project, and so providing access and resources (i.e. time) to an external researcher would not be in their interest. Secondly, the study aimed to focus on teams structured around business processes and so the idea was to gain access to companies with a high degree of re-engineering. Since some of the industrial companies had still functional-based structures, gaining access to process-based organisations would allow comparing TPMS initiatives between functional-based and process-based organisations.

The last two criteria were the 'winning criteria'. Firstly, it was important to identify those successful companies addressed in current literature. Secondly, the researcher looked for companies that had been awarded quality prizes recognising their outstanding management practices. The initial focus was on EFQM prizewinners or companies working under the umbrella of that model, while always keeping an eye open for other types of quality awards and accreditations.

After identifying a set of 'best practice' companies, each company was contacted by mailing them an information package. This included a letter[11] explaining the reasons for the visits, a brief description of the project (including the research questions), the objectives of the visits, and a proposal about the structure of the visits. A week after sending the information pack the researcher contacted the companies by phone in order to find out if they were interested in providing access to their organisation.

From the 14 companies that were contacted, visits were secured to 6 organisations, three of them in Scotland and another three in the Basque Country. Again, the profiles of these companies varied. The companies in Scotland were:

- Litton Interconnections - multinational electronics company. Winner of the 2001 Best Factory Special Award - prize awarded by Management Today and Cranfield School of Management
- Rank Xerox Scotland & Ireland– dedicated to the sale and repair of photocopiers. Another division of the parent company (Rank Xerox) was the first EFQM award winner back in 1992.
- NCR – multinational organisation dedicated to the design, manufacture and sale of automatic teller machines. The company is renowned within the industrial community for its team management practices.

[11] Appendix B1 shows an example of this letter

The companies studied in the Basque Country were:

- Irizar[12]– international coach manufacturer. 2000 EFQM prize winner
- Maier – plastic moulding company. The company has been accredited with the 'silver Q'[13].
- ITP – international aerospace company. A joint venture between the Spanish aerospace industry and Rolls Royce. First industrial organisation to be awarded with the 'silver Q'.

These six companies together with the four industrial collaborators, formed a range of industries with varied backgrounds, nature of business (i.e. multinationals, privately owned, cooperatives, joint ventures) and industrial sector (i.e. construction, food and drink, electronics, aerospace, automotive, service). It also provided an opportunity to compare TPMS practices in a wide variety of industries from two different countries.

7.3. Research instruments

The first task, prior to going into the companies, was to design the adequate research instruments in order to ensure the reliability of the data collection phase. The purpose of these instruments was to collect relevant data for answering research question two:

> RQ2. *What are the factors that enable and/or constrain the design of effective TPMS?*

The identification of the factors affecting the design of TPMS was planned to be done using a grounded theory approach (Glass and Strauss, 1967), in which theory would emerge from the data collected during the case studies. Therefore, it was important to collect a large amount of data.

Using a grounded approach does not require highly structured data collection instruments. Instead, the researcher needs to take a more flexible and holistic approach to collect significant data that will help in identifying specific patterns across the companies. For the purpose of this exploratory phase the researcher defined five generic areas relevant to TPMS

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[12] Irizar and Maier are part of Mondragon Corporacion Cooperativa (MCC), a cooperative industrial complex that integrates over 100 industrial, research, financial, welfare and university organisations. The unique management principles of this corporation have captured the interest of many academics and industrialist. More information can be found in Little and Mendibil (2001) or in the following website; http://www.mcc.es

[13] 'Silver Q' is a prize awarded by the Basque Government to those companies that achieve a minimum of 400 points against the EFQM assessment

design that would act as a general guide to collect the data from the companies. These areas were identified from the literature review presented in Chapter 2. The five areas are:

(a) Organisational culture, structure and business process management

Chapter 2 highlighted the implications that adopting a business process management philosophy had on performance measurement systems (Meyer, 1994; Garvin, 1995; Childe et al, 1996; Armistead, 1996; Hammer and Stanton, 1999; Kuwaiti and Kay, 2000). In fact, the evidence from process-based companies struggling to design effective TPMS was the point of departure for this study. Therefore, it is important to study the relationships between company structure, business process management initiatives and TPMS design.

Similarly, it is widely recognised that organisational culture has an important influence on the success of change initiatives (Kotter, 1996; Lanning, 2001), including PMS initiatives (Bourne et al, 2002; De Waal, 2002; Vakkuri and Meklin, 2003). It is also important to study organisational culture aspects of the companies.

(b) Strategy management and performance measurement systems

The deployment of business strategy to the teams and individuals has been addressed as a factor affecting the success of PMS projects (Kaplan and Norton, 1996; Bierbusse and Siesfield, 1997; Schneiderman, 1999). In addition, it can be inferred from current TPMS research (Zigon, 1997; Jones and Schilling, 2000; Hacker and Lang, 2000) that the clarity and awareness of business strategy plays an important role in TPMS design. Chapter 6 demonstrated that TPMS must show a clear link to the business strategy and corresponding PMS. As a result, it is critical to study in more detail the relationships within strategy management, performance measurement systems and TPMS design.

(c) Teamwork practices

Teamwork practices differ form one company to another. Studying the characteristics of teams and particular team management practices can provide new insights into the design of TPMS. In fact, Jones and Schilling's (2000) work suggests that the nature of the team task and the experience of team members can have an impact on designing TPMS.

(d) Support processes

Evidence shows that support processes (e.g. training, appraisals) have an important impact on team performance. In fact, team-based organisations call for team-based appraisals and rewards (Morhman et al, 1992; Lawler and Cohen, 1992; Armstrong and Murlis, 1998; Zobal, 1998), which will also have an impact on the structure of the PMS. In addition, research on business PMS suggest that reward systems have an important impact on the management of PMS (Kaplan and Norton, 2001; Franco and Bourne, 2003). Studying performance management processes and their relation with TPMS design is another key area for collecting data from the companies.

(e) Design of TPMS (process and content)

Chapter 2 highlighted the importance of using a structured process for designing TPMS. In addition, Chapter 6 presented a typology that identified the characteristics of a comprehensive TPMS design process, including the contents of the TPMS (i.e. dimensions and characteristics of the measures). Therefore, it is important to study how companies are designing TPMS and their contents.

Next, the specific research instruments designed for this exploratory phase are discussed.

7.3.1. Research protocol

As part of the preparation for the company visits a research protocol was designed. The research protocol, which would be sent to all companies, consisted of an overview of the research project (with special emphasis on the research question that the case study was focused on), a brief description of the field procedures and an outline of the main areas that the interviews would concentrate on.

The overview of the project gave a brief description of the background, research questions, research objectives and methodology of the project. This was to give the companies the overall context of the study. When defining the field procedures it was important to define a number of data sources to enable data triangulation and increase the validity of the findings (Yin, 1994; Stake, 1995). Although the research protocol sent to the companies only included a list of the interviewees and the approximate time required for each interview, the full components of the field procedures were the following:

1. Introduction to the company by the key contact person. Collection of general company documentation.
2. If possible, guided tour of the plant
3. Semi-structured interviews allowing the interviewees to expand on each of the questions. Mainly open-ended questions. Collection of more specific documentation.
4. After compiling data from interviews and documentation, prepare a feedback report to send to the companies. If possible, visit the company and discuss the contents of the feedback report with interviewees.
5. Present findings from 'best practice' organisations to industrial collaborators. Based on these findings prepare and discuss a final report with them.

7.3.2. Semi-structured interviews

The semi-structured interviews were designed to collect data that would allow the researcher to gain new insights into the factors that affect the design of TPMS. While providing the interviewees with ample opportunity to provide their point of view on several areas of the business, the main focus of the semi-structured interviews was on the five key areas for data collection.

Semi-structured interviews were carried out with the support of the interview guide (with collaborators) or the questionnaire (with 'best practices'). The questions included within these instruments served as prompts for more detailed discussions of areas that were of special relevance.

7.3.3. Questionnaire

Although access to data from the four industrial collaborators was not an issue, it was with the 'best practice' companies. Three of the 'best practice' companies were located abroad. This required a high consumption of resources (i.e. time and money) for data collection. In addition, the key contact in Rank Xerox was about to move to a different company. This also limited the access to that particular company.

In order to cope with the limited access to data, a questionnaire that would support the interviews was designed. This would allow the researcher to further structure the interviews so that data collection could be done faster. The use of more detailed questions, however, has the main disadvantage of not capturing the depth and detail of the interviewees' responses. Nevertheless, the advantage of using a questionnaire for supporting an interview is that one can get the best of both (i.e. interview and questionnaire). In other words, data collection can be done faster than when carrying out an open interview and even though there is less depth in the responses, still allows the researcher to gather that richness of data provided by face-to-face communication.

The questionnaire was also structured around the five key areas for data collection earlier described and included open ended, close ended, multiple choice and dichotomous ('yes' or 'no') questions.

It is important to say that the questionnaire was not given to the respondent to fill in. Instead, it was used as a guide for questions and answers by the interviewer. This meant that while keeping the focus on the specific questions within the questionnaire the respondent was not restricted to the possible answers given in the checklist, thus allowing the researcher to collect additional comments and insights related to each of the questions.

Appendix B2 shows the questionnaire used during the case studies.

7.3.4. Documentation and observations

The data gathered through the documentation provided by the company and the non-participant observations also provided relevant information.

Exchanging emails was another instrument used to access additional data from these companies. It was, however, a difficult task to get, through the exchange of emails, the same richness of data accessible during an interview.

7.3.5. Steering committee meeting

Quarterly project steering meetings were held during the initial 12 months of the study. The meetings included representatives from the four industrial collaborators and four academic staff (including myself). These meetings provided a great opportunity to present to, and discuss the findings from the case studies with, the industrial collaborators and academics on a continuous basis.

The comments and feedback gathered during these meetings are reflected in the cross-case analysis that will be described later in the chapter.

Table 7.2 summarises the data sources and data collection instruments that were used during the exploratory phase of the research.

Case code	Company	Field of industry	Unit size	No. of interviewed employees	Role of interviewees	Research instruments	Other research methods
CO1	Applecross	Construction	~25	7	Managing Director 5 functional managers / team members 1 Site manager / team member	RP	Documentation Steering committee discussions
CO2	Highland-Spring	Food and drink	~180	7	1 Project manager 1 Continuous Improvement coordinator 5 functional managers / team members	RP	Documentation Steering committee / face-to-face discussions
CO3	IBM	Electronics	~4500	2	Operations Manager HR Manager	RP	Documentation Steering committee / face-to-face discussions
CO4	Rolls-Royce	Aerospace	~500	4	HR Director HR manager 2 team members	RP	Documentation Steering committee discussions
BP1	Litton	Electronics	~170	3	Managing Director, Training Coordinator, HR coordinator	RP, Q	Documentation Face-to-face discussions
BP2	Rank Xerox	Service	~160	1	Regional manager / team leader	RP, Q	Documentation
BP3	NCR	Electronics	~1700	1	HR	RP, Q	Documentation
BP4	Irizar	Automotive	~630	1	Organisational development coordinator	RP, Q	Documentation
BP5	Maier	Plastic moulding	~650	1	HR manager	RP, Q	Documentation
BP6	ITP	Aerospace	~510	2	Quality manager, Engineering manager	RP, Q	Documentation

Case code - CO: Collaborator; BP: Best practice
Research instrument - RP: Research protocol, Q: Questionnaire

Table 7.2: Summarised case information, data sources and data collection instruments

7.4. Structure of the case studies

The structure of the case studies varied from the collaborators to the 'best practice' companies. While the collaborating companies provided us with the opportunity to carry out several visits and interviews, the study of 'best practice' companies was mainly based on one site visit and one or two interviews.

The study of collaborators started with an interview with the member of staff that was part of the project steering committee and a tour of the facilities. In all cases these people were responsible for the management of one or more teams within their respective companies. Applecross and Highland Spring were focusing on a particular cross-functional team and the next step was to interview the members of these teams. IBM and Rolls-Royce, on the other hand, were not focusing on the management of particular team but on business wide practices. As a result, the interviews were carried out with staff from different teams and functions.

The number of visits varied from 2 to 4 visits per company. In all cases there was at least a second visit to discuss the findings from the previous visit and to collect any additional data that was required. In the case of Applecross, Highland Spring and IBM, a final visit was carried out to present a set of recommendations based on the findings from the study of all ten companies.

Regarding the study of 'best practice' companies, all the studies (except Litton) were based on one visit. In any case, all five studies were followed up by several contacts through email. The study of Litton involved three site visits and interviews with three members of staff. Litton, Irizar, Maier and ITP also provided a visit to the site where teams were based, which allowed the researcher to observe the characteristics of the working environment.

7.5. Limitations of data collection

It is important for the researcher to be aware of the limitations of the data collection methods. The researcher should take into account these limitations during the data analysis phase in order to increase the validity of the research finding. The following are some of the limitations of the data collection phase of this fieldwork study:

1. Limited access: The location of some of the 'best practice' companies was a constraint for collecting data. This was specially difficult with the 'best practices' companies located in the Basque Country, which had an additional financial constraint. In most cases communication via email was used to try to overcome this limitation.

2. Secrecy or reluctance to show information: In some of the companies, interviewees were reluctant to provide certain information. This was especially evident in companies like Rolls-Royce or IBM. Rolls-Royce's reluctance to provide information related to company strategy and performance measures, appeared to be because of the tense situation caused by the threat of redundancies. In any case, the general feeling was that the company had a culture of secrecy rather than openness. A similar culture was evident in IBM where the staff interviewed appeared to be affraid of criticising existing management practices despite recognising that these were not the most appropriate. The Industrial Engineering Team manager supported that view and blamed the top-down management style and individualistic culture of the company as the blocking factors.

3. Information not available / interviewee bias: In some of the companies only one or two people were interviewed. As a result, some of the information could not be gathered from the

primary source of data (i.e. team members). This made it difficult to corroborate the responses given by the interviewee with other sources and increased the risk of bias. For example, the accuracy of statements like 'all our employees are aware of the company's strategy' made by the HR manager at NCR could not be questioned unless there was additional data to support the statement. In these cases, the researcher asked further questions to provide more evidence (e.g. what mechanisms do you use to increase the strategic awareness of your teams?).

7.6. Analysis of the case studies

The analysis of the data from the case studies was done following Miles and Huberman's (1994) stages of *data reduction, data display* and *drawing conclusions.* Prior to describing the data analysis process, this section gives a brief overview of each company.

7.6.1. Introduction to the companies

This exploratory phase studied 10 companies; four industrial collaborators (Applecross Properties, Highland Spring, IBM Greenock, Rolls-Royce Hillington) and six 'best practice' companies (Litton Interconnect Glenrothes, Rank Xerox Glasgow, NCR Dundee, Irizar, Maier, ITP).

7.6.1.1. Applecross Properties

Applecross Properties is a company dedicated to the design, construction and sale of luxury residential properties. In particular, the company is skilled in identifying and acquiring sites in highly desirable locations, then designing and building quality developments to a high specification. Once the company has acquired the site for development, they subcontract and manage the architects, civil engineers and other construction services. Applecross employs 25 staff at its head office and directly subcontracts site staff of between 75 and 120 operatives depending on what stage of the construction they are at.

7.6.1.2. Highland Spring

Highland Spring is a privately owned company that was formed in 1979. It manufactures and sells natural mineral water (still and sparkling) in a wide range of bottles and packs. Highland Spring is the UK's biggest British brand of natural mineral water exporting to over 50 countries worldwide. Highland Spring currently employees around 180 people.

7.6.1.3. IBM Greenock

IBM Greenock is an integral part of the American multinational competing in the IT market. IBM Greenock is dedicated to the production of computer equipment, desktops, laptops and servers. The plant in Greenock also includes a number of service groups that provide product support to several countries worldwide. Currently, there are around 4500 employees working at IBM Greenock.

7.6.1.4. Rolls-Royce Hillington

Roll-Royce Hillington is dedicated to the manufacture of components for the compressor systems of commercial jet engines. At present, in the Hillington plant, there are four business units producing parts for compressor systems; Forge, Stators, Seals and Rotors. The rest of the business units (including assembly of the engines) are distributed between the Rolls-Royce plants in Derby and Bristol. The company employees around 900 staff at Hillington.

7.6.1.5. Litton Interconnect Glenrothes

Litton is a global electronic company with its headquarters in Springfield, Missouri. The plant in Glenrothes operates within the electronic component business unit. The company is dedicated to the assembly of systems for major electronic and telecommunication OEMs such as Agilent, Polaroid, Motorola or Nokia. At present the company employs 180 people and is going through a rapid period of growth.

7.6.1.6. Rank Xerox Glasgow

Xerox is an American global company dedicated to the manufacture and sales of a wide range of electronic office equipment such as photocopiers, fax machines and printers. Rank Xerox Glasgow is dedicated to customer sales and service of a wide range of Xerox products. The company covers the geographic area of Scotland and Ireland. Currently there are around 160 employees working in the offices in Glasgow.

7.6.1.7. NCR Dundee

NCR Dundee is part of NCR Global which employs around 32,800 people. The plant in Dundee is dedicated to the design and manufacture of automatic teller machines (ATM) and is currently employing 1700 people. The plant in Dundee is NCR's only manufacturing site in Europe and biggest and most productive one worldwide. 37% of its revenue comes from the hardware business, 23% from the software and 40% from services. The company is moving from selling individual product to providing complete solutions.

7.6.1.8. Irizar

IRIZAR is a luxury coach builder, which is part of Mondragon Corporacion Cooperativa. Due to the growth in the export market Irizar now has manufacturing plants in countries like China, Brazil and Morocco. The plant in the Basque Country employs around 632 people.

7.6.1.9. Maier

Maier is also a member of the MCC co-operative corporation. The company is dedicated to the manufacturing of plastic moulded components, mainly for the automotive and mobile telephone industry. The company employs around 650 people in its plant in the Basque Country and due to the growth in the export markets has recently opened a new plant in Birmingham, UK.

7.6.1.10. ITP

ITP was formed in 1989 by merging companies from the private and public sectors in Spain with Rolls Royce from the UK. ITP currently manufactures the compression rings and several other parts for jet engines and these are then sent to other sites for final assembly. ITP, however, do assemble the Euro fighter jet engine at this site in the Basque Country. The company employs around 508 people.

7.6.1. Data reduction

The objective of data reduction was to select, focus and simplify data collected during the cases studies. The main data reduction technique used during the exploratory phase was *documentation*. Due to the more inductive or grounded nature of this stage of the research, codes were not created prior to the study, but instead areas of general domain were identified (i.e. the five areas of focus for data collection) in which codes could be developed inductively in later stages.

The first step after collecting data from the site visits was to create a detailed report for each company. These reports were structured around the five generics areas for data collection and they mainly contained data that was interesting from the companies' point of view. In order to focus on the relevant issues related to the research question, data required to be further filtered and reduced. An initial analysis of the data from the individual companies highlighted several specific aspects that were more relevant to the design of TPMS under each of the five generic areas for data collection. Based on these specific aspects the researcher created a *case study summary sheet* (Table7.3), which provided a structured, focused and consistent view of the data from each individual company.

The areas included in the case study summary sheet are a collection of the elements having an impact on TPMS design identified while studying each individual company. This does not mean that all these areas were relevant for every company.

Case code
0. General information
0.1. Company information: Information regarding industry sector and size (number of employees) of this particular company.
0.2. Case study details: Number of company visit, number of interviews, personnel interviewed and other methods used to collect the data
1. Organisational structure / business process management / culture
1.1. Current organisational structure: Functional, process orientated, matrix, other
1.2. Organisational culture: Organisational values and characteristics of the management style
1.3. Impact of organisational structure and culture: Benefits and drawbacks of current structure and culture
2. Strategy management and performance measurement systems
2.1. Strategy management process: Use of processes for deploying and communicating strategy to different organisational levels.
2.2. Performance management systems: Use of business wide performance measurement system and specific PMS approaches
2.3. Deployment level: The organisational levels to which strategy and performance measures are deployed to.
2.4. Impact of current strategy and performance measurement system: Benefits and drawbacks
3. Teamworking practices
3.1. Team characteristics: Type of team, team task, size, performance level / developmental stage
3.2. Members understanding of team performance: team members understanding of team performance
3.3. Team development processes: Systems used to increase team performance
4. Support processes
4.1. Training: Processes used for defining and providing staff training. Also include areas of training (e.g. machine training, communication skills)
4.2. Performance appraisal systems: Characteristics of the process used to appraise employees. Also include criteria used for performance appraisal.
4.3. Reward and recognition: Characteristics of reward and recognition systems in place.
5. Design of TPMS (process and content)
5.1. Top management commitment for designing TPMS
5.2. General details of the approach for TPMS design: Is it a publicly available approach? Is it a standard company procedure?
5.3. Characteristics of the approach: Phases and steps of the process, people involved in the process, duration, frequency (based on the characteristics of a comprehensive TPMS design process, Chapter 5)
5.4. Content of the TPMS: Dimensions and measures of team performance (based on the characteristics of a comprehensive TPMS design process, Chapter 5)
5.5. Effectiveness of TPMS: Perceptions from the interviewees about the effectiveness of the TPMS. Also, comparison against the characteristics of an effective TPMS identified in Chapter 6.
5.6. Impact of TPMS: Consequences of using the TPMS

Table 7.3: Case study summary sheet

Appendix B3 illustrates the completed case study summary sheet for one of the case study companies.

7.6.2. Cross-case analysis

Cross-case analysis is a technique that can enhance the internal validity of a construct (Voss et al, 2002). The aim of this cross-case analysis was to compare and contrast the individual case studies and to identify events or patterns that relate to factors that affect the design of TPMS.

In order to compare the data from the 10 companies Table 7.4 illustrates a matrix display. This matrix shows in one axis the case study companies, and in the other axis, each of the specific areas addressed in the case study summary sheet.

When inputting data into the matrix, the case study summary sheet was further refined by focusing only on the key observations. In addition, similar wording across the different organisation is used in order simplify the identification of common patterns.

The detailed analysis of the data across the 10 companies enabled the identification of several patterns of data (highlighted in Table 7.4), which reveal ten factors that can potentially affect the design of effective TPMS. These are the following:

1. Business process view (pattern highlighted in black)
2. Type of organisational culture (pattern highlighted in red)
3. Strategy deployment (pattern highlighted with light blue)
4. Use of organisational PMS (pattern highlighted in violet)
5. Purpose and benefits of using TPMS (pattern highlighted in dark yellow)
6. Systematic use of quality frameworks (pattern highlighted in orange)
7. Team maturity (pattern highlighted in green)
8. Focus of appraisals and rewards (pattern highlighted in yellow)
9. Management commitment (pattern highlighted in grey)
10. Structured approach to TPMS design (pattern highlighted in pink)

	Case code / **Comparative criteria**	CO1: Applecross	CO2: Highland Spring	CO3: IBM	CO4: Rolls Royce	BP1: Litton Interconnect
Structure and culture	*Organisational structure*	Functional (aware of core processes)	Functional and hierarchical	Matrix. Hierarchical. Team-based	Functional and hierarchical	Process-based (Customer cells) and flat, team-based
	Culture[1]	Decentralised power on critical functions Loose management style	Paternalistic and disorganised. Informal and loose management style.	High performance. Centralised power on critical functions. Competitive environment.	Autocratic and centralised power on critical function. Command and control management style. Impact of trade unions..	Flexible and adaptable to change. Participative management style. Decentralisation on power on teams.
	Impact of structure and culture	Little understanding of process objectives. Inefficiencies due to lack of cross-functional communication. Lack of measurement culture.	Lack of understanding of process objectives. Inefficient cross-functional communication and blame culture. Lack of measurement culture.	Good understanding of process objectives. Culture of measurement. Complex reporting structure -inefficient communication between layers	Lack of understanding of process objectives. Inefficiencies due to lack of cross-functional communication. Measurement = control	Clear understanding of process and customer requirements. Drives teamwork. Positive towards measurement.
Strategy and performance management systems	Strategy *management processes*	Strategy not translated into operational objectives for team members	Strategy not translated into operational objectives for team members.	Systematic approach to deploy strategy down to the individual level.	Strategic objectives are translated into operational goals for manufacturing cells	Clear mission statement translated into operational objectives. Short and long term strategic view.
	Performance management systems	Semi- structured PMS. At corporate level 'profit' is the measure and at process level time and cost measures. No quality frameworks used.	No integrated and structured PMS. No process based measures, 'line efficiency' only measures in place. No quality frameworks used.	Structured and integrated PMS. Does not use any recognised framework.	Structured PMS. Financially focused PMS. Quality initiatives such as lean manufacturing and systems engineering	Structured PMS in place. Does not use any recognised framework. Quality initiatives evident, i.e EFQM model, ISO 9001, Kaizen, lean manufacturing, 5S
	Deployment level	Process level	No deployment mechanism	Individual	Manufacturing cell	Team level
	Impact of strategy and performance management systems	Lack of understanding of team and individual objectives. Short term view. Lack of improvement culture.. Some team members are not aware of the purpose and benefits of TPMS.	Lack of strategic awareness. Lack of understanding of team and individual priorities. Lack of an improvement culture. Some team members are not aware of the purpose and benefits of TPMS.	Good strategic awareness. Individualistic measures (without team measures) negatively affect teamwork culture. Team member are concerned of conflicts between TPMS and individual measures.	Good strategic awareness. Short-term strategic view. Team members see PMS as a control mechanism	Increased business awareness. Good understanding of team priorities. Improvement culture. Positive perception of TPMS
Teamwork practices	*Team characteristics*[2]	Cross-functional team dedicated to managing the construction process (5 members Potential team / norming phase	Cross-functional team dedicated to the production and bottled water (13 members) Pseudo team / forming phase	Cross-functional team dedicated to supporting the main manufacturing lines (7 members) Real team / performing	Manufacturing cell teams manufacturing engine parts (8 members) Potential group / norming phase	Cross-functional work teams organised incorporating all the functions within the customer order fulfilment process (assembly of electronic equipment) Real / performing 8-10 members
	Members understanding of team performance	The achievement of process objectives, i.e. –delivery within quality standards, on time delivery and within budget	Line efficiency. No clear understanding	Balanced across several variables Combination of task performance with employee satisfaction	Process objectives, i.e. Manufacturing cells output	Balanced across several variables. i.e. Customer satisfaction and having the right staff competencies
	Team development processes	None	Localised training	Continuous improvement initiatives. Extensive training programmes	Specific training programmes	Systematic approach for creating and developing teams (DISC system). Continuous improvement initiatives

BP2: Rank Xerox	BP3: NCR	BP4: Irizar	BP5: Maier	BP6: ITP
Process-based and flat, team-based	Matrix structure. Complex reporting structure. Team-based organisation	Process-based (Customer lines) and flat, team-based	Process-based (product lines) and flat. Functions still exist. Team-based.	Matrix structure. Organised around 'mini-factories' focusing on the fulfilment process. Team-based.
High performance and self-management culture. Decentralisation on power on teams.	High performance culture. Centralisation of power on critical functions. Open and flexible to changes.	Flexible and adaptable to change, power decentralised on the teams. Participatory management model. Cooperative principles embedded.	Flexible and adaptable to change, power decentralised on the teams. Cooperative principles embedded.	High performance culture and decentralisation of power on teams.
Clear understanding of customer and team requirements. Drives teamwork. Culture of measurement	Good understanding of process objectives. Culture of measurement. Difficult to see the big picture of the company.	Clear understanding of customer and process requirements. Drives teamwork. Positive towards measurement	Clear understanding of customer and process requirements. Drives teamwork. Positive towards measurement	Clear understanding of customer requirements. Culture of measurement
Clear company mission translate into operational objectives. Balanced mix of strategic objectives (financial, employee development, learning, satisfaction)	Clear strategy translated into operational goals. Financially focused strategy.	Structured strategy deployment process. Feedback from all employees collected before agreeing strategy. Long term strategic view.	Structured strategy deployment process. Feedback from all employees collected before agreeing strategy. Long term strategic view	Structured strategy deployment process to all employees. Balanced set of strategic objectives (financial, customer, innovation, internal processes, staff development)
Structured and balanced PMS in place. Does not use any recognised framework. Quality initiatives evident, i.e. EFQM, Investors In People (IIP)	Structured PMS in place. Activity Based Costing is used. Quality initiatives evident, i.e. EFQM, ISO 9001, IIP	Structured and balanced PMS in place. Does not use any recognised framework. Quality initiatives evident, i.e. EFQM, ISO 9001, ISO 14001, 5S	Structured and balanced PMS in place. Does not use any recognised framework. Quality initiatives evident, i.e. EFQM, ISO 9001, ISO 14001, ISO 16943, 5S	Structured and balanced PMS. Do not use any recognised framework. Quality initiatives evident, i.e. EFQM, Six Sigma, ISO 9001, ISO 14001, AS 9000, 5S
Team level	Global Solutions Teams and below (i.e. manufacturing cells)	Team level.	Manufacturing cell/individual level.	Manufacturing cells. Aiming to have 100% individual objectives
Increased business awareness. Commitment to team objectives. Culture of continuous improvement. Positive perception of TPMS	Clear understanding of team and individual priorities. Commitment to objectives. Positive perception of TPMS	Increased strategic awareness. Clear understanding of team and individual priorities. Commitment to objectives. Culture of continuous improvement. Positive perception of TPMS	Increased strategic awareness. Clear understanding of team and individual priorities. Commitment to objectives. Culture of continuous improvement. Positive perception of TPMS	Increased strategic awareness. Clear understanding of team and individual priorities. Functional measures can jeopardise teamwork culture. Positive perception of TPMS
Self-directed and cross-functional work teams. Dedicated to the sale and maintenance of photocopiers. Responsible for execution of work, and managing working structures, holidays, rewards and salaries. High performing team 8-12 members	Cross-functional work teams dedicated to identifying customer needs, design, manufacturing and after sales support Real / performing team 8-10 members.	Self-directed and cross-functional work teams dedicated to the entire order fulfilment process (design and manufacturing of luxury coaches). High performing team 10-12 members	Cross-functional work teams dedicated to manufacturing and support of plastic moulding products. Real / performing team 6-10 members	Cross-functional work team dedicated to the order fulfilment process (manufacturing of components and assemble of aero engines). Real / performing teams 8-10 members
Balanced across several variables, i.e. Process objectives, continuous innovation of services/processes and team member satisfaction.	Balanced across several variables, i.e. GST process objectives. Innovation and people development also important ingredients.	Balanced across several variables, i.e. Process objectives, supplier/customer/team member satisfaction and skills development	Balanced across several variables, i.e. Process objectives, employee satisfaction and skill development	Balanced across several variables, i.e. Mainly related to the achievement of process outcomes (e.g. customer service.
Extensive training. Appropriate mechanisms for best practice transfer. Continuous improvement initiatives	Extensive training. Continuous improvement initiatives	Extensive training. Continuous improvement initiatives	Extensive training, and continuous improvement initiatives	Extensive training. Continuous improvement initiatives.

	Case code	CO1: Applecross	CO2: Highland Spring	CO3: IBM	CO4: Rolls Royce	BP1: Litton Interconnect
	Comparative criteria					
Support processes	*Training process*	No formal approach to identifying training needs and deliver training programmes.	No formal approach for identifying training needs and delivering training.	Individual skills gap analysis and structured training programmes.	No formal approach to training	Structured approach for identifying and delivering training programmes. Technical, strategic and attitudinal training
Support processes	*Performance appraisal systems*	No appraisal system. Lack of awareness of individual objectives, responsibilities and areas for improvement	No appraisal system. Lack of awareness of individual objectives and areas for improvement.	Structured appraisal system. 360-degree feedback.	No appraisal system.	None. Currently in the process of developing a competence based appraisal system
Support processes	*Reward and recognition*	Company-wide bonus based on profit figures	Company-wide bonus based on profit figures	Reward system directly linked to PBC charts. Only high performing individuals are rewarded.	Company-wide reward scheme based on profit figures	Business-wide system linked to profit figures.
Support processes	*Impact of support processes*	Lack of understanding of individual objectives and development areas.	Lack of understanding of individual objectives, development areas and drivers of team performance.	Individualistic and competitive environment, which jeopardises teamwork culture.	Lack of understanding of individual objectives, development areas and drivers of team performance.	Need to improve awareness of development areas for team and individuals
TPMS design	*Top management commitment for designing TPMS*	From Managing Director.	From Project Manager.	From Engineering Manager.	From HR Manager.	From the Managing Director.
TPMS design	*General details of the TPMS design approach*	None. There is a need for a practical tool.	None. There is a need for a practical tool.	Structured approach for designing individual measures (not team). There is a need for a team-based approach.	Semi-structured approach.	Approach in place. Not a recognised approach. A standardised approach required.
TPMS design	*Characteristics of the TPMS design approach*	N/A	N/A	Negotiation process of the objectives and measures between individual and manager. Measures deployed from business objectives.	Team measures deployed from company objectives. Not a standard procedure. Team leader and Production manager involved in the TPMS (not team members)	Involves all team members. The ABS leads the process to ensure all consistency of measures with business strategy.
TPMS design	*Content of the TPMS*	Uni-dimensional. Effectiveness measures: 'real vs planned sq footage constructed' and 'real vs planned expenditure'	Uni-dimensional. Effectiveness measure: 'line efficiency'	Semi- Balanced. Effectiveness: 'line efficiency', 'improvement ratio', Learning and growth: 'skill development'	Semi-Balanced. Effectiveness; 'output', 'stock levels', 'cost rate', 'customer complaints' and Team member satisfaction: 'absenteeism'	Balanced. Effectiveness: 'pass yield', 'customer complaints', 'customer satisfaction', 'customer/supplier returns'; Efficiency: 'customer/supplier relationship'; Learning and growth: 'Availability of skills', 'vendor ratings'
	Effectiveness of TPMS[3]	Low	Low	Medium	low↑	Medium↑
	Impact of the TPMS	Provides focus to the team. Other variables that affect team performance are not measured and as a result, the team is not of how to improve team performance	Lack of awareness of business strategy and of the contribution of the team to the overall strategy. Short term-focus and lack of understanding of root causes of low performance	Team members have a clear focus of their work. Individual objectives encourage competition (rather than cooperation) between team members.	All efforts of the manufacturing cells aligned with business strategy. Sort-term focus; most measures are lagging measures.	Increased business awareness and short/long term focus. Valuable platform for continuous improvement. Increased accountability and commitment of team members.

[1]Organisational cultural features adopted from Schein (1985), Mintzberg (1989) and Pheysey (1993)
[2]Team type based on the classification presented in Chapter 5 (Section 5.2); Performance level/development stage based on a combination of Katzenbach
[3]Based on interviewees' perceptions and on a comparison with the typology for TPMS design in Chapter 6 (Section 6.5)
EFQM: European Foundation for Quality Management; IIP: Investors In People

Table 7.4: (

BP2: Rank Xerox	BP3: NCR	BP4: Irizar	BP5: Maier	BP6: ITP
Structured approach for identifying and delivering training programmes. Technical, strategic and attitudinal training	Structured approach for identifying and delivering training programmes Technical, strategic and attitudinal training	Structured approach for identifying and delivering training. Technical, strategic and attitudinal training	Structured approach for identifying and delivering training. Technical, strategic and attitudinal training	Structured approach for identifying and delivering training. Technical, strategic and attitudinal training
Team-based appraisal system in place. The team itself carries out the appraisal, sometimes with the support of the mentors	Quarterly individual performance appraisal system. 360-degree feedback	Not structured appraisal. Team performance is frequently reviewed to define improvement actions.	Formal appraisal system (360 degree feedback). Focused on 10 areas for organisational learning.	Structured performance appraisal linked to performance
Team and individual based. Team members responsible for rewarding individuals. Rewards the generation and adoption of best practices.	Not structured reward system in place. Rewards are given in a non-systematic manner.	Company wide rewards based on profit figures and the evaluation against the EFQM.	Company-wide rewards based on financial performance.	Team performance based reward system. Also company-wide reward system.
Reinforce team development and teamwork culture. Reinforce the view that performance is not only about financial results.	Appraisal often reinforces individual culture rather than teamwork.	Good understanding of the development needs for teams. Reinforce the view that performance is not only about financial results	Increased strategic awareness and clear understanding of the development needs.	Good understanding of the development needs for teams and individuals.
From area/regional Manager.	HR Manager.	From Managing Director.	From Managing Director.	For Managing Director.
Approach in place. Not a recognised approach. A standardised approach would be useful.	Approach in place Not a recognised approach.	Approach in place. Not a recognised approach. A standardised approach would be useful	Approach in place. Not recognised approach	Approach in place Not recognised approach.
Teams have the responsibility (and skills) to define their own TPMS. Mentors can support the process if necessary.	Top-down process; mainly managers determine objectives and measures	Team members responsible to define measures linked to strategy. All team members involved and process led by team leader.	TPMS designed based on strategy and customer needs. Process led by the team leader and involves the team members.	Negotiation process between the different layers in order to agree objectives and targets. Measures derive from strategy. Top-down approach.
Balanced. Effectiveness: 'Sales', 'Service reliability'; Efficiency: 'Inter-team relationships'; Learning and growth: 'Service/process innovation', 'adoption of best practices'; Team member satisfaction	Balanced. Effectiveness: 'product development', 'quality assurance', 'global delivery management', 'supply line management', 'module assembly'; Learning and growth: 'Innovation', 'skills'	Balanced. Effectiveness: 'Flexibility', 'quality', 'cost', 'innovation', 'customer satisfaction'; Efficiency: 'customer/supplier relationship', Learning and growth: 'Skills available'; Team member satisfaction	Balanced. Effectiveness: 'delivery reliability', 'customer satisfaction'; Efficiency: 'average time for development and acceptance of plans'- related to decision taking capabilities; Learning and growth: 'skills availability', 'average time for actualisation of skill matrixes'; Employee satisfaction	Semi-Balanced. Effectiveness: 'Customer service', Learning and growth: 'skill availability'
High	Medium	High	High	Medium
Increased business awareness and strategic thinking. Increased accountability and commitment of team members. Continuous development of teamwork practices.	Provides a clear focus to all employees. Allows to manage several areas affecting team competitiveness. Appraisal used as performance review rather than development; switches off 'high performance' culture.	Increased commitment from teams. Focus on current and future areas to ensure team competitiveness.	Increased commitment from teams Capabilities-based appraisal ensure future outlook of all employees	Clear understanding of business strategy and individual contribution. The use of functional measures can jeopardise teamwork.

and Smith's (1993a) team performance curve and Tuckman and Jensen's (1997) stages of team development (see section 5.1.3.5)

Cross-case analysis matrix

(1) Business process view

This factor refers to the degree to which the company has defined the internal key business processes and has organised its internal structure (including teams) around these processes.

Those companies with a clear process-based structure showed better use of team management practices. Litton, Rank Xerox and Irizar are a good example of this. The flat and process-based structure of these companies encouraged a culture of teamwork. These teams had a clearer understanding of who the customer was and of the customer's requirements. This simplified the definition of the team objectives and the corresponding measures. IBM, NCR, and ITP had a matrix type of structure combining business processes and functions. These three companies were also heavily dependant on the performance of teams but TPMS design did not appear to be as effective as in the other companies. The complex reporting structures in these three companies meant that each team member had to report to a number of managers. As a result, team members had a mixture of team-based and functional measures. The latter were not always aligned with the team objectives and as a result, it sometimes creates conflicts between interests of the functions and the team.

Although several functions were still recognisable in Maier, the company was aware that their main task was to manage their critical business processes. Maier was focused on the performance of the business process and this enabled the team to have a clear understanding of the process goals.

The companies that were still thinking in terms of functions (i.e. Applecross Properties, Highland Spring and Rolls-Royce) were managing functional performance rather than process performance. They did not have such a clear picture of the application of teams across the functions, and so their TPMS were either non-existent or ineffective.

(2) Type of organisational culture

Organisational culture is formed by the values, norms, beliefs and attitudes held by employees. The management style promoted by the company is also an important part of organisational culture. The organisational culture of the case study companies was studied based on several cultural features described in current literature (Schein, 1985; Mintzberg; 1989, Pheysey; 1993)[14].

As one would expect, companies that had a *flexible and adaptable culture to change* (Litton, Rank Xerox, Irizar, Maier) demonstrated to be the most open to designing TPMS. Continuous change was an aspect accepted by most employees and thus, getting commitment

[14] For a sample list of cultural features see questionnaire (Appendix B2, Section 2)

to design a new TPMS was not be a big challenge as long as employees and managers understood the purpose and benefits of it.

The *high performance* culture that was evident in some of the companies (i.e. IBM, Rank Xerox, NCR, ITP) also seemed to have a positive impact on the use of TPMS. These companies continuously set performance targets and they managed their businesses based on the achievement of those targets. As a result, the use of performance measures plays a key role. IBM, however, showed a culture of *competition* rather than *cooperation,* which had a negative impact on the overall teamwork practices (including the use TPMS). In order to design a TPMS it would be necessary to change the mindset of team members so that they would focus on cooperation rather than competition.

Companies where *power was decentralised to the teams* (Litton, Rank Xerox, Irizar, Maier) rather than *centralised on key functions* (IBM, Rolls-Royce, NCR, ITP) had also more effective TPMS. Teams within the former organisations had a high level of autonomy for designing the TPMS. They decided on the key measurement points and this resulted in a more balanced TPMS because they placed more emphasis on measures related to the needs of individual team members as well as the on the development of internal team capabilities. In addition, all interviewees agreed that giving the team the responsibility to design their own TPMS increased their commitment to, and accountability for, the team objectives.

In the companies where power was centralised on critical functions (IBM, NCR, ITP) most measurement points were dictated from higher organisational levels although team members were also involved in the process of TPMS design. This included the deployment of functional objectives, which were a constraint for developing cross-functional TPMS. In addition, functional objectives were mainly related to *team effectiveness*. Team effectiveness was the area of most interest for management, as it directly contributed towards the company's key strategic objectives. The TPMS used within these companies were not necessarily balanced across the four dimensions of team performance.

The *informal and loose* corporate culture of Applecross and Highland Spring was a constraint for designing effective TPMS. In the case of Highland Spring, the culture could also be described as *disorganised* because of the lack of structure for decision-making, communication and performance improvement activities. It was not part of the culture and management style of these two companies to use PMS for managing the business and so neither team members nor managers had experience in using performance measures. Decisions were taken using informal systems and mainly based on personal perceptions and experience. The design of TPMS within these two organisations did not appear to be a process that would emerge naturally.

Finally, it is worth mentioning that the unique organisational culture of the two 'best practice' organisations that are part of the Mondragon Corporacion Cooperativa (i.e. Irizar and Maier) was also reflected in their PMS. The fundamental principles of these two companies include elements such as worker participation, social and financial democracy and community wellbeing. As a result, the PMS of both companies included a number of measures related to these principles.

(3) Strategy deployment

This factor relates to the degree to which the company translates strategy into operational goals and deploys these through the different organisational levels. Strategy deployment needs to be consistent with the organisational structure in that it creates and deploys strategy taking into account the different performance units (i.e. business units, processes, functions, teams, individuals) that form this structure.

The effectiveness of the TPMS design within the companies that had a structured strategy management process (i.e. IBM, Rolls-Royce and all 'best practice' organisations) was higher than the rest. Having a structured strategy management process resulted in TPMS that were clearly aligned with the company strategy and as a result, directed the team in the same direction as the rest of the organisation. Applecross and Highland Spring did not have a systematic process to translate strategy into operational goals. This had a negative impact on the strategic awareness of the team members, which in turn made it difficult for the teams to design performance measures aligned with strategy.

Irizar and Maier had a unique strategy management process. Both companies define 3 to 5 year strategic plans. Before agreeing and finalising the strategic plan, the management team communicates the initial draft of the plan to all employees, who can then review it and provide appropriate feedback. The management team then reviews this feedback and based on that, refines the initial draft and finalises the strategic plan. This allows the management team to gain maximum agreement and commitment among employees, while increasing the overall strategic awareness. This strategic awareness and commitment play a vital role when designing TPMS.

The nature and content of the strategy had also a clear impact on the design and quality of the TPMS design. The focus on satisfying the requirements of several stakeholders was recognisable within the strategy of IBM, Litton, NCR, Rank Xerox, Irizar, Maier and ITP. These included strategic objectives related to financial figures, employees' development, innovation, customer satisfaction, process optimisation and organisational learning. These strategic objectives were in turn cascaded down to the team levels and this affected the content and effectiveness of the TPMS, mainly because they combined lagging and leading measures for the team.

The main strategic lines of Rolls-Royce were related to 'maximising profit' and 'reducing cost'. This was also reflected in the content of the TPMS, which included measures such as 'output', 'stock levels', 'cost rates' and 'customer complaints'. The short-term focus of the business strategy was clearly evident within the TPMS and resulted in the use of lagging measures only.

(4) Use of organisational PMS

This factor covers two different aspects. Firstly, the company has a PMS that is deployed and integrated throughout the entire organisation and includes a balanced set of measures. Secondly, the company actively uses the PMS for decision-making, defining improvement actions and reviewing strategy. As a result, employees have certain experience and knowledge about using performance measurement systems.

The cross-case analysis showed that the companies that had an organisational PMS in place were using further developed TPMS. The organisational PMS provided a focal point to start the design of the TPMS. IBM, Litton, Rank Xerox, NCR, Irizar, Maier and ITP had an integrated and balanced PMS in place and this facilitated the design of effective TPMS. These companies were shown to have more effective TPMS in place. In addition, these TPMS had a more balanced view of team performance and in most cases included measures related to the four dimension of team performance (i.e. effectiveness, efficiency, learning and growth, team member satisfaction). The PMS used by Rolls-Royce was uni-dimensional as it only focused on financial measures. This resulted in a TPMS that had a clear financial and short-term focus.

Applecross and Highland Spring did not have a recognisable company wide PMS. Team members did not have a clear view of whether they could affect the company strategy or not and as such, it seemed to be more difficult to design a TPMS. In addition, the team members had little experience in using performance measures. They did not have a clear understanding of how to develop and manage a TPMS and often they were unsure of the need to develop one.

On the hand, people within IBM, Litton, Rank Xerox, NCR, IRIZAR, Maier, ITP were accustomed to using performance measures for performance reviews, decision-making and defining improvements actions. They had acquired experience and knowledge regarding the use of performance measures and they had a fairly good understanding of the purpose and potential benefits of having a PMS. This experience and knowledge in managing with measures appeared to be an important element for facilitating the design of TPMS.

(5) Systematic use of quality frameworks

This factor refers to the degree to which organisations demonstrate a systematic use of quality initiatives for managing and improving business performance.

All companies except Applecross and Highland Spring were using recognised quality frameworks including Kaizen, lean manufacturing, 5S, 6-sigma, ISO 9001, ISO14001, Investor In People (IIP) and EFQM. In some companies, these were well integrated within their strategy management process, while in others they were used as improvement tools. Rank Xerox and Irizar were especially good examples of how some of these frameworks (EFQM and IIP) can be integrated within the business strategy management process.

Performance measurement is an important element of any quality framework and thus, companies using quality initiatives demonstrated better experience in using performance measures. Obviously, this experience varied depending on how actively these frameworks were being used for managing performance.

The use of quality initiatives was also reflected in the contents of the TPMS. Quality initiatives focus on managing and improving a number of areas of the business and thus, the corresponding measurement systems can provide a more balanced view of performance. For example, the EFQM model focuses on the satisfaction of the stakeholders' requirements (employee, customer, society, shareholders) through the management of 5 enablers (leaderships, people, strategy, partnerships, processes). As a result, companies working under the umbrella of the EFQM model (i.e. Litton, Rank Xerox, NCR, Irizar, Maier, ITP) incorporated measures related to some of these stakeholders and enablers within their organisational PMS as well as their TPMS.

The systematic use of quality frameworks provides experience in using measurement systems and a more balanced view of performance. As a result, it appears that this facilitates the design of effective TPMS.

(6) Understanding of the purpose and benefits of using TPMS

This factor relates to the understanding of the purpose and perceived benefits of using a TPMS from managers and team members.

Those teams where managers and individual team members had a clear understanding of the purpose and benefits of using TPMS (IBM, Litton, Rank Xerox, NCR, Irizar, Maier, ITP) had more effective TPMS than those teams that did not have a clear understanding (Applecross, Highland Spring, Rolls-Royce). This was an expected finding as having a clear understanding of the purpose and benefits of a specific initiatives is a widely recognised success factors within change management (Kotter, 1996; Lanning, 2001) and PMS design and implementation literature (Bourne et al, 2002).

During the interviews within Applecross, Highland Spring and Rolls-Royce some of the managers and team members were sceptical about the use of TPMS. This was mainly caused by a lack of understanding of the purpose of using TPMS and the benefits that this could bring to their everyday activities. This scepticism about the value of using TPMS would make it difficult to get full commitment from team members involved in designing a TPMS.

(7) Team maturity

Team maturity refers to the developmental stage and performance level of the team. Team maturity was assessed through comparing teams against the Tuckman and Jensen's (1977) stages of team development and Katzenbach and Smith's (1993) team performance curve earlier described in Chapter 5 (Section 5.6).

The cross-case analysis showed that more mature teams had a better understanding of the meaning of team performance than those teams with low maturity levels. In other words, mature teams had a more balanced view of team performance and were more aware of the key factors affecting team success. As a result, their corresponding TPMS combined measures related to a number of dimensions and drivers of team performance.

For instance, *high performing teams* (Rank Xerox, Irizar) and *real* teams (IBM, Litton, NCR, Maier, ITP) had a broader understanding of team performance. They all agreed that the scope of team performance goes beyond the achievement of the task objectives. Although achieving team task objectives was a priority in order to satisfy external team stakeholders, they argued that team performance also included aspects such as developing the competencies of individual team members, satisfying the needs of team members and managing the areas that would ensure the future competitiveness of the team (e.g. innovation, supplier relationships). This was directly reflected in the TPMS that these teams were using. These TPMS included measures related to several of the dimensions that determine team performance (all four dimensions in the case of Rank Xerox, Irizar and Maier). They combined measures related to effectiveness (e.g. 'customer satisfaction', 'service reliability'), efficiency ('customer/supplier relationship', 'inter-team relationship', average time for acceptance of plans'), learning and growth ('vendor ratings', 'service and process innovation', 'adoption of best practices', 'skill availability') and team member satisfaction.

On the other side of the spectrum, companies with *potential teams* (Applecross and Rolls-Royce) and *pseudo teams* (Highland Spring) viewed team performance as being solely related to the achievement of task objectives. Team effectiveness was the only dimension they related to team performance and thus, their TPMS only included measures related to that dimension. In Highland Spring, team members did not have a clear understanding of the team concept, which resulted in a lack of awareness of the team goals. In their view team performance was related to 'line efficiency' but they had little understanding on how they could affect that variable. The low maturity of the team clearly affected the definition of common goals and the design of the corresponding TPMS.

(8) Focus and content of appraisals and rewards

This factor relates to the degree to which performance appraisal and rewards are designed to fit in with the team-based culture.

Six of the companies were using structured appraisal system; four of them team-based (Rank Xerox, Irizar, Maier, ITP) and two of them individual-base (IBM and NCR). The four companies using team-based appraisal systems placed emphasis on reviewing individual performance that was linked to the overall team performance and on identifying the individual development that support the competitiveness of the team. On the other hand, IBM and NCR used the performance appraisal to review individual performance objectives. IBM appraised individuals against the objectives included in the Personal Business Commitment (PBC) charts. The PBC included personal objectives and targets that each individual had committed to for the following working period. These objectives were not necessarily linked to the objectives of the team and so did not always required the collaboration and cooperation between team members. NCR was using a quarterly performance appraisal system, in which individuals were appraised against 3 objectives per quarter. Again, these objectives were not always aligned to the team objectives. Both companies agreed that their individually-focused performance appraisals were inconsistent with teamwork practices in that they created an environment of competition amongst the team members.

The impact that reward and recognition systems had on the design of TPMS was clearly evident. All ten companies had some type of reward system. Applecross, Highland Spring, Rolls-Royce, Litton, Irizar and Maier only used company-wide rewards, which were based on profit figures. Irizar was the only company that apart from profit figures used the evaluation against the EFQM as a criterion to reward employees. As a result, the measure related to the evaluation against the EFQM was a key measurement point within the organisational PMS.

ITP rewarded teams based on their process performance and the system appeared to be effective. NCR provided rewards in an ad-hoc manner but the implications of this were not clear from the data collected.

Rank Xerox and IBM provided the most useful insights into the impact of rewards on the design of effective TPMS. Rank Xerox showed how rewards can facilitate the process of designing TPMS, while IBM showed that reward systems can also be a barrier for designing effective TPMS. Rank Xerox rewarded individuals and teams that made outstanding contributions towards increasing team and business performance. While team rewards were awarded by external people, individual rewards were awarded by the team members themselves. Teams and individuals were not only rewarded for achieving performance targets but also for generating and adopting best practices. This was a strategic business objective to ensure the continuous competitiveness of the team and the company believed that it was important to reward teams based on that factor. As a result, *generation and adoption of best practices* became a key measure within the TPMS.

IBM had a reward system directly linked to the PBC charts. Due to the high-performance culture within IBM only those team members demonstrating outstanding performance were rewarded. In addition, rewards were awarded by external figures to the team (unlike in Rank Xerox). This focus on individual objectives (rather than team objectives) and rewards (only for the highest performers) created a competitive environment among team members who were competing with each other instead of cooperating. Their main objective was to be better than the other team members so that they could achieve the highest performance levels and as a result, get the corresponding rewards. For these teams, it did not make much sense to develop a TPMS while their performance was being appraised and rewarded based on individual performance.

Although Rank Xerox had also a high performance culture and used individual rewards (as well as team rewards), the team itself decided who of its members deserved special recognition. That decision was taken based on her/his contribution to the overall team performance. In addition, teams were rewarded for their performance against a number of dimensions and that provided a more balanced view of team performance. These characteristics of Rank Xerox's reward system considerably facilitated the design of effective TPMS.

This exploratory study also examined other support processes across the organisations such as training and career progression practices. The cross-case analysis, however, did not reveal any clear effects of these processes on TPMS design.

(9) Management commitment

Management commitment refers to the level of involvement and support from managers in designing TPMS. Management commitment was assessed by studying the perception of managers on the value and benefits of using TPMS and their willingness to provide the required resources to design an effective TPMS.

As in any other change initiative, management commitment proved to be a key factor for designing TPMS. Companies where managers were more committed to the design of TPMS (IBM, Litton, Rank Xerox, NCR, Irizar, Maier, ITP) had more effective TPMS. In these companies the use of TPMS was embedded within their management style and thus, the commitment came from all organisational levels. In Applecross and Highland Spring management commitment was specific to certain managers. Those managers who were not committed appeared to be a barrier to design TPMS.

Most of the interviewed managers emphasised the importance of having effective TPMS and showed total commitment with the TPMS development process. Not all companies, however, provided teams with the required resources to design an effective TPMS. NCR, for example, would take the teams out for a day in order to discuss and communicate the overall company strategy, determine the requirements for the teams and, based on these requirements, develop the TPMS. On the other hand, companies like Applecross, Highland Spring and Rolls-Royce were not providing enough resources for designing TPMS and this was directly reflected in the quality of their TPMS.

(10) Structured approach for TPMS design

This factor is related to the existence and use of a clearly defined and understood process for designing TPMS.

All companies, except Applecross and Highland Spring, used certain processes for designing their TPMS. In any case, these two companies also recognised the importance of having a structured process to design an effective TPMS.

IBM, Rolls-Royce and Litton were not satisfied with the existing processes. IBM was using a structured and standardised process but this focused on developing individual measures. In words of the Industrial Engineering Team Manager this process was not adequate:

> *'We need a process better suited to teamwork because with the current individually orientated system the competitiveness between team members will continue increasing'*

Rolls-Royce and Litton did not think that their current processes allowed identifying all the key measurement points. This was especially true in the case of Rolls-Royce where the

TPMS only included measures related to *effectiveness*. Litton had well balanced TPMS but wanted to start introducing more of the soft or intangible type of measures.

Rank Xerox, NCR, Irizar, Maier and ITP were satisfied with the output of their processes. The TPMS developed in Rank Xerox, Irizar and Maier included a well balanced set of measures but those developed in NCR and ITP were very much focused on measures related to *effectiveness* and they also included functional (not team) measures. Thus, several questions could be raised about the adequacy of the processes that NCR and ITP were using for designing TPMS. In fact, these two companies were using a top-down approach for designing TPMS in which measures were mainly dictated by the managers above the team. As a result, the TPMS mainly focused on *effectiveness* measures and were not adequately balanced across the four dimensions of team performance.

The processes used within Rank Xerox, Irizar and Maier appeared to be the most comprehensive. These three companies were using very flexible processes, which mainly consisted in getting the team together (usually with the support of a mentor) and discussing and agreeing the objectives and measures for the next working period. These processes involved all team members, had generally a person leading the process and were mainly focused on aligning team measures with company strategy and customer requirements. Teams were responsible for defining and implementing the particular process for developing their own particular TPMS. A higher level of ownership and accountability over the measures was shown by these teams.

These three companies pointed out that having clear leadership was also essential for developing effective TPMS. In all companies there would be one person leading the design process. The role of this person was not to manage the process but to provide direction and support if necessary. This leader would ensure that the teams had covered all areas that were relevant regarding the short- and long-term competitiveness of the teams.

7.7. Discussion

The objective of this exploratory study was to compare TPM practices across 10 organisations with an especial emphasis on the design aspects of TPMS. It is important to mention that, in spite of the lack of effective TPMS in place, both Applecross and Highland Spring are highly successful companies with an exponential growth rate during the last few years. Due to their relatively small size these two companies have managed to continuously grow (financially and in market share) with little support from advanced performance management systems. In order to cope with that exponential growth, however, they now need to acquire new working practices and as such, improving team management practices has become a top priority.

All 10 companies studied during this exploratory phase were using or intending to use teamwork practices with the aim of improving business performance. They were using teams to enhance customer focus, cross-functional integration, process effectiveness, innovation capabilities, and employee satisfaction, all of which have an impact on the overall performance of the business. As a result, all companies understood and emphasised the importance of continuously improving team performance management processes including TPMS. Nevertheless, the development stage regarding the design and use of TPMS varied considerably across the companies.

In seeking an answer to research question one (i.e. RQ1. What are the factors that enable and/or constrain the development of effective TPMS?) the cross-case analysis highlighted several patterns of data that revealed ten potential factors affecting the design of TPMS. Figure 7.2 summarises the process followed during this exploratory research phase

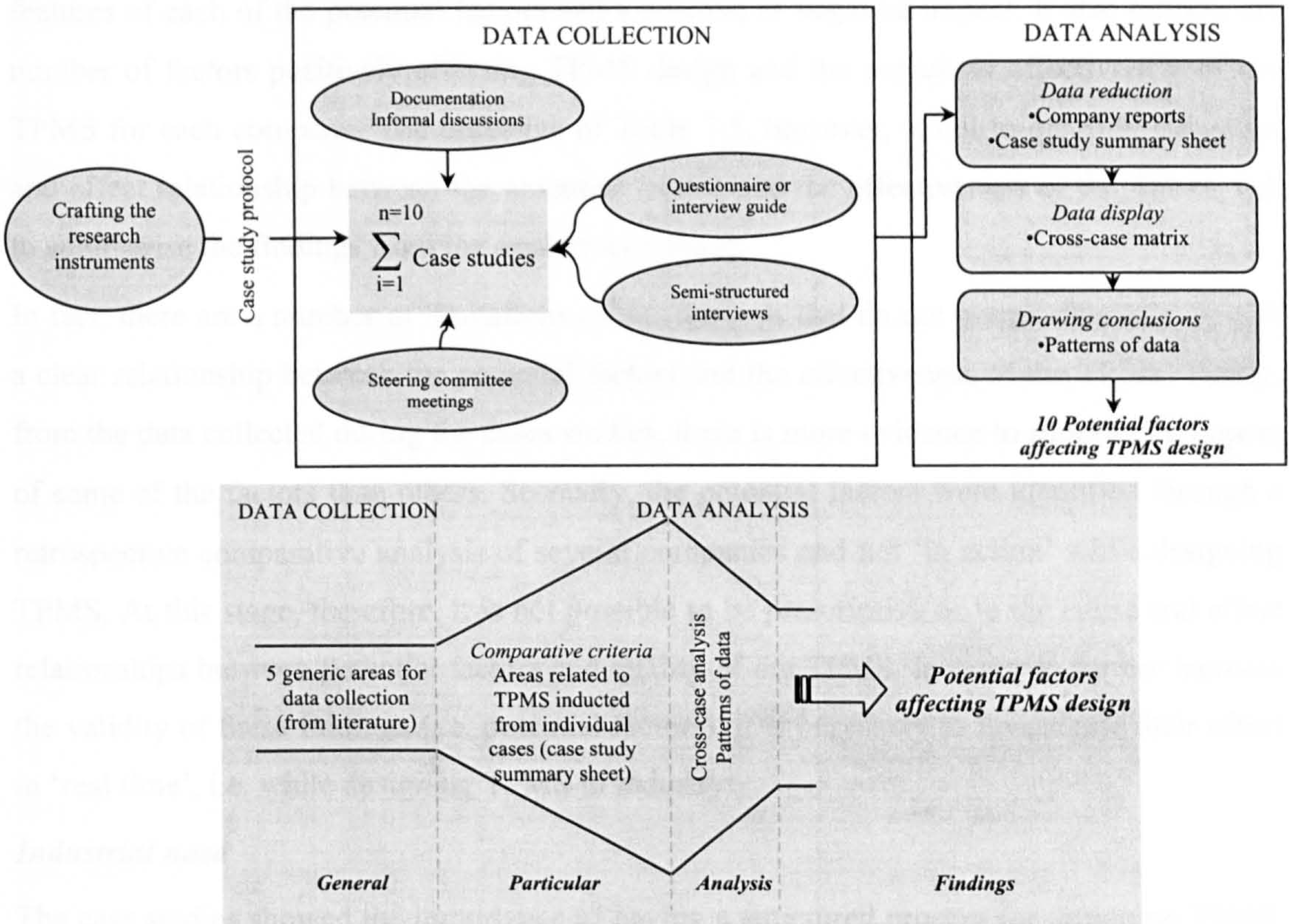

Figure 7.2: Process map of the exploratory research phase

Amongst these ten potential factors there are some that can be considered generic for any type of change management initiative, and these are recognised within the existing literature. In fact, *management commitment, type of organisational culture* and *purpose and benefits of* *change* (TPMS in this case) have been identified as having a great impact on the success of change management projects (Kotter, 1996; Lanning, 2001).

The researcher also identified other potential factors affecting the design of TPMS including *strategy deployment, use of organisational PMS, systematic use of quality frameworks* and *structured and comprehensive approach for TPMS design.* These four factors can be considered generic to any PMS design project, as they are not only specific to TPMS design projects. Current research on PMS (e.g. Wisner and Fawcet, 1991; Kaplan and Norton, 1996; Neely et al, 2000) and on TPMS (e.g. Zigon, 1997; Jones and Schilling, 2000) recognises the importance of these factors.

The other three potential factors that were identified are specific to TPMS design projects. These potential factors include *business process view, focus and content appraisal and reward systems* and *team maturity.*

Table 7.5 summarises the findings from the cross-case analysis by comparing all ten companies against the potential factors. For each company, it illustrates if the specific features of each of the potential factors had a positive or negative impact. It also reflects the number of factors positively affecting TPMS design and the perceived effectiveness of the TPMS for each company. The objective of Table 7.5, however, is not to quantify the cause and effect relationship between the potential factors and the effectiveness of the TPMS, but to summarise the findings from the exploratory phase.

In fact, there are a number of limitations of this analysis that do not permit determination of a clear relationship between the potential factors and the effectiveness of the TPMS. Firstly, from the data collected during the cases studies, there is more evidence to support the impact of some of the factors than others. Secondly, the potential factors were identified through a retrospective comparative analysis of several companies and not 'in action' while designing TPMS. At this stage, therefore, it is not possible to be prescriptive as to the cause and effect relationships between potential factors and quality of the TPMS. In order to further increase the validity of these findings (i.e. potential factors), it is necessary to investigate their effect in 'real time', i.e. while designing TPMS in industry.

Industrial need

The case studies showed the importance of having a structured process for designing TPMS. The most effective processes were those used by Rank Xerox, Irizar and Maier. The following were the common features of these processes:

- Flexible and low standardisation
- Team members have the ownership over the TPMS design process
- A clear leader supporting the process
- Linked to company strategy and customer requirements

In all cases the success of these flexible processes relied on the advanced development stage or maturity of the teams. These teams had high levels of autonomy and a clear understanding of company goals and customer requirements. They also had a clear understanding of the meaning of team performance and of the drivers that have an impact on team performance. This facilitated the identification of the key measurement points.

The Training Coordinator from Irizar stated that the process used for TPMS design was more successful within some teams than in others. Due to their knowledge and experience, mature teams felt comfortable with the flexible system, while non-mature teams required a more structured and guided process. Rank Xerox also stated that, depending on the level of experience and maturity of the team, certain teams required the support of a mentor while designing their TPMS.

All three companies agreed in that the rate of success of the TPMS design process could be enhanced by developing a standardised and formalised process that could be easily transferred from one team to another. High performance teams could still use the process in a flexible way, but this would provide a structured approach for TPMS design to non-mature teams. The rest of the companies, whether they were satisfied with their current process or not, also recognised the potential value and benefits that a standardised process could bring. While some companies (Applecross, Highland Spring, Rolls-Royce, Litton) stated that a standardised process would facilitate the design of effective TPMS, others (Rank Xerox, NCR, Irizar, Maier, ITP) highlighted the possibilities that such a process offers to transfer best practice in TPMS design from one team to another irrespective of where these teams are located.

In spite of the evident industrial need for a practical TPMS design tool, the next step is to identify existing TPMS design approaches and to assess if these provide a valid solution to the industrial problem. This leads to the definition of research questions 3 as follows:

RQ3. *Is there a need for a new construct to facilitate the design of TPMS?*

Case code / Potential factors	Applecross	Highland Spring	IBM Greenock	Rolls Royce Hillington	Litton Glenrothes	Rank Xerox Glasgow	NCR Dundee	Irizar	Maier	ITP
1. Business process view	low (-)	low (-)	medium (+/-)	low (-)	high (+)	high (+)	medium (+/-)	high (+)	medium (+/-)	medium (+/-)
2. Type of organisational culture	informal / loose (-)	informal / loose (-)	high performance, centralised power (+/-)	Autocratic, centralised power (-)	flexible and adaptable, decentralised power (+)	high performance, flexible and adaptable, decentralised power (+)	high performance, centralised power (+/-)	flexible and adaptable / participatory, decentralised power (+)	flexible and adaptable, decentralised power (+)	high performance, decentralised power (+)
3. Strategy deployment	no (-)	no (-)	yes (+)	partially (+/-)	yes (+)	yes (+)	yes (+)	yes (+)	yes (+)	yes (+)
4. Use of organisational PMS	no (-)	no (-)	yes (+)	partially (+/-)	yes (+)	yes (+)	yes (+)	yes (+)	yes (+)	yes (+)
5. Systematic use of quality frameworks	no (-)	no (-)	yes (+)	yes (+)	yes (+)	yes (+)	yes (+)	yes (+)	yes (+)	yes (+)
6. Understanding of the purpose and benefits of TPMS	not clear (-)	not clear (-)	clear (+)	not clear (-)	clear (+)	clear (+)	clear (+)	clear (+)	clear (+)	clear (+)
7. Team maturity	potential (-)	work group (-)	real (+)	potential (-)	real (+)	high performing (+)	real (+)	high performing (+)	real (+)	real (+)
8. Focus and contentsof appraisal and rewards	business (+/-)	business (+/-)	individual (-)	business (+/-)	business (+/-)	team (+)	individual (-)	business (+/-)	team (+)	team (+)
9. Management commitment	medium (+/-)	medium (+/-)	medium (+/-)	medium (+/-)	high (+)	high (+)	high (+)	high (+)	high (+)	high (+)
10. Structured and comprehensive approach for TPMS design	no (-)	no (-)	(+/-)	no (-)	partially (+/-)	yes (+)	partially (+/-)	yes (+)	yes (+)	partially (+/-)
Number of factors in (+) mode	1/10	1/10	7/10	3/10	9/10	10/10	7.5/10	9.5/10	9.5/10	9/10
Effectiveness of TPMS	low	low	medium	low↑	medium↑	high	medium	high	high	medium↑

Note: a '½' symbol means that criteria has been partially fulfilled

Description of potential factors	
1. Business process view	The degree to which the company has defined the internal key business process and has organised its internal structure around those processes.
2. Type of organisational culture	The values and beliefs embedded in the organisation and the type of management style promoted by the company.
3. Strategy deployment	The existence of a process to translate strategy into operational goals and deploy these through the different organisational levels.
4. Use of organisational PMS	The existence of an integrated and balanced PMS. The company actively uses the PMS for decision-making, defining improvement actions and reviewing strategy. Employees have certain experience and knowledge in using performance measurement systems.
5. Systematic use of quality frameworks	Organisations demonstrate a systematic use of quality frameworks and initiatives for managing and improving business performance.
6. Understanding of the purpose and benefits of TPMS	The perceived focus, purpose and benefits of the TPMS from managers and team members
7. Team maturity	The developmental stage and performance level of the team
8. Focus and content of appraisal and reward systems	The degree to which performance appraisal and rewards are designed to fit in with the team-based culture and to whether these are based on a single or multiple dimensions of team performance.
9. Management commitment	The level of involvement and support from managers in designing TPMS.
10. Structured and comprehensive approach to TPMS design	The existence and use of a clearly defined and understood process for designing TPMS.

Table 7.5: Summary of cross-case analysis

7.8. Chapter conclusions

The objective of the exploratory research described in this chapter was to explore current practice regarding the design and use of TPMS in order to gain new insights into the factors that affect the design of effective TPMS. The identification of these factors would allow the researcher to provide an answer to research question 2 (i.e. *RQ2. What are the factors that enable and/or constrain the design of effective TPMS?*).

The cross-case analysis of ten organisations highlighted ten potential factors affecting the design of effective TPMS. These potential factors can be divided into three groups depending on whether they are specific for TPMS initiatives, PMS projects, or generic for any change initiative. Potential factors that are generic to change initiatives include:

- Management commitment
- Type of organisational culture
- Understanding of the purpose and benefits of change (TPMS in this case)

Specific factors for PMS projects include:

- Strategic deployment
- Use of organisational PMS
- Systematic use of quality frameworks
- Structured and comprehensive approach for PMS design

Factors that are specific for TPMS initiatives include:

- Business process view
- Focus and content of appraisal and reward systems
- Team maturity

The evidence from this comparative analysis, however, is not enough to provide a final answer to research question 2. It is necessary to carry out several TPMS design exercises in industry, in order to assess the validity of the potential factors and to identify any potential new factors.

Finally, this exploratory study led to the definition of research question 3, i.e. RQ3. *Is there a need for a new construct to facilitate the design of TPMS?*

In order to answer RQ3 it is required to carry out a detailed analysis of currently available TPMS design tools. This assessment will identify any potential limitations and determine if these tools are valid to solve the industrial problem.

The following chapter provides a detailed description of this assessment.

8. AN INTEGRATED APPROACH TO TPMS DESIGN

While broad frameworks are useful, they should be tailored, along with flexible tools, to each situation (Management consultant)

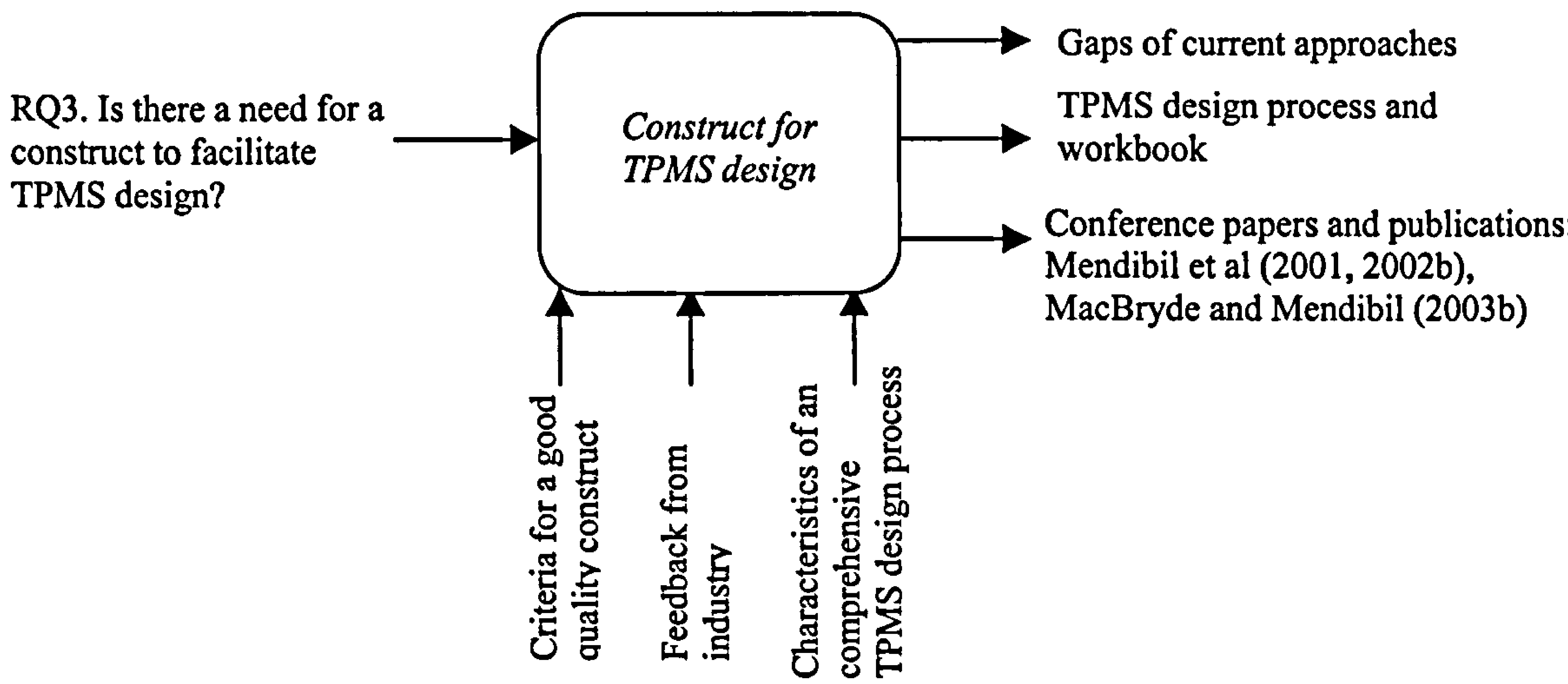

Figure 8.1: Chapter 8 input-output diagram

This chapter is split into two different sections. The aim of the first section is to provide a reliable answer to RQ3 (i.e. *Is there a need for a construct to facilitate TPMS design?*), which emerged from the exploratory phase described in the previous chapter.

Kasanen et al (1993, pp. 244) state that "constructs refer, in general terms, to entities that produce solutions to explicit problems". In this case, the TPMS design construct should help teams (and team leaders/managers) in designing effective TPMS.

In relation to RQ3, this chapter describes the evaluation of six approaches currently available against a criteria defined by the researcher. This facilitates the identification of the limitations of current approaches and provides an answer to RQ3 – i.e. *Yes, there is a need for a new construct to facilitate TPMS design.*

The second section of this chapter deals with research question 4 (RQ4), which emerged as a result of finding an answer for RQ3. RQ4 asks the following: *What should a TPMS design construct include?* This second section describes the development of the construct, which provides an integrated approach to TPMS design. The construct includes a detailed process for TPMS design and a paper-based workbook for teams to easily apply the process.

8.1. Current approaches to TPMS design

This section will describe a critical review of currently available approaches for designing TPMS with the objective of answering RQ3. For doing so, not only specific approaches for developing TPMS are described, but also certain strategic PMS frameworks and development approaches in order to study their appropriateness in the context of teams.

8.1.1. Criteria for evaluation

The typology for TPMS design (Chapter 6, Table 6.5) forms the basis for evaluation. In addition, it is also important to consider the criteria for assessing the quality of constructs suggested by constructive research theory (Kasanen et al, 1993, p.246). This was earlier described in Chapter 4 (Section 4.4) and includes the following features:

- Practical relevance
- Practical utility / proved to be useful
- Link to theory / theoretically grounded
- Theoretical novelty
- Applicable in other environments

In this research, the practical relevance (i.e. need for a construct for TPMS design) was demonstrated during the exploratory phase (Chapter 7). Companies highlighted the potential benefits of having a tool for facilitating TPMS design, and so a practical solution needs to be provided.

Of particular interest for this evaluation is the fact that a construct, in order to be valid and reliable, must have a clear connection to existing theory – i.e. it must be theoretically grounded. For example, some of the most widely recognised PMS frameworks (e.g. Balanced Scorecard) are based on business performance models that address the meaning and drivers of business success. Eccles and Pyburn (1992) argue that it is critical to develop a business performance model before designing PMS. Similarly, a solution for designing TPMS needs to be built upon sound teamwork and PMS design theories (Baker and Salas, 1997). Dickinson and McIntyre (1997), for example, developed a framework for developing teamwork measures (Figure 8.2) based on a teamwork model. They argue that, in order to ensure the validity of the construct and the measures, performance measures need to be tied to a theory or model of team performance.

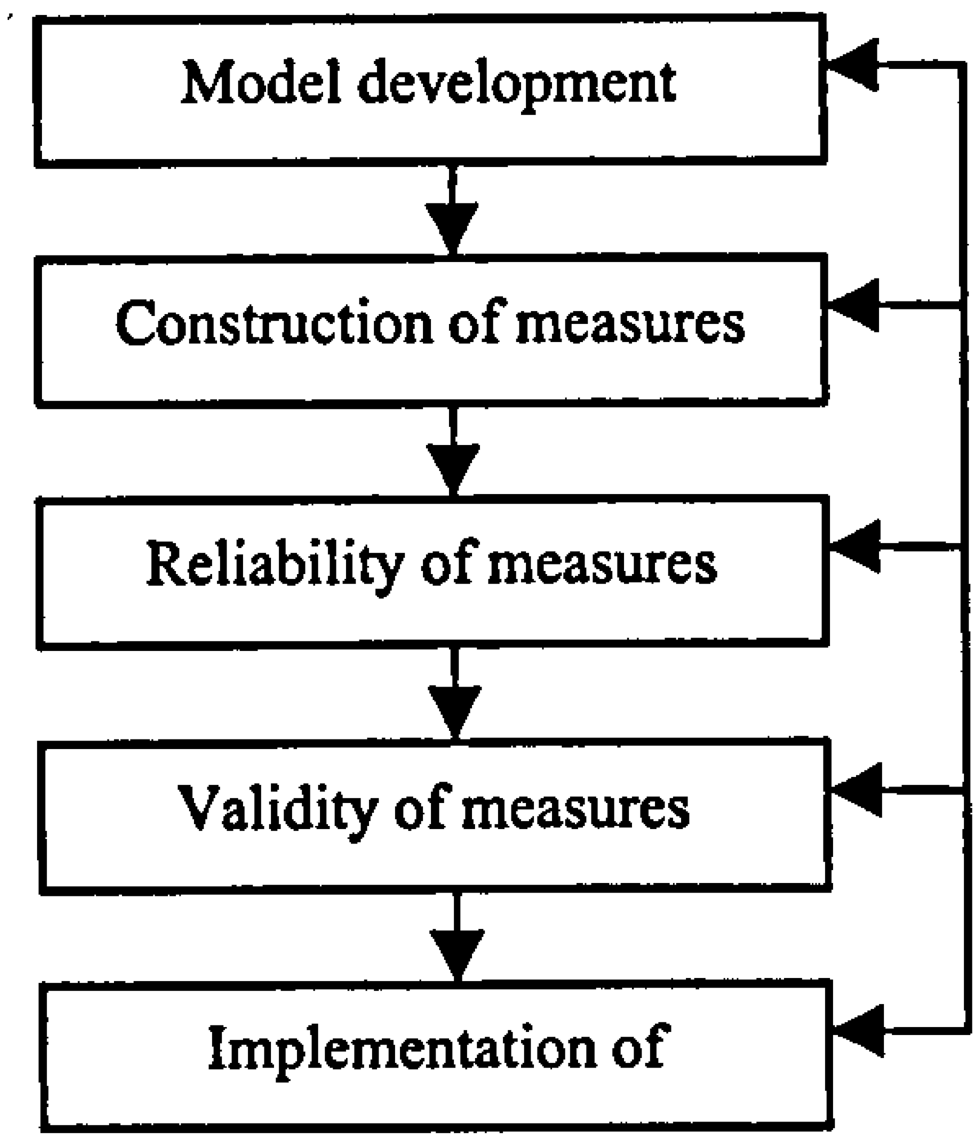

Figure 8.2: Framework for developing teamwork measures (Dickinson and McIntyre, 1997)

In summary, the criteria to evaluate current TPMS design approaches will, therefore, include the typology for TPMS design described in Chapter 6 and the specific criteria adopted from constructive research theory. In this thesis the latter means that:

1. the construct has a clear link to theory on team performance
2. the construct has a clear link to theory on PMS design
3. the construct includes a practical tool to facilitate TPMS design

8.1.2. Evaluation of existing TPMS design constructs

Six TPMS development approaches were evaluated using the criteria above described (this evaluation is shown in Table 8.1). The main objective of this analysis was to evaluate the completeness of currently existing approaches. Note that while the Balanced Scorecard (Kaplan and Norton, 1992, 1993, 1996, 2001), Performance Prism (Neely and Adams, 2001; Neely et al, 2002) and the Cambridge PM Process (Neely et al, 1996) were developed with the aim of designing business wide PMS, the approaches by Jones and Schilling (2000), Zigon (1999) and the Tarkenton Productivity Group (2000) are specific for designing TPMS.

Other business wide PMS approaches can also be found in the literature. These include, amongst others, the Performance Pyramid (Lynch and Cross, 1991), the Results and Determinants Matrix (Fitzgerald et al, 1991), the Performance Measurement Questionnaire (Dixon et al, 1990), the Input-Process-Output-Outcome model (Brown, 1996), the Integrated Performance Measurement Systems Reference Model (Bititci and Carrie, 1998) and the Integrated Dynamic Performance Measurement System (Ghalayini et al, 1997). These approaches, however, are not included within this analysis because they do not provide appropriate mechanisms to deploy performance measures to the team level, and they make little reference to team and people related variables.

Criteria for evaluation	BSC	PP	CPMP	J&S	ZIG	TMDM
A TPMS design construct should:						
Demonstrate a clear link to team performance theory *(T)*	X	X	X	X	X	X
Demonstrate a clear link to PMS design theory	✓	X	✓	✓	✓	✓
Include a practical tool for implementation	✓	X	✓	X	✓	X
A TPMS development process should:						
Review and evaluate existing TPM system	X	X	✓	X	X	X
Enable identification of company's strategic objectives	✓	✓	✓	✓	✓	✓
Enable identification of team's stakeholders' requirements *(T)*	½	½	½	½	½	½
Enable the identification of team strategy/purpose *(T)*	X	X	X	✓	½	✓
Enable development of performance measures	✓	✓	✓	✓	✓	✓
Focus on areas that the team is accountable for *(T)*	X	X	X	✓	✓	✓
Enable goal prioritization	✓	✓	✓	✓	✓	✓
Involve key users of the TPM system *(T)*	X	X	✓	✓	✓	✓
Provide a maintenance and review structure	X	X	½	½	X	X
Top management support	✓	✓	✓	✓	✓	✓
Full team members support *(T)*	✓	✓	✓	✓	✓	✓
Clear and explicit objectives	✓	✓	✓	✓	✓	✓
Set timescales for design and implementation of TPM system	✓	X	✓	X	X	X
Facilitate the identification of key drivers of team performance *(T)*	½	½	½	½	½	½
Facilitate the understanding of the causal relationships between measures	½	½	½	½	½	X
Assign individual responsibility for the measurement, communication and improvement tasks associated with each goal *(T)*	X	X	X	✓	✓	✓
Be flexible and require low resource consumption	X	X	X	✓	✓	✓
The measures in a TPMS should be:						
Derive from the stakeholders represented within the team membership *(T)*	X	✓	X	½	½	½
Clearly defined/explicit purpose	✓	✓	✓	✓	✓	✓
Relevant and easy to maintain	X	✓	✓	✓	✓	✓
Simple to understand and use	✓	✓	✓	✓	✓	✓
Provide fast, accurate feedback	X	✓	✓	✓	½	✓
Stimulate continuous improvement	✓	✓	✓	✓	½	½
Clearly defined data collection and methods of calculating the level of performance	X	✓	✓	X	✓	X
Clearly defined frequency of measurement	X	✓	✓	✓	✓	✓
Applied at team and individual level *(T)*	✓	X	X	X	✓	X
Related to outcomes, process and drivers of team performance *(T)*	½	½	½	½	½	½
Capture the dynamic nature of teamwork *(T)*	X	X	X	X	X	X
Reliable, valid and acceptable	X	✓	✓	✓	½	✓
A TPMS should measure:						
Effectiveness *(T)*	✓	✓	✓	✓	✓	✓
Efficiency *(T)*	X	X	X	½	½	½
Learning and growth *(T)*	½	½	X	½	½	½
Team member satisfaction *(T)*	✓	✓	X	½	½	½

Notes: Those characteristics marked with a '*(T)*' are unique to the context of TPMS
BSC = Balanced Scorecard (Kaplan and Norton, 1992, 1993, 1996, 2001), PP = Performance Prism (Neely et al, 2002), CPMP = Cambridge Performance Measurement Process (Neely et al, 1996), J&S = TPM process (Jones and Schilling, 2000); Zig = 7-step TPM process (Zigon, 1999), TMDM = Total Measurement Development Method (Tarkenton Productivity Group, 2000)
✓ = Yes; **X** = No; ½ = Partially

Table 8.1: Evaluation of existing TPMS design constructs

Table 8.1 shows that none of the current approaches fulfils all the criteria of an effective TPMS design construct. The three team-specific approaches (Zigon, 1999; Jones and Schilling, 2000; Tarkenton Productivity Group, 2000) appear to be the most complete although the Cambridge PM process (Neely et al, 1996) also fulfils many of the criteria. The completeness of this approach is due to the fact that, even though it does not emphasise on team performance, it provides a comprehensive set of guidelines to operationalise the PMS design process. Some of the functionalities of the business-wide PMS approaches, however, would need to be customised in order to be suitable in the context of teams. For instance, the Performance Prism (Neely et al, 2002) highlights the importance of identifying company stakeholders (not team stakeholders).

While all approaches embed existing knowledge in PMS design, none of them evidences a clear link to theories on team performance. In the case of the business-wide PMS approaches this is normal, because they focus on business performance rather than team performance. The TPMS design approaches, however, should demonstrate that link. Instead, they all fail to make the meaning of team performance explicit and as a result, the measures defined using these approaches might not represent a truly balanced view of team performance. During the exploratory research phase, it was clear that the lack of understanding of what determines team performance was one of the difficulties that industrial organisations were facing when designing TPMS. It is, therefore, essential for a TPMS design construct to enable the design of measures that provide a true representation of team performance.

The Cambridge PM Process (Neely et al, 1996) and the 7-step TPM process (Zigon, 1999) include a practical tool to facilitate the design of PMS, both using a workbook format. There are also a number of paper-based and software tools built upon the Balanced Scorecard. The rest of the approaches suggest guidelines for PMS design but do not provide a practical tool.

The following is a summary of the analysis of each approach:

8.1.2.1. The Cambridge PMS design process

The main strength of this process is that it facilitates the identification of performance drivers (organisational performance drivers in this case) and the development of measures for these drivers. This facilitates the understanding of the causal relationships between outcome measures and performance drivers. On the negative side, this process only covers one of the four dimensions that determine team performance. It suggests the development of measures related to quality, cost, time and flexibility, which are all variables related to the *effectiveness* dimension of team performance.

This process has relatively high resource consumption, because it is carried out over a series of workshops and requires the involvement of management at all times.

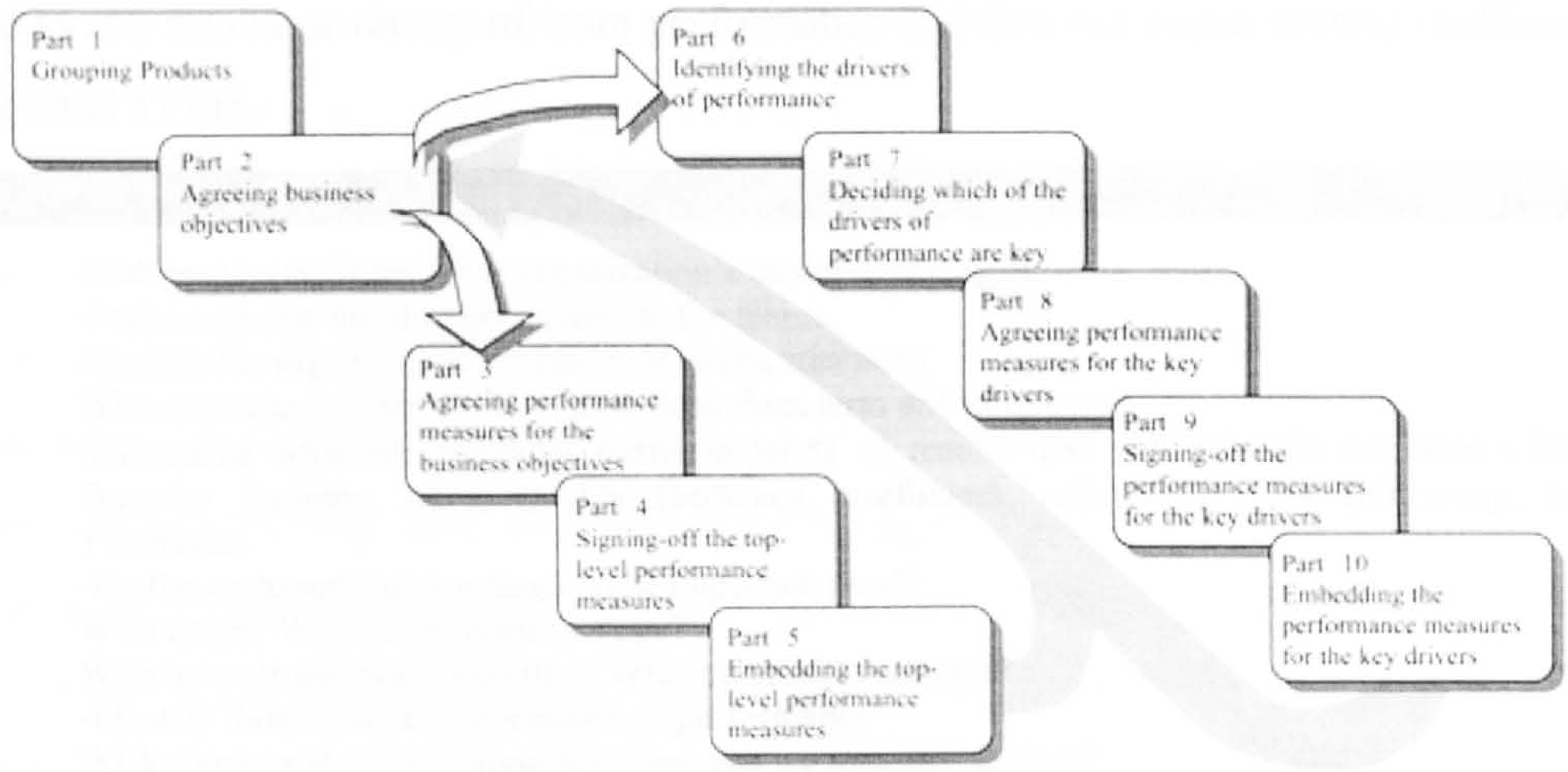

Figure 8.3: Cambridge PM Process (Neely et al, 1996)

8.1.2.2. Zigon (1999) 7-step process

The workbook developed by Zigon (1999) includes several techniques (e.g. customer diagrams) that support each of the steps of the process (Table 8.2). The main drawback of this process is the lack of integration with team performance theory. It provides limited mechanisms to facilitate the identification of key drivers of team performance and the understanding of the causal relationships between different measures. Also, the measures developed through this process do not necessarily relate to all the key dimension and drivers of team performance. In fact, these measures mostly relate to variables related to team effectiveness (i.e. quality, quantity, cost, time and flexibility) while ignoring the other key dimension of team performance (i.e. efficiency, learning and growth and team member satisfaction). This means that the TPMS might not provide a true picture of team performance.

Step	Task
1.	Review the existing organizational measures
2.	Define team measurement points
3.	Identify individual team member results that support the team
4.	Weight the results
5.	Develop performance measures for each results
6.	Develop performance standards
7.	Create a tracking system

Table 8.2: 7-step process for measuring team performance (Zigon, 1999)

8.1.2.3. Jones and Schilling (2000) and Tarkenton Productivity Group (2000) processes

The works by Jones and Schilling (2000) (Table 8.3) and the Tarkenton Productivity Group (2000) (Table 8.4) show many similarities to Zigon's (1999) process but do not include a practical tool to support the process of designing TPMS. Again, these two processes are not linked to any model or theory of team performance and this can cause several inefficiencies on the final TPMS.

Step	Task
1.	With managers: What is the organization's business strategy? -Make sure that the strategy is clear to the teams -Review the organization's mission or vision statement
2.	With customers: What do they need, both short term and long term? -Determine what the customer needs in terms of results that will help the customer's business: Quantity (volume, rate), Quality (accuracy, usefulness, reliability), Cost (efficiency, budget), Timeliness. -Do the customers have a single most important need?
3.	With teams: What is the team strategy?
4.	With team or steering committee: What constitutes success? -Identify three to seven dimensions of performance
5.	With teams or steering committee: How can we measure success? -Brainstorm potential measures -Review available measures in current organizational records -Create new measures if necessary
6.	Select five to ten best (that is, the critical few) measures of team performance. -Test against criteria for good measures -Repeat this step until all measures meet criteria
7.	With management: Are the measures acceptable? -Expect management to make adjustments
8.	With team: Do the measures really work? -Test measures with real data -Make modifications based on experience -Develop feedback reports and format for presentation

Table 8.3: Process for developing team measures (Jones and Schilling, 2000)

Step	Task
1.	Provide basic education in performance measurement
2.	Identify what the team wants to accomplish that improves the total organization's competitive position (Strategic Self-View)
3.	Identify what the team's customers would like the team to accomplish (Customer View)
4.	Identify what management holds the team accountable for accomplishing (Accountability View)
5.	Identify what accomplishments are considered important based on the information that the team currently collects and reviews (Information Systems View)
6.	Consolidate and agree on key accomplishments
7.	Determine business and customer requirements for each key accomplishment
8.	Identify evidence of performance for each requirement
9.	Brainstorm potential indicators
10.	Select five to ten measures for the team's scorecard

Table 8.4: Total measurement development method (Tarkenton Productivity Group, 2000)

One of the strengths of these two processes is that they provide a mechanism that includes the specific criteria to assess the quality of each individual measure. A common drawback of these processes (and also the process suggested by Zigon, 1999), however, is that they only enable the identification of certain stakeholders' requirements. They all place emphasis on identifying the requirements of the parent organisation and the customer, but ignore the needs of other stakeholders such as suppliers, regulators / communities / pressure groups and even the team members. Ignoring the requirements of some of these stakeholders can jeopardise team performance.

8.1.2.4. Balanced Scorecard

The Balanced Scorecard (Kaplan and Norton, 1992, 1993, 1996, 2001) (Figure 8.4) was developed with a focus on organisational performance. It, however, meets many of the criteria for TPMS. This approach focuses on describing the cause-and-effect relationships between the different measures of the scorecard and between the outcomes measures and performance drivers. This makes the strategy of the company transparent and gives better understanding of the key areas that need to be managed in order to improve overall business performance. Kaplan and Norton (2001) propose 'strategy maps' as a mechanism to describe these causal relationships. Strategy maps graphically describe the relationship between business strategy and the objectives and measures for the different perspectives of the scorecard. Strategy maps could be adapted to the TPMS context in order to describe the causal relationships between the team's strategy, the measures for the different dimensions of team performance and the corresponding performance drivers.

The Balanced Scorecard describes organisational performance as the combination of four perspectives, namely: *financial, customer, internal business process* and *learning and growth* perspectives. These four perspective cover the *effectiveness, team member satisfaction* and, to an extent, *learning and growth* dimensions of team performance. The learning and growth perspective of the Balanced Scorecard refers to those capabilities that the organisation needs to develop to ensure future business competitiveness. The learning and growth dimension within the team context refers to the future viability of the team. It includes aspects related to the knowledge embedded by the team (e.g. skills, tools, procedures) and those required behaviours (i.e. participation, commitment and willingness) for future success. What the Balanced Scorecard does not cover is the *efficiency* dimension of team performance, which is to with the monitoring of the key teamwork processes.

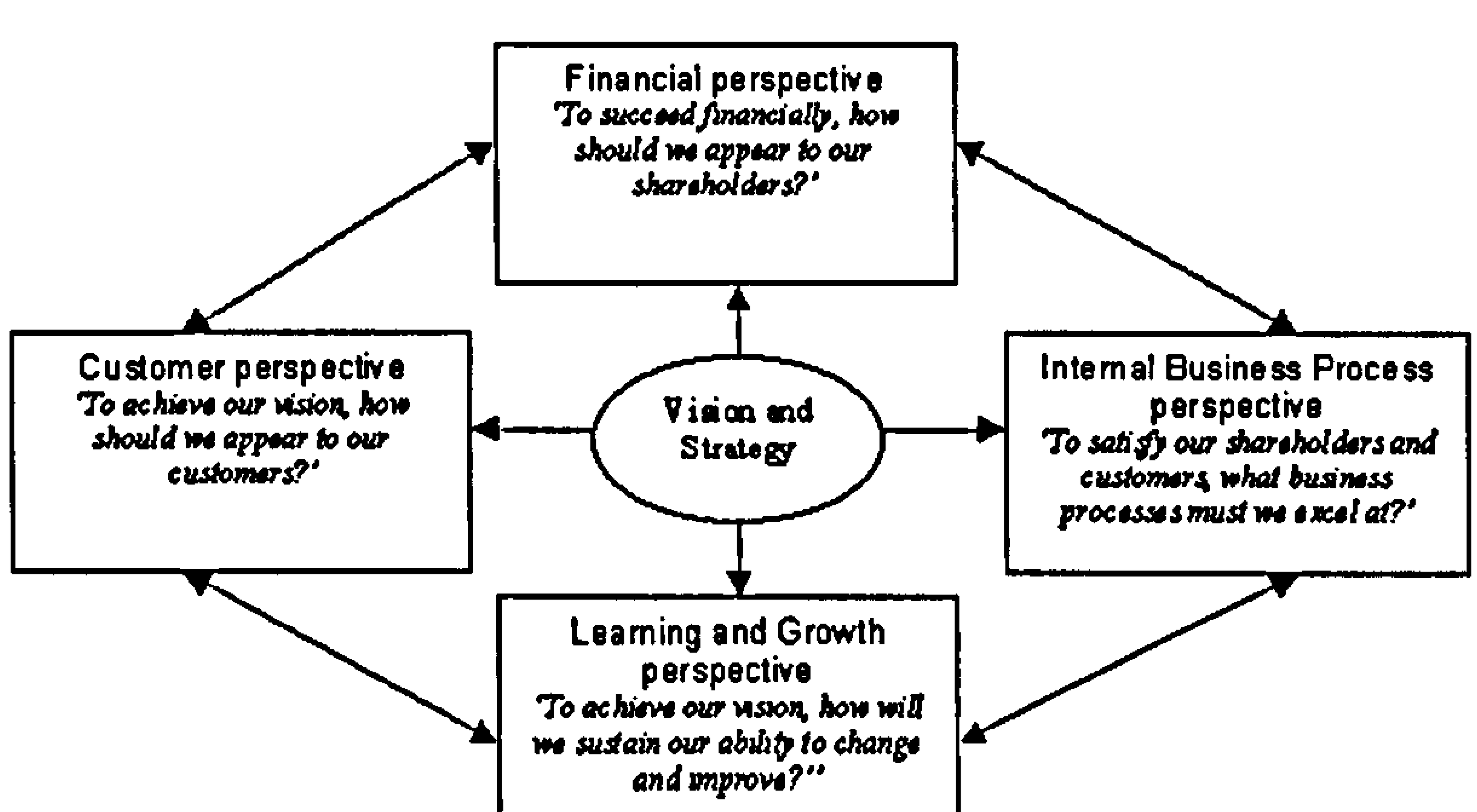

Figure 8.4: The Balanced Scorecard (Kaplan and Norton, 1996)

One of the drawbacks of the Balanced Scorecard is that it ignores stakeholders other than shareholders and customers. This approach has also been criticised for being difficult to operationalise (Neely et al, 2000) and for not providing any mechanism to integrate the top-level strategic scorecard with operational-level objectives and measures (Ballantyre and Brignall, 1994). Although in their latest book Kaplan and Norton (2001) describe how the top-level scorecard should be deployed to the operational level, it still appears that the Balanced Scorecard is a tool to be used at corporate or business unit level rather than at a team level. Zigon (1998, p.16) argued that while it can be forced to work at the lower levels (*much like a shoe can be used to pound in a nail*) there are other tools that work much better below the division manager.

The Balanced Scorecard has also high resource requirements and therefore, it is not best suited for designing TPMS.

8.1.2.5. Performance Prism

The Performance Prism (Neely et al, 2002) (Figure 8.5) is one of the more recent strategic PM frameworks. It is also a multidimensional framework that focuses on measuring business performance. This framework is similar to the Balanced Scorecard in many ways. Through its five 'facets' or perspectives it provides a balanced view of business performance and encourages thinking through the links between different measures. The Performance Prism has two main unique features in comparison to other approaches. Firstly, it argues that measures should derive from stakeholder requirements (see also Bititci and Carrie, 1998 and Bititci et al, 2000) and not from strategy as most research on performance measurement claims. Secondly, it argues that since companies are becoming increasingly demanding of their stakeholders measures related to *stakeholder contribution* should be a key element of any PMS.

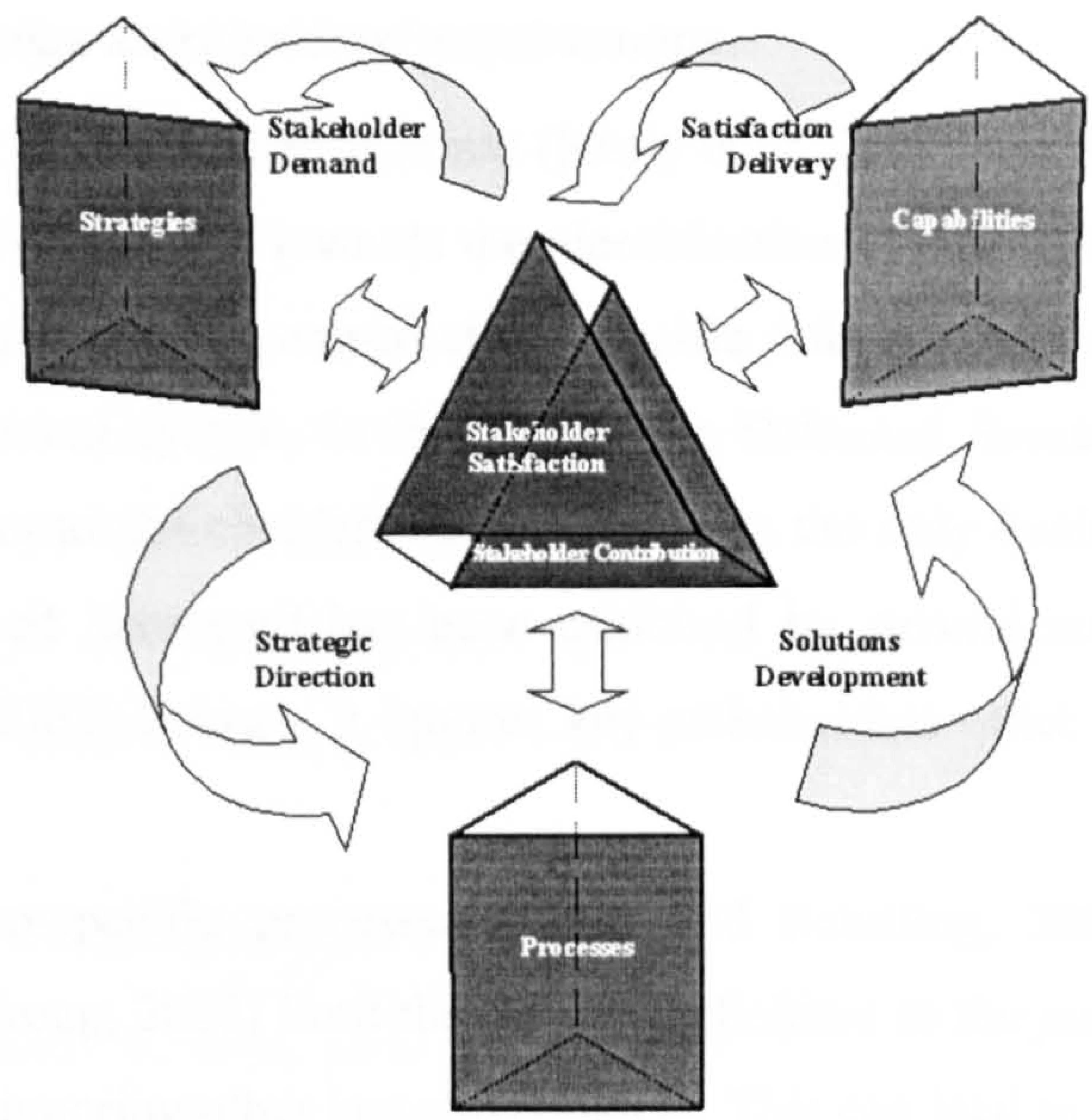

Figure 8.5: Performance Prism (Neely et al, 2002)

The Performance Prism includes a catalogue of performance measures to populate each of the perspective of the prism. This catalogue provides an extensive list of performance measures and a description of the specific objectives of each measure and details about how to measure it. The five perspectives (and the corresponding measures) of the Performance Prism, however, do not cover the four dimensions that determine team performance. This does not come as a surprise if we consider that the unit of analysis of this approach is business performance and not team performance.

An important drawback of the Performance Prism is that it is difficult to operationalise. This approach does not provide any mechanisms to facilitate the design of the PMS and the deployment to the team level. As with the Balanced Scorecard, the Performance Prism requires high resource consumption and thus it is not best suited to design TPMS.

8.1.3. Summary of evaluation

The most critical areas that current constructs do not adequately cover are highlighted in red in Table 8.1. These are as follows:

Demonstrate a clear link to team performance theory

Existing approaches do not demonstrate a clear and explicit link to theory on team performance. This jeopardises the quality of the TPMS as it might not take into account the dimensions that determine and drivers that affect team performance.

Enable identification of team stakeholders' requirements

All the constructs, except the Performance Prism (Neely et al, 2002) and the Cambridge PM process, take a prescriptive approach towards the identification of stakeholder requirements. In other words, it is prescribed by the construct the specific stakeholders that are relevant for constructing the measurement system. In that sense, the Balanced Scorecard (Kaplan and Norton, 1996, 2001) refers to shareholders and customer as the only business stakeholders. This view of the Balanced Scorecard has been criticised by several authors (Neely and Adams, 2001; Brignall, 2002) because it ignores key stakeholders other than shareholders and customers.

Similarly, the three team-specific processes (Jones and Schilling, 2000; Zigon, 1997; Tarkenton Productivity Group, 2000) limit the team stakeholders to the *parent company* and the *customer*, potentially ignoring other key stakeholders. This can lead to a TPMS that does not include measures related to the satisfaction of certain stakeholders (e.g. team members), which can put in risk the performance level and future competitiveness of the team.

The Performance Prism (Neely et al, 2002) and the Cambridge PM process (Neely et al, 2002) take a more open approach to identifying stakeholders and their requirements. Rather than prescribing specific stakeholders they encourage the members involved in the PMS design process to think about the different stakeholders of the business. This increases the probabilities of considering all key stakeholders' requirements for designing the PMS. These two approaches, however, are tailored for business-wide PMS and so, they do not make reference to specific team stakeholders. That is why the evaluation table shows a *partially fulfilled* mark ('1/2' sign) for this criterion.

Facilitate the identification of key drivers of team performance

A similar thing happens with this criterion. Although the Balanced Scorecard (Kaplan and Norton, 1996, 2001) and the Cambridge PM process (Neely et al, 2002) provide certain mechanisms for identifying the key drivers of business performance, they do not refer to those specific drivers of team performance (see Chapter 5, Figure 5.3). That is why when evaluating these two approaches against the above criterion they were given a *partially fulfilled* mark rather than a full mark.

The three team-specific processes only partially fulfil this criterion too. They do not provide any specific mechanism to identify the key drivers of team performance. As a result, team members identify and incorporate some of the drivers within the team strategy in an ad hoc manner.

Facilitate the understanding of the causal relationships between measures

One of the key strengths of the Balanced Scorecard (Kaplan and Norton, 1996, 2001) is the way in that it defines the relationships between performance measures. This facilitates a clear understanding of the causal relationships between measures at different organisational levels. This mechanism, however, is not best suited to understand the relationships between performance measures related to team performance.

The other constructs do not provide any specific mechanism for understanding these causal relationships. The lack of understanding of these relationships will constrain the potential for improvement of the team.

Capture the dynamic nature of teamwork

As discussed within Chapter 6, team performance measures need to evolve as the team moves from one level of performance to another. In addition, measures should also be reviewed in parallel to changes in the company's strategic objectives and in the requirements of team stakeholders.

This analysis shows that none of the six constructs evaluated provides a mechanism to enable the team to identify changes in the team development process and to re-design the TPMS accordingly.

Measurement dimensions

Although all six constructs enable the design of performance measures, none of them will necessarily define performance measures related to each of the four dimensions that determine team performance. The Balanced Scorecard (Kaplan and Norton, 1996) and the Performance Prism (Neely et al, 2002) focus on measures related to each of the dimensions included in the respective frameworks (Figure 7.4 and Figure 7.5). These two frameworks, however, represent business performance and so, they only enable the definition of measures related to certain dimensions of team performance (mainly *effectiveness* and *team member satisfaction*). Similarly, the Cambridge PM process (Neely et al, 1996) mainly focuses on the definition of measures related to the *effectiveness* dimension of team performance.

The mechanisms provided by the three team-specific processes do not necessarily enable the design of performance measure for the four dimensions that determine team performance. Therefore, the TPMS designed using these processes might not give a complete view of team performance. This fact does not come as a surprise because these three processes have not a clear link to any team performance model.

To summarise, the detailed analysis of current constructs shows that these fail in fulfilling the evaluation criteria and as a result, they do not provide an effective solution to the industrial problem. Therefore, the answer to RQ3 is '*Yes, there is a need for a new construct to facilitate TPMS design*'.

8.2. Developing the TPMS design construct

Having identified the need for a new TPMS design construct the next task is to actually develop it. The following are the two main reasons why developing a TPMS design construct is important:

1. to provide an effective practical TPMS design solution to tackle the existing industrial problem
2. to design a research instrument that will support the researcher in carrying out real TPMS design initiatives and as a result, will facilitate the validation of the findings from the exploratory research phase (Chapter 7)

While the first objective is related to making a practical contribution, the second objective aims to further expand the knowledge around TPMS design by validating the findings related to factors that enable and/or constrain the design of effective TPMS.

It is, therefore, important to first develop a quality and reliable TPMS design construct. This leads to the definition of research questions 4 and 5 as follows:

RQ4 – What should a TPMS design construct include?

RQ5 – What is the impact of using the TPMS design construct in industrial organisations?

RQ4 refers to the identification and description of the contents of a TPMS design construct that provides a reliable solution to industry and closes the gaps of existing approaches. Meanwhile, RQ5 is concerned with assessing the impact of using the construct with real teams. This assessment will demonstrate the practical utility and applicability of the construct.

8.2.1. Criteria for developing the construct

In order to obtain a good quality construct it is required to define the criteria that will serve as a guideline to develop the construct. These criteria are the same as the one used for evaluating existing approaches (Section 8.1.2) with the addition of the feedback from industrialists. The case studies carried out during the exploratory research phase together with the continuous interactions with the four industrial collaborators provided with useful guidelines to develop the construct. The feedback from industry addressed the needs of the end users of the construct. From the perspective of the industrial organisations the construct should:

- Enable the design of measures related to behaviour, attitudes and other intangible assets
- Enhance the understanding of the relationships of performance drivers and team performance
- Be easy to understand and use
- Be generic, i.e. applicable in any type of team
- Be flexible enough to allow free-thinking and innovation

The first two points are identified in the typology for TPMS design while the third requirement is a key criteria from constructive research. The last two points, however, are not addressed by the typology or by constructive research theory and so, the researcher must take them into account before developing the process.

Related to the last point, team leaders pointed out that a process that is too rigid would jeopardise the effectiveness of the TPMS by not providing any flexibility to make decisions and to bring in ideas from the employees involved in the process. Therefore, while being useful as a guide, the TPMS development process would require to be flexible enough to allow freethinking.

Table 8.5 summarises the criteria for a good quality TPMS design construct.

Criteria for a TPMS design construct
Based on the Constructive Research approach:
❑ Connection to existing theory
❑ Theoretical novelty
❑ Practical relevance of the construct
❑ Practical usefulness
• Assist in developing effective TPMS
• Saves time and effort
• Encourages continuous improvement and organisational learning
❑ Practical usability
• Easy to use and understand
• Describes the different elements of the construct
• User-friendly
Based on the typology for TPMS design:
❑ Characteristics of a comprehensive TPMS design process (Chapter 6)
Based on the feedback from industry:
❑ Generic for any different types of teams
❑ Flexible enough to allow free-thinking and innovation

Table 8.5: Criteria for developing a good quality TPMS construct

These criteria provide the guidelines to develop the TPMS design construct. The main objective of the construct is to provide a guide or step-by-step process for teams to create their TPMS. This step-by-step process needs to be converted into a practical tool in order to make it operational and usable by teams. The conversations with industrialists led to the decision that a paper-based workbook would be the best method for translating the TPMS design process into a practical tool. The main argument of the industrialists for choosing a paper-based tool over other tools (e.g. software) was the lower cost and higher flexibility of the TPMS design process. In addition, existing PMS design approaches that are widely accepted and used (e.g. Cambridge PM Process, Zigon 7-step process) are also based on paper-based workbooks.

8.2.2. TPMS design process

The first step towards developing a TPMS design construct is to define a process that will provide teams with a step-by-step guide to design TPMS. As previously addressed, a key requirement for the construct is to have a clear link to theory, in this case to theory on team performance and team performance measurement systems design. The TPMS design process described within this section is built upon the TPMS framework illustrated in Figure 8.6. The essence of the TPMS framework lies in the fact that it highlights the connection between the design of performance measures and theory on team performance. As a result, the TPMS design process aims to provide an integrated approach to TPMS design by combining the team performance model (Chapter 5, Figure 5.3) with the features included in the typology for TPMS design (Chapter 6, Table 6.5).

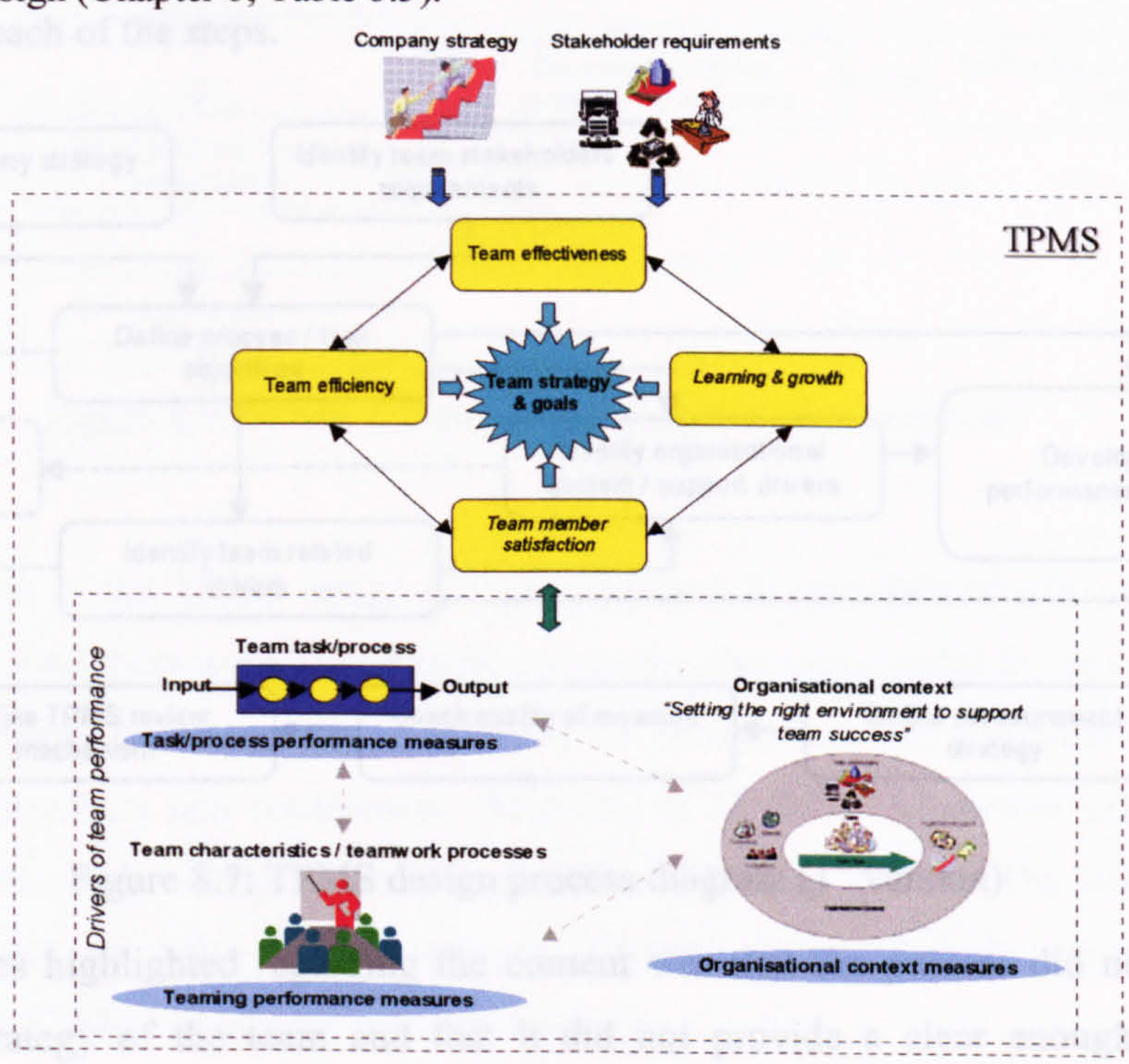

Figure 8.6: TPMS design framework

When structuring the TPMS design process, the researcher focused on some of the existing approaches. Although a new construct was going to be developed, the structure of the Cambridge PM Process (Neely et al, 1996) and the Zigon 7-step process (Zigon, 1999) was taken into account because these are considered as 'best practice' performance measurement system design processes. The usability and usefulness of these two processes and their corresponding workbooks is proved and as a result, the researcher decided to use a similar structure for the TPMS design process and the workbook. The main difference is that the TPMS design process includes the functionalities to fulfil the criteria of a good quality construct (Table 8.5), some of which are not fulfilled by the above two approaches (see p.163).

Several versions of the TPMS design process were developed and modified prior to getting to the final one. The modifications to the older versions were based on the application of each version of the process within industrial organisations.

The first version of the process (Figure 8.7) was evaluated with two pilot case studies with organisation located in the west of Scotland, including KVC and IBM (Mcmonegal, 2002).

In IBM and KVC the process was not actually implemented. Instead, a team leader from each of the companies was taken through the process, explaining them in detail the purpose and content of each of the steps.

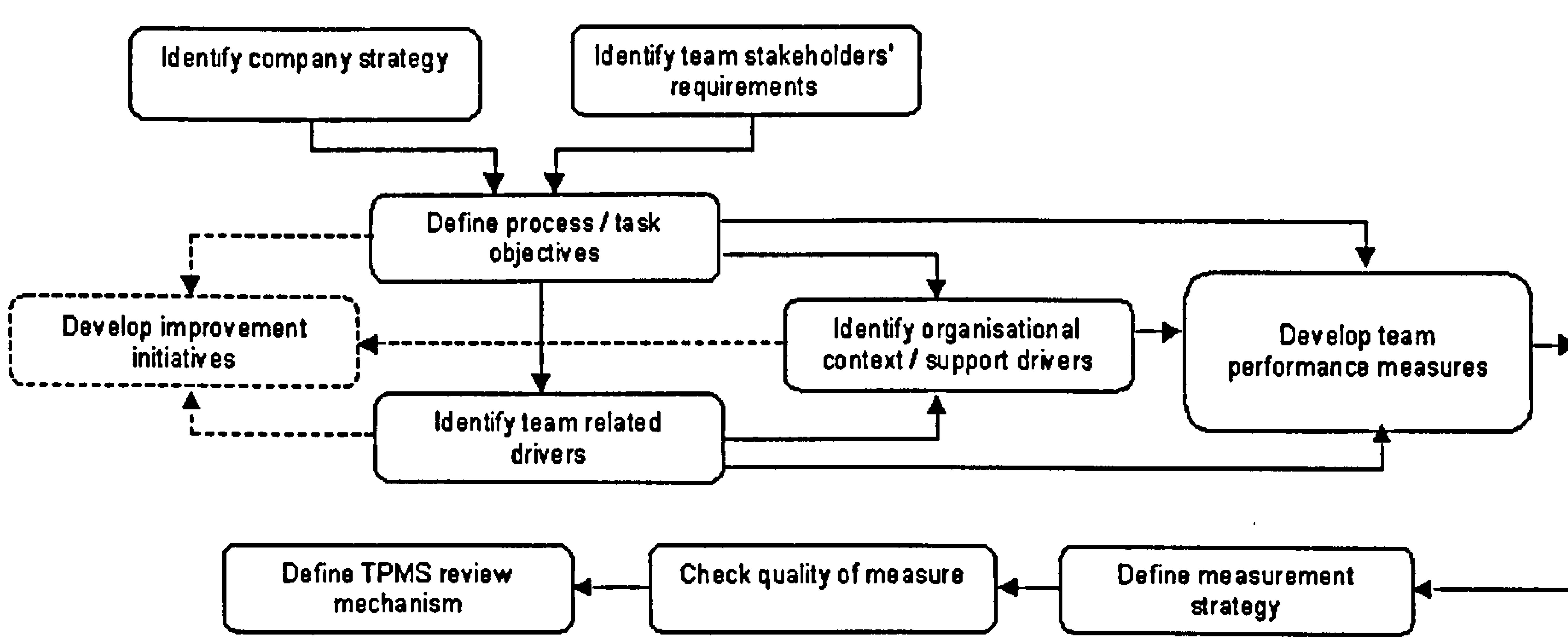

Figure 8.7: TPMS design process diagram (1st version)

The main issues highlighted regarding the content was that the process did not explicitly address the strategy of the team and that it did not provide a clear enough distinction between the top level measures and the measures related to performance drivers. This could result in the team members' efforts deviating from the key strategic objectives. It was, therefore, decided to modify the process by including a specific step for defining the team strategy and the corresponding strategic objectives and to make a clear distinction between measures related to the top team goals and measures related to the performance drivers (see Figure 8.8).

Another area for improvement identified through the pilot case studies was the need for a mechanism to assess the existing team strategy and performance measures. In fact, the first version of the TPMS design process made little reference to the evaluation of the existing strategy and performance measures. Such a mechanism could enhance the understanding of the relationship between past strategy, performance measure and overall team performance. This would increase the potential for team learning. As a result, an important activity introduced within the steps *define team strategy and goals* and *develop appropriate measures* (see Figure 8.8) was to assess the adequacy of the existing team strategy and performance measures.

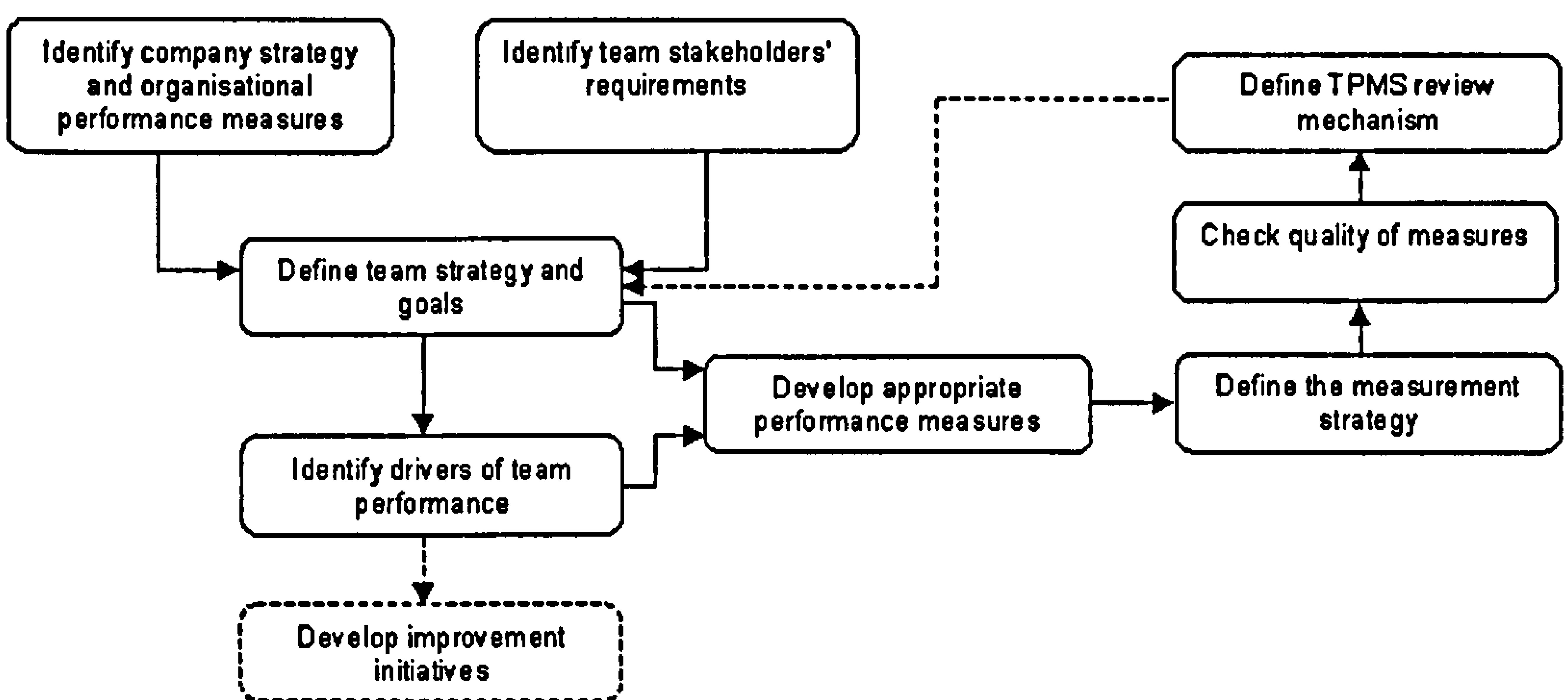

Figure 8.8: TPMS design process diagram (final version)

The final version of the TPMS design process (Figure 8.8) was defined after a number of applications. In total there were 13 industrial companies that participated in the evaluation of the previous versions of the process. In addition, the process was also presented in academic and industrial seminars and conferences (Mendibil et al, 2001; Macbryde and Mendibil, 2003b) and reviewed by independent referees (Mendibil et al, 2002b). The latter provided valuable feedback to refine earlier versions. Chapter 9 describes in more detail the application of the TPMS design construct in industry.

8.2.3. TPMS design workbook

8.2.3.1. Style and structure of the workbook

The TPMS design workbook aims to provide teams with an easy-to-use tool to facilitate the design effective TPMS. As such, it is essential to carefully consider the content of the workbook as well as the style and structure in which this content is presented.

In order to define a set of generic guidelines for developing the workbook a number of existing workbooks were analysed. These included the PM workbooks developed by Neely et al (1996) and Zigon (1999) and three other workbooks chosen at random (Mcmonegal, 2002).

From the study of the above workbooks it was decided that the following elements related to style and structure should be considered when developing the TPMS design workbook:

- A front cover containing the workbook title, a list of the worksheets contained within the workbook, and space to record the name of the team and the team members
- An introductory section detailing the purpose of the workbook, and providing any relevant background information to back this up
- Brief introduction to accompany each section, explaining the importance and purpose of the section.
- Instructions on how to answer each question, with guidance provided where necessary regarding the interpretation of the results
- A clear, easy to understand layout

8.2.3.2. Overview of the TPMS design workbook

The main part of the workbook is based on the TPMS design process illustrated in Figure 8.9. The TPMS design process involves 10 stages, 9 of them explicitly focusing on the TPMS design activities and 1 stage (5a) aiming to link the TPMS with continuous improvement initiatives.

Table 8.6 summarises each of the stages included in the workbook. A more detailed description of each of the stages and the contents of the TPMS design workbook can be found in Appendix C.

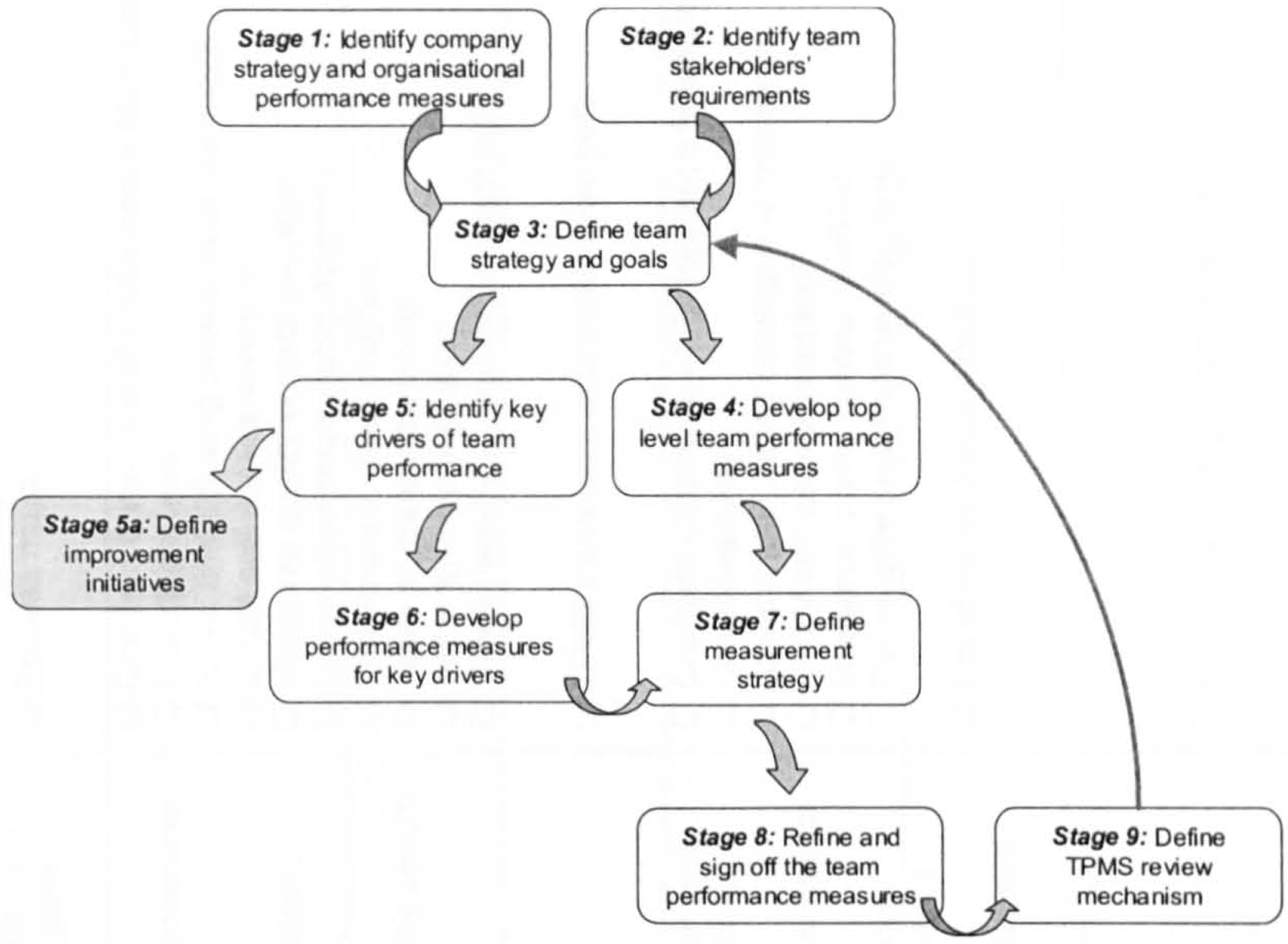

Figure 8.9: Overview of the TPMS design process

The workbook is divided into 10 different worksheets, which correspond to each of the stages of the TPMS design process. As Table 8.6 illustrates, each of this worksheet is structured around four key areas:

Purpose - Describes the main objectives of the corresponding stage

Who is involved? – Identifies the staff that should be involved at each stage.

Note that in certain stages (3, 4, 5, 5a, 6, 7, 9) not all the staff addressed will always be required. The need for team mentors and/or managers depends on the level of maturity, knowledge and experience of the team. For example, a self-directed and high performing team will not need as much support from mentors as a team in the early stages of development. The latter will need continuous guidance from the mentor or manager to identify business strategic objectives, stakeholder requirements and corresponding performance measures. Similarly, a team with previous experience on designing and using PMS will not need as much external support as a team with little experience.

What to do – Describes the activities that need to be carried out at each stage of the process. A table or diagram that the team needs to complete, generally accompanies each of these activities.

Support tools – Describes a number of tools, techniques or reference guides required to assist the team in carrying out the activities specified at each stage of the process.

Stage	Purpose	Who is involved?	What to do	Support tools
Stage 1: Identify company strategy and organisational performance measures	to obtain a complete and unambiguous statement of the strategy and corresponding objectives of the business	All team members, mentor or managers, process facilitators	1.1. Identify mission statement and business strategic objectives 1.2. Identify existing performance measurement system	❑ Brainstorming sessions to clarify strategic objectives
Stage 2: Identify team stakeholders' requirements	to identify team stakeholders' and their requirements	All team members, mentor or managers, stakeholders, process facilitators	2.1. Define team stakeholders and corresponding requirements	❑ Brainstorming sessions: -Who is affected by and affects the team results? -What does the team need to do satisfy the stakeholder, and vice versa? ❑ Team stakeholder diagrams
Stage 3: Define team strategy and goals	to define team strategy and corresponding goals	All team members, mentor or managers (not always needed), process facilitators	3.1. Assess current team strategy against stakeholder requirements 3.2. Define objectives against all stakeholder requirements 3.3. Define objectives against all four dimension of team performance	❑ Strategy maps ❑ Process maps
Stage 4: Develop top-level performance measure	to design effective measures for each of the team strategic objectives	All team members, mentor or managers (not always needed), process facilitators	4.1. Assess the adequacy of existing performance measures 4.2. Define effective measures against objectives 4.3. Prioritise measures 4.4. Define cause-effect relationships between measures	❑ Cranfield Catalogue of Performance Measures ❑ QuickMeasures ❑ Jones and Schilling catalogue of measures ❑ EFQM self-assessment tool ❑ Measures quality control checklist ❑ Cause-effect relationship diagrams
Stage 5: Identify key drivers of team performance	to identify the key drivers affecting the team objectives	All team members, mentor or managers (not always needed), process facilitators	5.1. Identify key team performance drivers and define specific objectives for each	❑ Performance driver diagram ❑ Team performance model ❑ Team type classification ❑ TPMS framework and deployment path
Stage 5a: Define improvement initiatives	to define improvement actions for performance drivers	All team members, mentor or managers (not always needed), process facilitators	5a.1. Assess current status of performance drivers 5a.2. Assess their impact on team performance 5a.3. Define improvement action	❑ TPMS framework and deployment path
Stage 6: Develop performance measures for key drivers	to design effective performance measures for the key performance drivers (including team development measures)	All team members, mentor or managers (not always needed), process facilitators	6.1.Assess the adequacy of existing measures for drivers 6.2. Define effective measures against driver objectives 6.3. Prioritise measures 6.4. Define cause-effect relationships between measures for drivers and top-level team measures 6.5. Define team development performance measures	❑ Cranfield Catalogue of Performance Measures ❑ QuickMeasures ❑ Jones and Schilling catalogue of measures ❑ EFQM self-assessment tool ❑ Measures quality control checklist ❑ Cause-effect relationship diagrams
Stage 7: Define measurement strategy	To define measurement strategy and assign responsibility over individual measures	All team members, mentor or managers (not always needed), process facilitators	7.1. For each measure define data sources, methods of collection and frequency of data collection 7.2. Assign responsibilities for data collection to individual team members	❑ List of measurement methods
Stage 8: Refine and agree performance measures	to check the quality of each performance measure and to agree of the performance measures	All team members, mentor or managers, process facilitators	8.1. Take each performance measure through the measure quality control check 8.2. Refine list of team performance measures 8.3. Agree on performance measures 8.4. Define structure of feedback reports and format for presenting the measurement data. 8.5.Create the final team performance scorecard	❑ Measures quality control checklist
Stage 9: Define TPMS review mechanism	to define an appropriate plan and structure for performance review and a system that will trigger the review of the TPMS	All team members, mentor or managers, stakeholders, process facilitators	9.1. Define and agree performance review plan 9.2. Define and agree performance review structure 9.3. Define and agree TPMS review mechanism	❑ Strategic planning cycle ❑ Performance review meetings ❑ Stakeholder surveys ❑ Team development performance measures

Table 8.6: Overview of the TPMS design construct

8.3. Chapter conclusions

This chapter was divided into two different sections:

The first section evaluated six approaches to TPMS design currently available. In order to do so, the researcher first defined the criteria for evaluation. This assessment identified the limitations and gaps of these approaches and as a consequence, provided an answer to research question 3:

RQ3. *Is there a need for a construct to facilitate TPMS design?*

Answer: *Yes, there is a need for a new construct to facilitate TPMS design*

The second part of this section described the development of the TPMS design construct and by doing so, it partially answered research question 4 (RQ4. *What should a TPMS design construct include?*), which naturally emerged as a consequence of the answer to RQ3.

RQ4. *What should a TPMS design construct include?*

Answer: *The TPMS design construct proposed here includes a 10-stage TPMS design process and a workbook based on that process. The TPMS design process is connected to existing theory on team performance through the team performance model (Chapter 5, Figure 5.3) and to theory on team performance measurement design through the typology for TPMS design (Chapter 6, Table 6.9). In fact, this connection of the process to novel theory on TPMS design also makes the construct theoretically novel. The workbook should provide guidance to teams, by describing the activities to carry out, the people involved and the support tools to use at each stage of the design process.*

At the end of this chapter RQ3 has been answered. In addition, RQ4 has been partially answered and a practical tool for TPMS design has been presented. In order to assess if the construct fulfils all the criteria, and as a result provide a final answer to RQ4, it is still necessary to evaluate the practical *usability* and *usefulness* and the *applicability* of the construct. *Usability* refers to how easy it is to use and understand the tool, while *usefulness* refers to the impact of the tool and to whether it achieves what is meant to be achieved. *Applicability* refers to the domain of use of the construct or the types of industry and teams that the construct can be applied in. Chapter 9 and 10 will tackle the issue of usability, usefulness and applicability and by doing so, it will seek a reliable answer to research question 5 (RQ5), i.e. *What is the impact on teams using the TPMS design construct in industrial organisations?*

Chapter 9 describes the validation of the construct during a number of industrial workshops where the construct was applied with several teams. These workshops played a key role mainly in evaluating the content, usability and applicability of the construct. Due to the limited duration of the workshops, however, further evidence was required to evaluate the usefulness and impact of the construct. As a result, a key objective of Chapter 10 is to support the evaluation of the usefulness of the construct. Chapter 10 describes the design and implementation of a TPMS in Highland Spring during a 12-month period. The construct was not directly applied in this case, but it was customised to the needs of the team. The logic of the process followed by the team, however, was very similar to that included in the TPMS design construct. As a result, the study in Highland Spring, with the support of the evidence from the industrial workshops, allowed the researcher to evaluate the usefulness and impact of the construct.

One of the objectives of the construct was to provide a research instrument that would facilitate the validation of the factors affecting the design of effective TPMS identified in Chapter 7. The validation of these potential factors will also be discussed in Chapter 9.

Chapter 8 was the final stage of the theory-building phase. The following two chapters move into the theory refinement and construct testing phase.

9. THE TPMS DESIGN CONSTRUCT IN PRACTICE

Relevance cannot be assessed without identifying a class of practitioners as potential users of the study's findings (Thomas and Tymon, 1982, p.350)

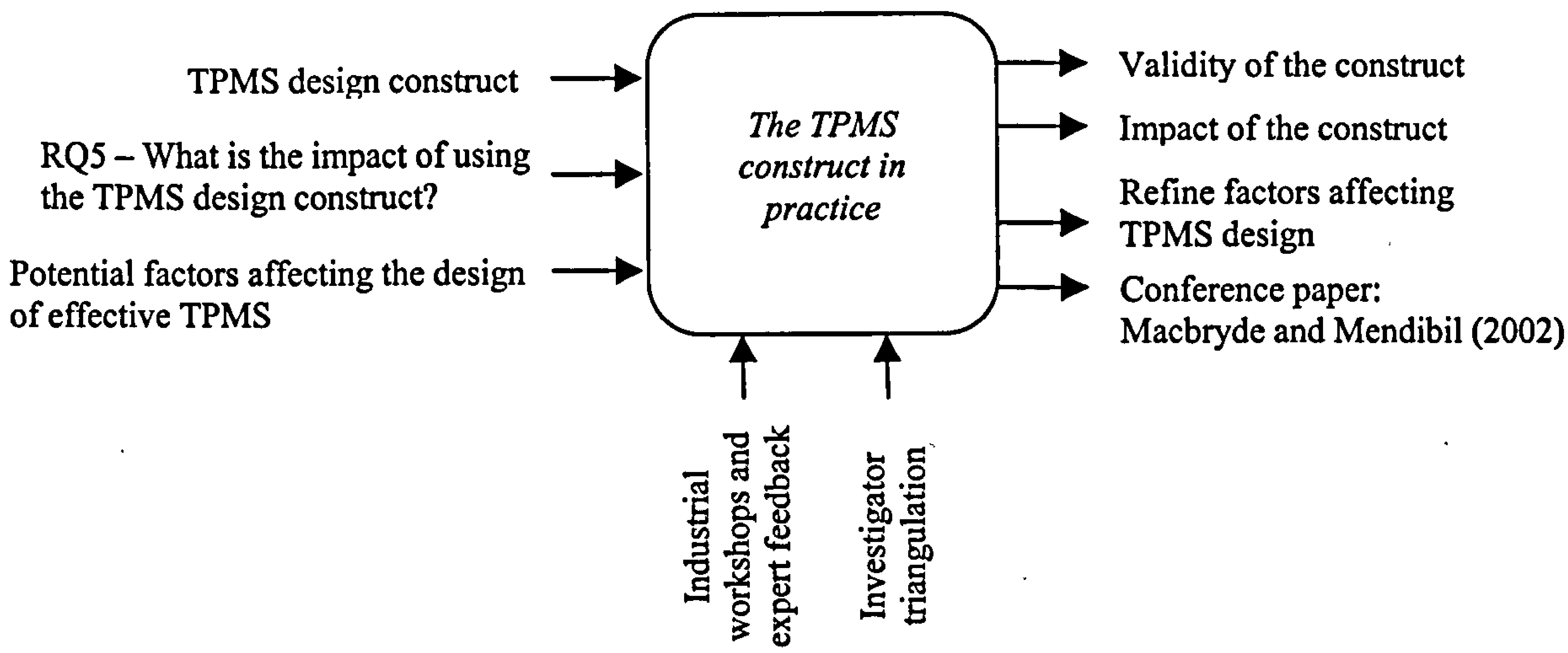

Figure 9.1: Chapter 9 input-output diagram

The purpose of this chapter is to take the reader through the application of the TPMS design construct with teams in industry. The construct was applied and discussed with teams from a variety of types of industry in Scotland and Australia during a series of workshops. These application exercises facilitated the assessment of the validity of the construct and provided a reliable answer to RQ5 (i.e. What is the impact of using the TPMS design construct?).

The industrial workshops not only allowed the researcher to assess the validity and impact of the construct but also to validate the potential factors that affect the design of effective TPMS identified in Chapter 7. The last section of this chapter will tackle this issue.

This is the first of two chapters describing the activities related to the *theory refinement and construct testing phase* of this research (see Figure 1.4 and 4.2).

9.1. Details of the workshops

Most of the workshops (with the exception of two) were carried out during a visit to Australia. The researcher and supervisor were invited by Smartlink[16] to conduct a series of workshops and seminars on team performance measurement throughout Australia. In total, 5 workshops were carried out. This enabled the researcher to apply the construct to 11 teams from 9 different organisations and to discuss it with staff from further 12 organisations. In addition, the researchers presented the research work during a number of seminars held in Adelaide, Whyalla, Albury, Brisbane, Sydney, Perth and Canberra.

Although the workshops mainly focused on manufacturing organisations, the attendees included teams and individuals from a variety of industries including financial, research and education, forestry and government institutions. The seminars attracted the attention of several management consultants and also included people from art/design and economic development agencies. This provided valuable feedback from a completely different business perspective. Of special relevance was the feedback gathered during a seminar held in Adelaide, which was attended by around sixty management consultants and HR specialists.

Two more workshops involving two product development teams were carried out in Scotland. In this case, the implementation of the construct was part of a study that aimed to improve the understanding of the development and management of product design teams (Singhal, 2002).

The broad range of types of organisations that were involved during the workshops and seminars was an essential mechanism to increase the external validity and generalisability of the construct and findings of this research.

9.1.1. Research instruments

During the workshops a number of data collection methods were used in order to assess the validity of the construct and to refine the findings regarding the factors that affect TPMS design. The use of multiple sources of evidence would increase the construct validity of the research (Yin, 1994; Stake 1995). It is also important to mention that a third researcher was also involved in facilitating the workshops with the two design teams (IT1, IT2, see Table 9.1). This provided the opportunity to triangulate the observations made by each of the three researchers in order to increase the validity of the construct.

Finally, as it was mentioned in Chapter 8, the TPMS design construct itself was an important research instrument because it provided an appropriate mechanism to collect data from companies while designing a TPMS.

The following are some of the data collection methods used during the workshops:

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[16] Smartlink is the national institute for manufacturing management, an organisation established to enhance the management capabilities of Australian small and medium manufacturers. More information can be found at http://www.smartlink.net.au/

9.1.1.1. *Workshop feedback questionnaire*

A *workshop feedback questionnaire* (Appendix D1) was developed to gather feedback from the teams involved in the TPMS design workshops. The aim of the questionnaire was to collect feedback from the end users so that the content, usefulness, usability, novelty and impact of the construct could be assessed.

The questions in the feedback questionnaire were designed using the likert scale system. Here the respondents are asked to provide a numerical value depending on their level of agreement with a particular statement.

9.1.1.2. *Expert feedback form*

The objective of the *expert feedback form* (Appendix D2) was to get feedback from the people attending the seminars on TPMS. Many of the attendees were experts on the area of team management (including HR specialists, management consultants, coaches/trainers, team leaders) and therefore their views and contribution would provide valuable benefits to the final findings of this research.

9.1.1.3. *Participant observation*

The observations made by the researcher while facilitating the TPMS design workshops were probably the most important source of data. Firstly, it allowed the assessment of the applicability and usefulness of the construct from a different perspective (i.e. from the facilitators standpoint). This provided the opportunity to compare and contrast the observations of the researcher with the feedback gathered via the workshop feedback questionnaire. Secondly, it enabled the researcher to observe *in-situ* certain problems that teams had with designing TPMS and to identify the reasons for these problems.

9.1.2. Structure of the workshops

The duration of the workshops varied from 4 to 6 hours, but they were all structured in a very similar way. During the first part of the workshops (2-3 hours approximately) the researchers would present the theoretical background of the research and would provide an overall description of the TPMS design construct.

In the second part, the teams would apply the construct in order to design their TPMS. The researchers would act as facilitators of the process, making sure that teams understood the logic of the construct and supporting them in carrying out the required tasks. Prior to starting using the construct, teams were asked to map the process they were responsible for using the 'post-it' technique. This simple technique involves each team member writing in a separate 'post-it' the daily activities she/he is responsible for and then linking all the individual 'post-it's' following the sequence in which these activities occur. At the end of the exercise the team had an overall view of the process with all the individual activities included (Figure 8.2). This allows the teams to better understand the inter-relationships between different activities and team members while identifying potential improvements to the current process.

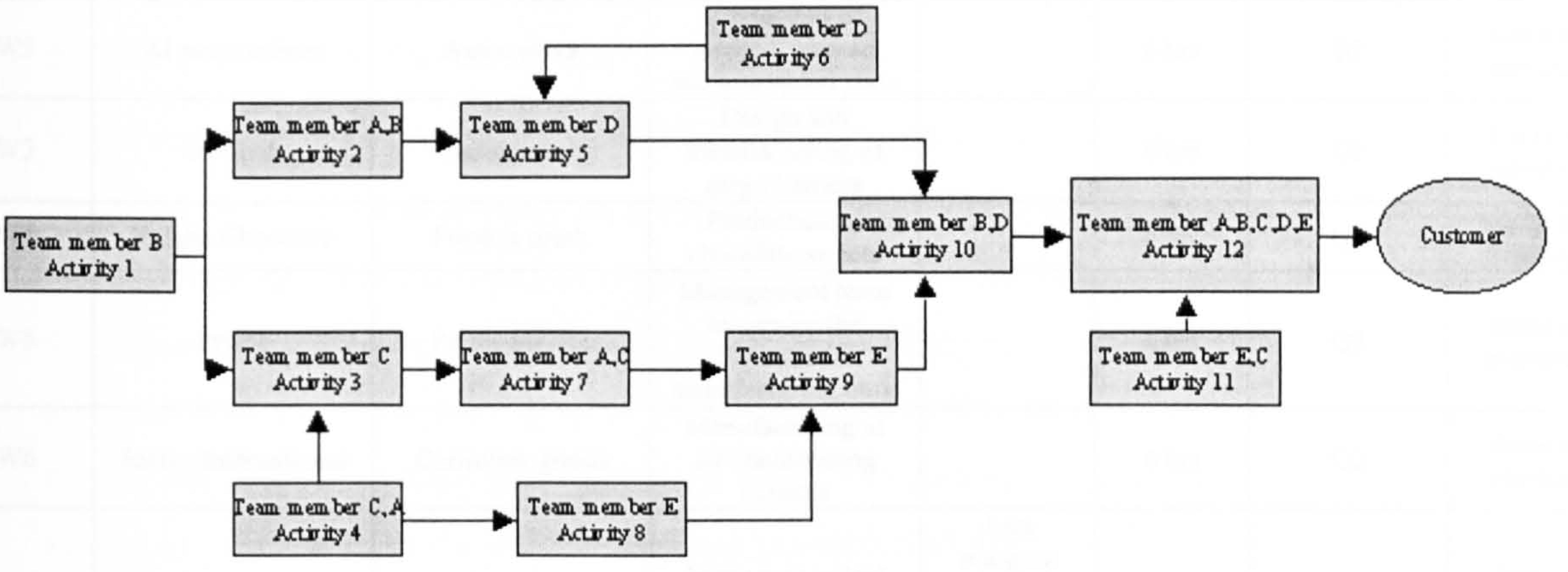

Figure 9.2: Process map

The application of the workbook lasted between 2 and 3 hours. The last half an hour of the workshops was used to summarise the work done during the day, get feedback from the teams and identify areas for future work for each of the teams.

The workshops with the two product development teams (IT1, IT2) were carried out over two visits to each of the companies. During the first visit the researchers interviewed the teams with the support of a questionnaire that focused on the management of design teams (Singhal, 2002). In the second visit, both teams went through the TPMS design workbook in order to assess the validity of the construct in their specific environment. In these two cases, feedback about the construct was collected through discussions and observation rather than with the support of the *workshop feedback form.*

Table 9.1 summarises the participating companies and details of the workshops. Table 9.2 summarises details of the expert feedback collected during the seminars in which this research work and the construct were presented and discussed.

Case code	Company	Field of industry	Team task	Role of interviewed employees	Duration of the workshop	Questionnaire (1&2)	Other research instruments
IW1 (3 teams)	Clipsal	Electronics	Order fulfilment – electrical accessories manufacturing	Production manager	6 hrs	Q, Q2	Informal discussion, participant observation, TPMS workbook
IW2	AI automotives	Automotive	Production of pressed, painted and assembled parts		6 hrs	Q2	Same as previous
IW3	Milford	Automotive	Design and manufacturing of cargo barriers		6 hrs	Q2	Same as previous
IW4	Haighs Chocolate	Food & drink	Production of chocolate sweets		6 hrs	Q2	Same as previous
IW5	Pryme	Public service	Management team to service the institutional manufacturing units		6 hrs	Q2	Same as previous
IW6	Seeley International	Consumer goods	Manufacturing of air conditioning systems		6 hrs	Q2	Same as previous
IW7	Holden and Castrol	Automotive	Indirect chemical management	Area resource specialist (team leader)	6 hrs	Q, Q2	Same as previous
IW8	Bradley Sewell & Cia	Accountancy	Strategy management		4 hrs	Q2	Same as previous
IW9	Dante Telecommunications Solutions	Telecommunications	Development of software for telecommunications	HR manager	6 hrs	Q, Q2	Same as previous
IT1	Polaroid	Electronics	Design and development of the digital mini portrait camera	Design team members	4hrs	Design team management questionnaire	Same as previous
IT2	Honeywell	Electronics	New Product Introduction management team	Design team members	4hrs	Design team management questionnaire	Same as previous

Case code - IW: Industrial workshop; IT: Investigator triangulation
Research instruments - Q: Company questionnaire; Q2: Workshop feedback questionnaire

Table 9.1: Summary of construct application cases

Expert code	Job type	n	Field of industry	Research instruments
E1	Management consultants	18	Including internal consultants for manufacturing and software industry	Expert feedback form, informal discussion
E2	HR specialists	10	HR consultancy, government, manufacturing, forestry, education	Expert feedback form, informal discussion
E3	Directors, managers, team leaders	16	Manufacturing, government, research and education, construction, accounting, architecture and urban planning	Expert feedback form, informal discussion

Total number of respondents = 44

Table 9.2: Expert feedback

9.2. Evaluation of the TPMS design construct

The criteria for evaluating the validity of the TPMS design construct was defined earlier in Chapter 8 (Table 8.5). The main four elements of these criteria are *contents, usability, usefulness* and *applicability/generalisability* of the construct.

9.2.1. Contents of the construct

When assessing the contents of the TPMS design construct it was important to verify if the construct had the characteristics of a comprehensive TPMS design process highlighted by the typology for TPMS design (Chapter 6, Table 6.9). The assessment of the contents (Table 9.3) shows that the construct includes most of the features of an effective TPMS design process, with the exception of two: *set timescales for the design and implementation of TPMS* and *applied at team and individual level.* The former, a mechanism that enables the setting of timescales for the design and implementation of the TPMS, will be included during the next series of modifications to the workbook. On the other hand, when developing the construct it was decided that the TPMS design process and workbook would initially only focus on designing team-based measures. The deployment of these measures to the individual team members was an important issue included in the presentations and discussions during the workshops. However, the aim of the construct was to focus on team-based measures. Once these were adequately designed, the team would then start thinking about linking these to each individual team members. Again, the next version of the construct will include a task related to deploying team measures to individuals.

The workshops provided interesting feedback regarding the flexibility and resource consumption of the TPMS design construct. Several teams highlighted that the construct does not require many resources and can be used as a local management tool. They also argued that existing PMS systems require high resource consumption and that it takes a long time to see the real benefits.

"This tool could be applied locally by the team without having to wait to develop a company wide system, which would take much longer time" – IW7

"BSc can be very effective but takes a long time to implement; longer to see results. The more tools the better. Tools are situational and while broad frameworks are useful, they should be tailored, along with flexible tools, to each situation. In this case teams" – Management consultant

"It is a refreshingly straightforward approach that can be readily explained and applied to most teams. Unlike many proprietary systems it doesn't rely on expensive instruments (e.g. software or long term buy in from external consultants). It recognises that "one hat does not fit all sizes" and that team work is not always appropriate" – educational service manager

Criteria for evaluation	TPMS design construct
A TPMS development process should:	
Review and evaluate existing TPM system	✓
Enable identification of company's strategic objectives	✓
Enable identification of team's stakeholders' requirements	✓
Enable the identification of team strategy/purpose	✓
Enable development of performance measures	✓
Focus on areas that the team is accountable for	✓
Enable goal prioritization	✓
Involve key users of the TPM system	✓
Provide a maintenance and review structure	✓
Top management support	✓
Full team members support	✓
Clear and explicit objectives	✓
Set timescales for design and implementation of TPM system	X
Facilitate the identification of key drivers of team performance	✓
Facilitate the understanding of the causal relationships between measures	✓
Assign individual responsibility for the measurement, communication and improvement tasks associated with each goal	✓
Be flexible and required low resource consumption	✓
The measures in a TPMS should be:	
Derive from the stakeholders represented within the team membership	✓
Clearly defined/explicit purpose	✓
Relevant and easy to maintain	✓
Simple to understand and use	✓
Provide fast, accurate feedback	✓
Stimulate continuous improvement	✓
Clearly defined data collection and methods of calculating the level of performance	✓
Clearly defined frequency of measurement	✓
Applied at team and individual level	X
Related to outcomes, process and drivers of team performance	✓
Capture the dynamic nature of teamwork	✓
Reliable, valid and acceptable	✓
A TPMS should measure:	
Effectiveness	✓
Efficiency	✓
Learning and growth	✓
Team member satisfaction	✓

Table 9.3: Assessing the contents of the TPMS construct

9.2.2. Usability and structure of the construct

With regards to the usability of the construct, the general feeling was that although the construct provided a logical path to designing TPMS, the workbook itself could be laid out in a more clear way. At this point, it is worth mentioning that the workbook used during the workshops was the first version. Since then, several changes have been made based on the feedback collected.

One of the areas in need of improvement was the duplication of tasks (e.g. having to write team objectives in more than one table).

"The workbook needs to be streamlined to make following through easier" – IW1b

"Less duplication is required to make the process smoother" – IW9

Table 9.4 summarises the evaluation of the usability of the construct.. Remember that a likert scale system was used to rate each of the areas shown on the left hand side of the table. Therefore, the rating values go from 1 (lowest) to 6 (highest).

	IW1a	IW1b	IW1c	IW2	IW3	IW4	IW5	IW6	IW7	IW8	IW9	Avg
1. Follows a logical path to design team performance measures	4	5	4	4	3	4	4	5	5	5	5	4.3
2. Clearly laid out and easy to work through	3	5	3	3	3	3	5	4	4	4	5	3.8
3. Provides enough relevant information	4	3	5	4	4	4	4	4	5	5	5	4.2
4. Simple and easy to use	4	4	4	4	3	4	5	4	4	5	6	4.2

Table 9.4: Feedback of the usability of the TPMS construct

A disparity of opinions was evident regarding the amount of relevant information provided by the workbook. While some teams considered that the background information provided was complete and adequate, others felt that there were areas that required further explanations. In particular, certain teams highlighted that it would be better to explain the differences between the different sets of measures (i.e. efficiency, effectiveness, learning and growth, team member satisfaction, and driver related measures). Also, including more examples for guiding the TPMS design process was pointed out as being an area for improvement

"The workbook presents very useful tools and definitions" – IW7

"It was tough to get the mindset around the different type of measures. It would be useful to better explain the differences between the different groups of measures" – IW1a

"We'd like a better description of the measures supplied" – IW4

"I'd have liked to run through a number of examples with the workbook" – IW9

The limited duration for the application of the construct also conditioned the effectiveness of the outcomes. It this regard, the management team dedicated to service institutional manufacturing units stated that extended time frame was required for designing TPMS and discussing some of the definitions.

"This is a huge area to cover over a short period of time. We require a good deal more time" – IW5

During all the workshops, the teams were provided with a handout of examples of performance measures acquired from the sample version of the Catalogue of Business Performance Measures (Centre for Business Performance, 2000). The objective of the handout was to prompt examples of measures that teams could adopt, in particular for those teams with little experience in designing and using performance measures. The handout showed to be very useful during the workshops, especially when teams could not think of appropriate measures related to certain objectives. The Catalogue of Business Performance Measures (Centre for Business Performance, 2000), however, was not developed with the aim to design team-based measures and so, it does not provide examples of measures related to several variables of team performance. As a result, some teams found it difficult to design measures related to team-orientated variables such as team processes (e.g. communication, decision making, leadership) or team knowledge.

"Some of the objectives we defined are difficult to measure. It would be useful to have examples of how to measure some of those areas" – IW6

"Need to pass on some witty gritty measures!! There are a lot of measures around that would fit in nicely with your work" – Director of training and education centre

The next version of the workbook will include a more extensive catalogue combining measures and measurement methods proposed by a number of different authors (e.g. Brannick et al, 1997; Zigon Performance Group, 2002; Jones and Schilling, 2000).

9.2.3. Usefulness of the construct

In general terms, the participating teams found the construct to be a useful tool to design TPMS. Table 9.5 summarises the feedback related to the usefulness of the construct. The opinion from experts collected during the seminars was also a valuable way to assess the usefulness of the construct. During the seminars, a detailed overview of the construct was described so that the attendees could have a good understanding of its purpose and contents.

Although some of the areas illustrated in Table 9.5 refer to specific functions that the construct was designed to perform (therefore, the positive feedback from the teams) there are some other areas that refer to the impact of using the construct. These included aspects like *the construct drives a team and people centred culture*, *increases the empowerment and accountability of team members* and *encourages continuous improvement and learning.*

Most of the teams (with the exception of IW1c) felt that the application of the workbook and the consequent TPMS were a valuable approach for encouraging a team-orientated culture. This was because the construct provides a balanced view of team performance, focusing on both the economical and social aspect of teams. Also, they suggested that designing an effective TPMS could increase the accountability of the team and its members over the key areas of responsibility.

"One of the strengths of the process is that it focuses on those aspects within our team's area of control. This should provide the team with more autonomy to manage those key areas" – IW3

Most teams believed the construct could *save time and effort* in designing TPMS. Still, certain teams appeared not to agree with this. For example, IW6 perceived team performance measurement as a high resource consuming task in that it increases the workload of the team and the efforts required from team members. The reason behind this was that the teams were sceptical about the benefits of designing and using TPMS. In any case, in the feedback form *save time and effort* did not relate to the everyday activities of the team but to the process of designing TPMS.

	IW1a	IW1b	IW1c	IW2	IW3	IW4	IW5	IW6	IW7	IW8	IW9	Avg
1. Allows aligning team performance with company strategy	5	6	4	5	5	4	6	4	5	5	5	4.9
2. Enables understanding stakeholders needs	5	6	4	5	5	4	6	4	5	5	5	4.9
3. Focuses the team and its individuals on the key factors affecting performance	5	6	4	5	5	4	5	4	4	5	6	4.8
4. Determines the specific resources required by the team	4	4	5	5	4	4	4	4	5	5	5	4.4
5. Drives a team and people centred culture – increases staff satisfaction	5	5	3	5	5	4	5	4	5	6	6	4.8
6. Provides a practical tool to be used by different types of teams	5	6	4	4	5	4	4	5	5	5	5	4.7
7. Provides a practical tool to be used in different type of organisations and at all organisational levels	4	6	4	4	4	4	5	4	5	5	5	4.5
8. Saves time and effort	5	5	4	5	4	4	6	3	6	5	6	4.8
9. Increases the empowerment and accountability of teams	6	5	4	5	4	3	3	4	5	5	5	4.4
10. Provides a more comprehensive view of team performance	5	6	6	6	5	4	6	5	5	6	5	5.4
11. Encourages continuous improvement and learning	5	6	5	5	5	5	4	5	4	4	5	4.8
12. There is a need for a tool like this	6	6	4	6	6	6	4	6	5	5	5	5.4

Table 9.5: Feedback on the usefulness of the TPMS construct

The value of the construct as a continuous improvement and learning tool was also highlighted by most of the teams. The assessment of the impact of previous team strategy and performance measures had the potential to reinforce team learning. Similarly, the identification and assessment of the key drivers of team performance would act as a mechanism to drive continuous improvement.

"*Going through the process enabled us to identify those key drivers that affect our performance and we were not previously aware of. We can now focus on improving these drivers*"- IW6

"It is key that the workbook focuses on drivers. If a team is going to succeed it is very important to identify and manage those drivers" – Regional business development manager

Several of the organisations stated that the construct was a valuable tool to encourage and guide discussions between team members on issues related to improving the management of teams. In fact, one of the aims of the construct is to take teams through a logical thinking process that will enable them to design TPMS while reviewing several aspects related managing the team.

"We as a team have an opportunity to use much of today's contents as a catalyst to develop a new approach for managing the team. The tool has stimulated a good debate for the PRYME Team" – IW5

"Very useful framework to commence discussion" – IW7

"Very good as a starting point for discussion" – IW1a

All teams agreed that their organisations needed a tool similar to the TPMS design construct. This was also the opinion gathered from most of the people attending the seminars (see Figure 9.3). This feedback suggested that the construct should be used as a complementary tool to other team management and performance measurement methods. IW7 was using the Balanced Scorecard to structure its business-wide performance management systems. The team, however, felt that the system was not effective enough at the operational level and that the TPMS construct would be an ideal complement:

"The company is using BSc but this is not helping to integrate different departments. In fact, an increase competition between departments is evident. A more localised tool applicable to the lower levels is currently needed... It is required to put this tool in place as an additional process to the normal team management practices. It also fills the gap of the Balanced Scorecard regarding the deployment of performance measures to the team level." – IW7

"Not necessarily new tools, but improved system for customising and using existing tools" – HRM manager (timber growing organisations)

"This area is so important, it's filling a need as you know" – Marketing manager (accounting firm)

"The BSc is a very effective approach to manage business strategy and performance at an strategic level, but its effectiveness decreases as you go down the different organisational levels" – Management consultant

The IT2 product development team stated that the construct was a very good complementary tool to other approaches such as the Balanced Scorecard or Six Sigma, which were already in place. This team highlighted that the construct provides an increased focus on the key objectives and drivers that the other approaches do not.

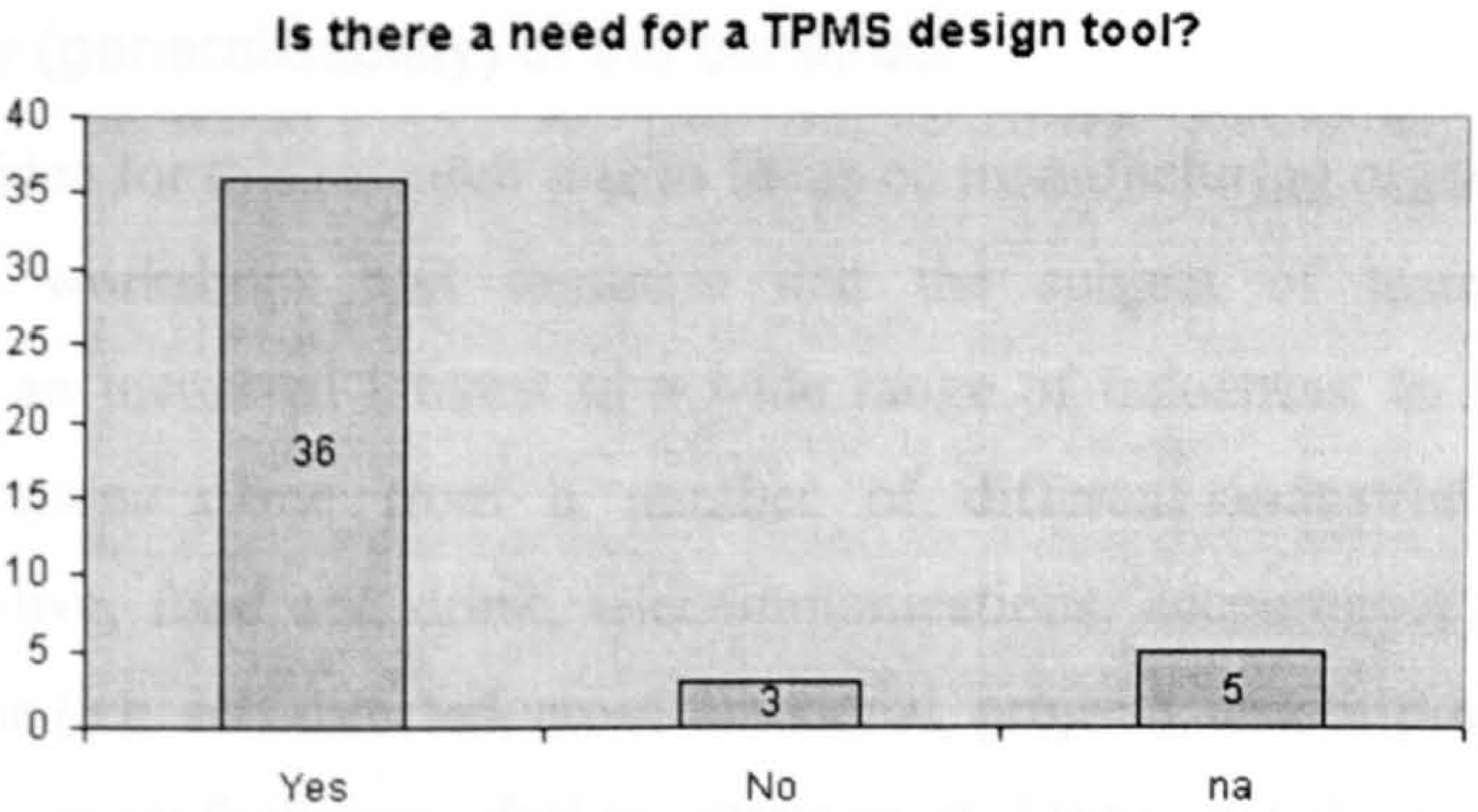

Figure 9.3: Expert feedback on the need for a TPMS design tool

An issue of concern was the investment and resources needed to manage the measurement system. Therefore, it is important to find the right balance between investment and potential benefits.

"The collection of the required data and management of the measurement system might involve high resource utilisation. We don't want measurement to become our primary activity" – IW6

"The measurement process is often more complex than it needs to be and the time/effort required to manage it 'kills' it off" – organisational development consultant

Figure 9.4 summarises the feedback gathered during the seminars, which focused on describing the theoretical background, purpose and contents of the construct. Most of the expert feedback highlighted the *practical* nature of the construct and the *high interest* of the research topic. They also highlighted that the research contents were *very critical for current organisation* and *innovative.* A few experts also described the research as *theoretical* and others as *more of the same thing.* It is, however, important to point out that the latter also described the research as *practical* and *very critical for current organisations.* This further emphasises the strong theoretical background of the construct and its practical relevance.

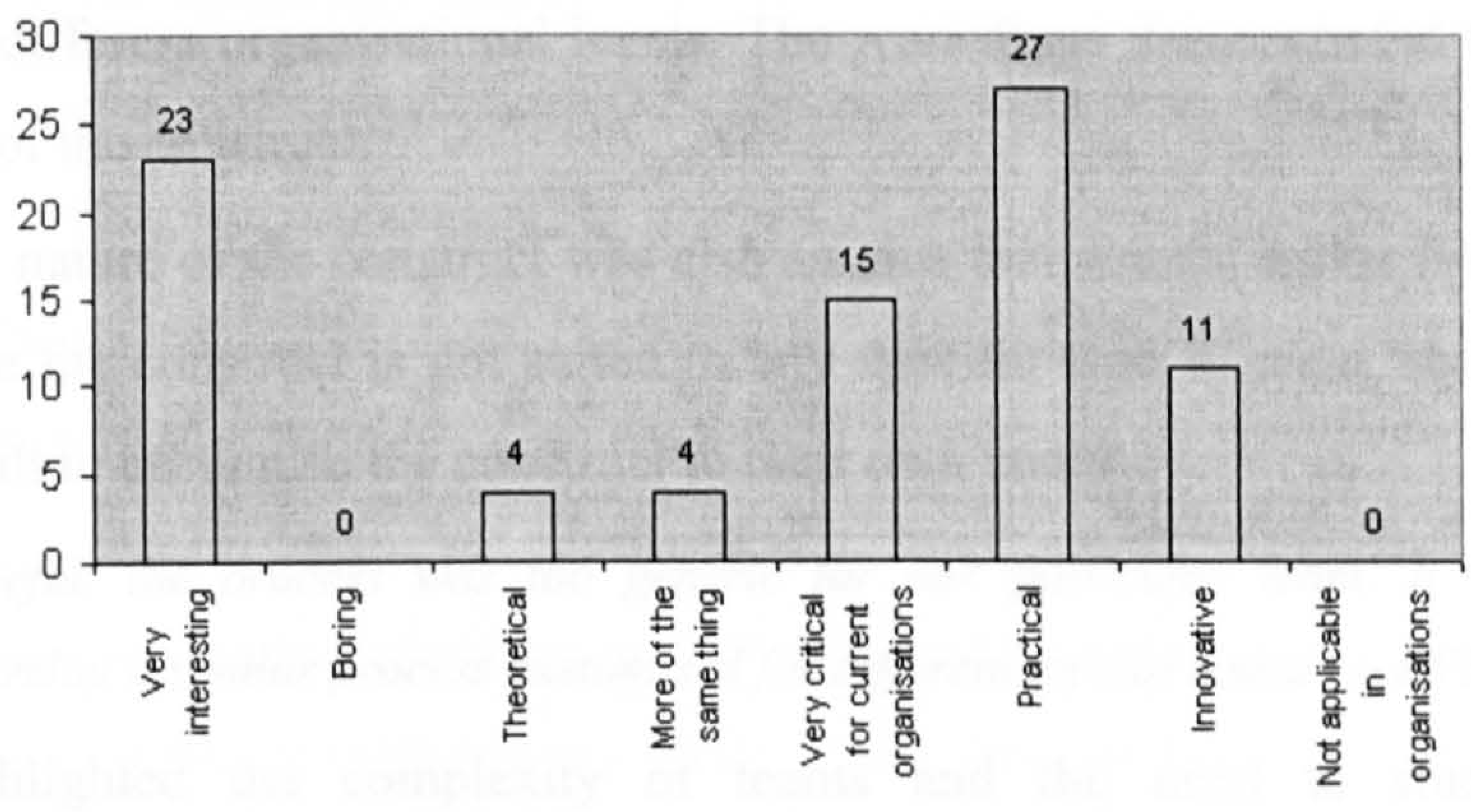

Figure 9.4: Expert feedback on the contents of the seminars

9.2.4. Applicability (generalisability) of the construct

Although the initial idea for this research was to focus on manufacturing organisations it was evident during the workshops and seminars that the subject of team performance measurement raised an increased interest in a wide range of industries. In fact, the teams attending the workshops came from a number of different industrial sectors (e.g. government, automotive, food and drink, telecommunications, accountancy). These teams also varied in the type (e.g. self-directed, cross-functional, project), task or process they were responsible for (e.g. manufacturing, design, strategy making), development stage (e.g. working group, potential team, real team) and organisational level they belonged to (e.g. shop-floor, middle management, top management). Although the feedback varied from one team to another, they all agreed that the construct was useful for their teams. This leads to the conclusion that the construct is applicable to different types of teams, from different types of industry, carrying out a variety of tasks and at different organisational levels.

The construct showed to be particularly useful and relevant in the product design and development field. The feedback from the two design teams (IT1 and IT2) was positive in that they agreed that the construct could be a valuable support for managing design projects. They pointed out that the construct could be very useful when developing a project plan. At the beginning of industrial design projects these teams lay out the fundamental objectives of the project in the project plan, which sets out all the main goals of the project. Both teams thought that the construct would play a key role during this stage by establishing the overall strategy and methodology of the project and enhancing the awareness of the key issues surrounding the project.

One of the requirements from industrial partners and included in the criteria (Table 8.5) was that the construct should be applicable to as many teams as possible. The generic nature of the construct meant that this could be applicable to teams operating in different types of industry and at different organisational levels. The workshops demonstrated the wide range of applicability of the construct.

Yet, the generic nature of the construct was also an area that several teams found difficult to overcome. Since the construct is not suited to any specific type of team, some teams were finding it difficult to customise the construct to their own needs.

"While being useful, the process was too generic for our particular team. It would be more appropriate to develop a similar process customised for different type of teams" – IW5

Chapter 5 highlighted the complexity of teams and the need to study each team independently. This means that although generic features can be identified for each type of teams, these need to be independently studied in order to clearly describe the specific drivers of performance. Also, due to the dynamic nature of teams, the impact of drivers varies over time and so, drivers that are key at one point might be overshadowed by other drivers in later stages. Due to the complex inter-relationships between teams and performance drivers the TPMS design construct does not provide an 'off the shelf' solution to all types of teams. Instead, it acts as a logical thinking process to facilitate teams in identifying their unique performance drivers.

"Performance drivers depend on the level of the team in the company. For lower level teams usually technical skills and knowledge are critical while for higher level teams usually ego, flexibility and soft skills will play a more important role. This means that usually there is not a total solution. Still, it is very important to identify the particular drivers"– consultant and executive coach

"Impact of drivers change over time.... There is not a 'one fits all' solution; you have to always cut and paste to build a system to suit your particular needs" – management consultant

In summary, although the TPMS design construct does not explicitly address the unique performance drivers for each type of teams (and as a result some teams find it difficult to identify those drivers) its generic nature increases the applicability of the construct to a wide range of teams across different types of industry.

"The workbook can be effective to discuss project requirements in depth regardless of the type of team" – IT1, product development team

9.2.5. Summary of the evaluation

Table 9.6 summarises the evaluation of the TPMS design construct by comparing it with the criteria for a good quality construct defined in the previous chapter (Table 8.5).

The *link to theory* and the *theoretical novelty* of the construct were demonstrated by developing the construct based on the novel typology for TPMS design (Chapter 6, Table 6.9). In fact, as Table 9.3 illustrates, the contents of the construct meet the features of a comprehensive TPMS design approach.

In comparison to other approaches for designing TPMS the novelty of this construct mainly resides in the following four contributions:

1. It recognises the importance of identifying the requirements of the different team stakeholders while previous constructs only focused on the team customer and parent company.
2. It focuses on identifying, measuring and improving key performance drivers in order to ensure the long-term competitiveness of the team. This allows team members to better understand the relationship between team drivers and overall performance and by doing so to improve team learning.
3. The construct facilitates the team to adopt a balanced set of performance measures, which provides a more comprehensive view of team performance.
4. The construct provides a mechanism to capture the dynamic nature of teamwork. It enables the definition of measures that monitor a change in the development stage of the team. These measures will trigger the review process of the TPMS in order to define new measures that are more appropriate for the specific development stage of the team.

As discussed in the previous section, the feedback gathered from the workshops and seminars demonstrates the *practical relevance* and *usefulness* of the construct. This was partly achieved by following the requirements that industrial partners and end-users had indicated prior to developing the construct. In terms of *usability,* teams pointed out several areas that need to be improved in order to ensure that the construct is easier to use and understand. These changes will be introduced in the next version of the workbook.

In conclusion, the TPMS design construct fulfils the criteria of a good quality construct. It is a novel and a valid construct for designing effective TPMS. In any case, it will be valuable to test and evaluate the next version of the workbook once the required modifications are introduced.

Criteria for a TPMS design construct	
Based on the Constructive Research approach:	
❑ Connection to existing theory	✓
❑ Theoretical novelty	✓
❑ Practical relevance of the construct	✓
❑ Practical usefulness	✓
• Assist in developing effective TPMS	✓
• Saves time and effort	✓
• Encourages continuous improvement and organisational learning	✓
❑ Practical usability	
• Easy to use and understand	½
• Describes the different elements of the construct	½
• User-friendly	½
Based on the synthesis of the literature:	
❑ Features of the typology for TPMS design (Chapter 6, Table 6.9)	✓
Based on the feedback from industry:	
❑ Generic for any different types of teams	✓
❑ Comprehensive: covers all the steps of the TPMS design process	✓
❑ Easy to use by teams	✓
❑ Include measures related to behaviour, attitudes and other intangible assets	✓
❑ Enhance the understanding of the relationships between performance drivers and team performance	✓
❑ Flexible enough to allow free-thinking and innovation	✓

Table 9.6: Summary of the evaluation of the TPMS design construct

9.3. Perceived impact of using the construct

The assessment of the impact of using the TPMS design construct was based on the perceptions of the team members participating in the workshops. These perceptions were collected from the teams straight after participating in the workshops. For this assessment, the impact of applying the tool and implementing the TPMS on team performance in the longer term is not considered.

Most of the areas of impact from using the construct have already been discussed during the previous sections (Section 9.2.3). It is, however, important to highlight the areas in which teams felt that the construct could have a key impact.

(1) Saves time and effort

One of the objectives of the construct is to save time and effort when designing TPMS. The general perception of the teams was that the construct provides valuable guidance and support, which has a positive impact on the time and effort required to design TPMS.

Several teams and experts agreed that the construct requires little investment and resources (i.e. time and effort) compared with other performance management approaches. Especially relevant is the view that the construct could overcome typical weaknesses of approaches such as the Balanced Scorecard, which require many resources and long timescales for implementation. This construct could provide teams with flexibility to enable them to apply it frequently, without using a lot of resources and having long timescales for implementation.

(2) Focuses team efforts on managing those key drivers for team success

All teams believed that by identifying the key drivers of team performance, the construct focuses the team efforts in the right direction. During the workshops, some of the teams defined performance measures for certain key drivers that they were previously not aware of. They believed these drivers were critical and that the team would start focusing on them in the future. For example, the cargo barriers design and manufacturing team (IW3) highlighted the importance of keeping a close contact with other teams within the organisation in order to minimise deficiencies and transfer best practices. As a result, they defined *inter-team relationships* as a key driver of team performance. *Number of ideas transferred and implemented* was one of the performance measures that team adopted and they also defined an improvement action, i.e. establish monthly improvement inter-team meetings.

(3) Provides a continuous improvement and learning platform

The feedback received demonstrates that the construct provides an appropriate mechanism to encourage continuous improvement and team learning. It also allows the team to assess the impact of the existing team strategy, TPMS and status of the key performance drivers. Based on that assessment it encourages the definition of improvement actions.

(4) Increase accountability and commitment of the team and its members

Most of the teams believed that by involving all team members in the application of the process and by focusing on the areas where the team has a direct impact, the accountability over the measures and commitment of the team members to the team would considerably increase. It is widely recognised that accountability and commitment have a critical impact on team performance and so, the construct should also have a positive effect on team performance.

(5) Increases management commitment and support

The feedback from the workshops and seminars suggested that the construct could be used as a local management tool for managing team performance, complementing other business-wide performance management tools (e.g. Balanced Scorecard, Six Sigma). Teams argued that by clearly addressing and measuring those key areas affecting team performance they could increase the awareness of management and thus, gain their support. They highlighted that the support provided by management should increase by explicitly addressing the resources required by the team.

"Management also needs to understand what the key drivers are in order to provide enough support to the team" – Regional business development manager

"Through the identification of specific elements of organisational support required by the team, this measurement system should allow us to gain more management commitment"- IW6

(6) Encourages team development, cross-functional integration and a teamwork culture

Many teams found that one of the main strengths of the construct was to start and direct a discussion related to improving team management practices. As previously mentioned, the aim of the construct was to take teams through a logical thinking process in order to generate a constructive discussion that will lead to a new approach for measuring and managing team performance. In fact, in several cases it was evident that it was not about the end result (i.e. TPMS) as much as it was about the learning gained through the discussions between team members while going through the different steps of the construct. This learning could lead to further developing teams and the teamwork culture.

Both product design teams (IT1 and IT2) agreed that the construct could be used as a facilitation tool to aid the design teams to communicate and think as a team, with a set of clearly defined goals and measures. More importantly, they stated that the construct helped the design team to understand and appreciate each team member's role better.

"The construct supports the understanding of each team members role and encourages effective team thinking" – conclusions from the study of the two design teams (Singhal, 2002)

IT1 mentioned that within the design team there was often a power struggle between the different functions (e.g. design, manufacturing, marketing). In their opinion, the TPMS design construct could assist in eliminating this problem. This is because the construct highlights the roles, functions and objectives of the team and the team members and so an appreciation of all team members can be formed. The positive effect that the construct could have for integrating different functions was also pointed out by IW7.

This is a key impact of the construct within the context of this thesis. Remember that this research departed from an industrial problem evident in companies adopting business-process structures. The feedback from the workshops demonstrates that the construct not only facilitates the design of TPMS for process-based teams but also improves cross-functional integration.

(7) Increases the probability of success of the TPMS

From this researcher's personal point of view as the facilitator during the workshops, using the construct increased the confidence in the final outcome of the process (i.e. TPMS) because the construct was being built upon a sound theoretical basis. This theoretical basis (developed in Chapter 6) took into consideration many of the factors that ensure the success of a TPMS and so, the construct increases the probabilities of a successful implementation of the TPMS.

From the observations during the workshops, the researcher believes that the teams participating in the workshop felt the same way. The theoretical background provided in the workbook and discussed at the start of the workshops appeared to increase the confidence of teams on the effectiveness of the construct and the final outcomes (the TPMS in this case).

(8) Minimises the negative impact of constraining factors

An interesting lesson learned during the workshops was that the application of the construct enabled the teams to overcome the negative impact of other factors. For instance, even those teams with little understanding of the company strategy or the drivers that affect team performance managed to develop a TPMS. In theory, these two factors can jeopardise the effectiveness of the construct. However, their negative impact was reduced because the construct encourages team members to discuss and identify strategy objectives and performance drivers. The process mapping exercise and the clear emphasis on cross-functional objectives also enabled them to overcome the difficulties that teams operating within functional structures encounter when defining objectives and measures. This impact is discussed in more detail in the following section.

9.4. Validation of the factors that affect the design of effective TPMS

The industrial workshops also provided an opportunity to validate the findings regarding the potential factors affecting the development of effective TPMS identified in Chapter 7. The role of this researcher was to facilitate the workshops and this allowed him to collect data (through interviews, discussion and observations) related to the factors that affect TPMS design.

9.4.1. Semi-structured interviews

A number of semi-structured interviews were carried out during the workshops. The aim of these interviews was to study in more detail certain aspects of the companies involved in the workshops and, as a result, to refine the findings regarding the factors that affect the design of effective TPMS.

These semi-structured interviews were supported by a company questionnaire. This questionnaire was a modified version of the questionnaire used during the initial exploratory phase but with an increased emphasise on each of the potential factors.

9.4.2. Coding

In order to keep a direct link between the research question under investigation (i.e. RQ2. what are the factors that enable and/or constrain the design of effective TPMS?) and the data collected during the workshops, all ten potential factors identified during the exploratory phase were coded (Table 9.7). Miles and Huberman (1994, pp. 64) argue that codes are efficient data-labelling and data-retrieval devices that empower and speed up data analysis. Coding also increases construct validity by creating a clear link between the research issues and the research instruments (the workshops in this case). In this case, the purpose of using codes was to provide a mechanism to simplify labelling those instances and observations that showed the impact of the potential factors. This would facilitate the validation of each of the potential factors.

Appendix D3 illustrates the comments gathered and observations made during the workshops. These are linked to the specific potential factors in order to demonstrate their impact on the design of TPMS. Note that none of these observations are linked to the *use of a structured approach for TPMS design*. The impact and importance of that factor was discussed in Section 9.2 (Evaluation of the TPMS design construct) and the specific observations and comments were collected through the *workshop feedback questionnaire* and *expert feedback form*.

Potential factors affecting TPMS design	Code
1. Management commitment	MC
2. Business process view	PROCVIEW
3. Type of organisational culture	CUL
4. Strategy deployment	SD
5. Use of organisational PMS	PMS
6. Systematic use of quality frameworks	QF
7. Understanding of the purpose and benefits of TPMS	PUR-BEN
8. Team maturity	TM
9. Focus and contents of appraisal and reward system	APPR-REW
10. Structured and comprehensive approach for PMS design	APP

Table 9.7: Codes for individual potential factors

9.4.3. Limitations of data

Before drawing any conclusions from the data illustrated in Table 9.8 it is important to clearly identify the limitations of this data in order to increase the reliability of the findings. The following are the main limitations:

(1) Time constraint

The limited duration of the workshop meant that most of the teams had not enough time to go through all the stages of the workbook. Therefore, it was important to take into account that the quality of the final outcome (i.e. the TPMS) could be compromised because of the pressure to finish the whole process. In any case, it was evident that most teams opted for studying each of the stages of the workbook in detail rather than rushing through the entire process.

The time limitation had a bigger impact on the amount of data collected from each of the participating teams. It was not possible to carry out interviews with all teams. Due to time limitations, semi-structured interviews were only carried out with individual team members from IW1b, IW7, IW9, IT1 and IT2. The effect of this can be observed in Table 9.8 where some data is missing in certain sections. The research, however, also collected data through participant observation and this provided sufficient evidence to validate the potential factors affecting TPMS design.

(2) Teams outside their natural context

An important consideration to make when analysing the data is that the teams were not in their natural context when designing the TPMS. All teams had expressly attended the workshops to improve their understanding on team performance measurement. This meant that the teams were fully focused on learning and designing an effective TPMS. This is a very different context from the one where teams carry out their daily activities. TPMS design will rarely be the main priority in a team's list of daily tasks and even if it is, there will generally be other activities that need to be carried out in parallel, which might take team members' focus away from TPMS design activities.

During the workshops teams were isolated from the pressures of their daily activities, and so when analysing the data, it is important to take into account that the design of TPMS in the natural context could be affected by factors not present in the workshops (e.g. TPMS design activities overtaken by new priorities).

Also, since only a few of the workshops (except IW1, IT1, IT2) took place in the teams' own company, it was not possible for the researcher to make observations that could support the findings. Visiting the actual workplace could aid in making observations about the general organisational culture, structure, strategy deployment systems and use of performance measurement, but this was not possible during the workshops. Instead, the discussions held with the teams while implementing the construct provided further details about each organisation.

9.4.4. Cross-team analysis

Table 9.8 illustrates a comparison of the 13 companies that used the construct by comparing them against each of the 10 potential factors affecting TPMS design.

The last three sections of Table 9.8 relate to (1) how far through the workbook the team got the workshops, (2) the number of factors positively affecting the design of TPMS and (3) the quality of the final TPMS designed. Due to the limited time it was normal for the teams to struggle to accomplish all the tasks of the workbook. It was, however, important to assess the quality of the work the teams carried out during the available time in order to illustrate any relationships between the potential factors and the quality of the TPMS. The quality of the TPMS was assessed by studying how clearly and precisely teams had defined their objectives, performance drivers and corresponding measures. It was also important to see if these objectives and measures were related to the four dimensions of team performance.

Table 9.8 shows the relationship between the number of factors positively affecting the design of TPMS and the quality of the final outcome (i.e. TPMS). If one assumed that all factors were independent from each other and they all had the same level of impact on the design of TPMS, then there would be a direct correlation between the number of factors and the quality of the TPMS. A careful analysis of Table 9.8, however, rejects that assumption. The three teams within Clipsal (IW1a, IW1b, IW1c) showed the same positive factors in place, but even so, there were obvious differences in the quality of the final TPMS ('low', 'good' and 'average' respectively). Also, the quality of the TPMS designed by IW1b was the same as, or higher, than those designed by teams that had more positive factors in place (i.e. IW3, IW5, IW6, IW8, IW9).

In the case of Clipsal the reason for the differences in the quality of the TPMS was the level of involvement of the managers. In IW1a no manager was involved but in IW1b and IW1c the Production Manager and the Quality Manager were involved respectively. These two managers had a clear understanding of the company's strategic objectives and had also previous experience in designing and using performance measures. As a result of their involvement, IW1b and IW1c managed to overcome the negative impact of the lack of (1) operational goals for the team, (2) organisational PMS and (3) understanding of the purpose and benefits of TPMS. IW1a, however, struggled through the process of designing its TPMS because of the negative impact of these three factors and the lack of management involvement.

For the same reason, IW1b designed a better quality TPMS than two of the teams that had more positive factors in place (i.e. IW3 and IW6). In IW3 the Production Manager was involved in the process. He had a clear understanding of the company strategy, which he passed on to the team members. The lack of a organisational PMS and his inexperience in designing PMS, however, were an important barrier to design the TPMS. In IW6 no manager was involved in the process. Although the team appeared to have good conditions for designing a quality TPMS the lack of involvement of a senior figure had a negative impact on the entire process.

There are three main conclusions to be drawn from these differences in the relationship between potential factors and quality of the TPMS:

1. the impact of certain factors (management commitment in this case) is bigger than others'
2. potential factors are related to each other and thus,
3. the impact of one factor can overcome the impact of others'

Case code	IW1a	IW1b	IW1c	IW2	IW3	IW4	IW5	IW6	IW7	IW8	IW9	IT1	IT2
Potential factor													
MC	Low (-)	high (+)	high (+)	high (+)	high (+)	high (+)	high (+)	low (-)	high (+)	high (+)	high (+)	high (+)	Senior manager involved (+)
PROCVIEW	low (-)			medium (+/-)	low (-)	low (-)	medium (+/-)	low (-)	high (+)	medium (+/-).	high (+)	high (+)	high (+).
CUL	centralisation of power on critical functions (-) Paternalistic culture			centralised power in critical functions (-)	*no data*	paternalistic and informal organisation (-)	centralised power (-)	centralised power (-)	high-performance, flexible and adaptable. (+)	high performance, flexible and adaptable (+)	decentralised power, flexible and adaptable (+)	high performance, decentralised power, flexible and adaptable (+)	high performance, decentralised power / flexible and adaptable (+)
SD	no (-)			yes (+)	no (-)	no (-)	yes (+)	yes (+)	yes (+)	yes (+).	yes (+)	yes (+)	yes (+)
PMS	no (-).			yes (+)	yes (+/-)	no (-).	no (-).	yes (+)	yes (+)	no (-)	yes (+)	yes (+)	yes (+)
QF	yes (+/-)			yes (+/-)	yes (+/-)	*no data*	*no data*	*no data*	yes (+)	*no data*	*no data*	yes (+)	yes (+)
PUR-BEN	not clear (-)			clear (+)	not clear (-)	not clear (-)	clear (+)	not clear (-)	clear (+)	clear (+)	clear (+)	clear (+)	clear (+)
TM	work group (-)			group of team leaders (-)	Potential team (-)	group of team leaders (-)	Cross-functional potential team (+)	group of team leaders (-)	high performing team (+)	Potential team (+/-)	Real team (+)	high performing team (+)	high performing team (+)
APPR-REW	business (+/-)			*no data*	*no data*	*no data*	*no data*	*no data*	Individual (-)	Individual (-)	*no data*	team (+).	team (+).
APP	TPMS design construct (+)												
Factors in (+) mode	2/10	2/10	2/10	6/9	3/8	2/6	5.5/7	4/8	9/10	6/8	8/8	10/10	10/10
% of fulfilment of the workbook	55%	70%	65%	75%	60%	70%	60%	65%	95%	80%	80%	na	na
Quality of TPMS	low	good	average	good	average	average	good	average	very good	good	good	na	na

Note: Interviews were carried out with IW1, IW7, IW9, IT1 IT2. For the rest of the companies data was collected mainly from discussion and observations during the workshops.

Table 9.8: Cross-team analysis of the workshops

The following section discusses the findings related to each of the potential factors:

(1) Management commitment

The commitment of managers to the process of TPMS design was shown to be important during the workshops. In most teams a senior or middle manager took part, which proved their commitment to improving team management practices. In some cases the managers took a 'back sit' role during the workshops, letting the other team members drive and facilitate the process, while in others they were the driving force. In both cases, the fact that managers were present and involved in the process had a positive impact on the commitment of the rest of the team members in the process. This was evident from the proactive behaviour that many team members were showing. This was again shown in the case of IW6 where no manager participated.

Management involvement proved to be very relevant, in particular for assisting the teams to identify and align company strategy with team objectives. In the case of IW1b, IW1c and IW4 it was the manager who helped the teams to define the strategic objectives, because the team members showed little strategic awareness. The quality of the final TPMS would have been much reduced had this crucial step in the process not been adequately accomplished.

Whether the commitment by managers is the same once the participants get back to their daily pressures, remains to be seen, but its importance was evident in the workshops.

The provision of resources to design an effective TPMS is another factor with an important impact. For the purpose of these workshops, organisations sent the teams away for a day and this proved to be a valuable factor for designing the TPMS. As many of them mentioned, carrying out this exercise as part of their daily activities would have been a very difficult task.

"You need a day away from your normal activities to be able to go through the workbook. I don't know if management will be happy to do that with all teams in our company" – IW6

In any case, the provision of resources will be closely related to the level of management commitment.

(2) Business process view

The teams that were operating within flat and/or process-based structures (IW2, IW5, IW7, IW9, IT1, IT2) had a much better understanding of the common goals. Also, these teams were more aware of the role of each individual team member and the key drivers of team performance, all of which facilitated the design of the TPMS.

On the other hand, teams within organisations with strong functional structures (IW1, IW3) were finding more difficult to define common objectives for the team, which included members across a number of functions. Some teams members also struggled to understand the interdependent roles of team members because they were not used to cooperating and collaborating between individuals. Often, team members recognised that they were working in a very individualistic (and sometimes competitive) manner.

The process mapping exercise done at the beginning of every workshop proved to be very useful for teams to better understand the requirements of the end-to-end processes they were responsible. These exercises facilitated the definition of common objectives, measures and certain performance drivers. In particular, the team members from those operating within functional structures (IW1, IW3, IW4, IW6) got really involved during the process mapping exercise, because this enabled them to see that their individual roles were closely inter-related with others' and that they all shared common goals. In other words, it acted as a valuable teambuilding exercise.

(3) Type of organisational culture

It was a difficult task to gain insights into the culture of the organisations from only observing teams design their TPMS. Most of the workshops (except IW1, IT1 and IT2) were held outside the premises of the organisations. Therefore, it was not possible to make observations of the working environment where teams operate, which could also provide valuable insights into the culture of each organisation. The informal discussion and several interviews held with the teams, however, provided valuable information regarding the culture of the companies.

The study showed that companies with a high-performance culture (IW7, IW8, IT1, IT2) used PMS more systematically. In a high performance culture, teams are continuously challenged with stretched performance targets. Performance measurement plays a key role in the management of these teams. This had a positive impact on teams' perception of the value of using performance measures; on their experience of using measures; and on their knowledge of the issues surrounding the design of performance measures.

As it was pointed out in Chapter 6, companies with an *adaptable and flexible culture* (IW7, IW8, IW9, IT1, IT2) appeared to have a good predisposition towards designing a new approach to team management. Similarly, teams within companies where power was *decentralised* to teams (IT1, IT2) showed a better understanding of the concepts and process of TPMS design than those teams within companies where power is *centralised* (IW1a, IW1b, IW1c, IW2, IW6). Teams with a high level of autonomy rapidly understood the importance of managing other areas, rather than just those related to *effectiveness* and therefore they believed it was also important to measure the other dimensions. On the other hand, the teams that operated in an environment where power was centralised and where departments focused on functional objectives, did not always focus on the team objectives and their TPMS mainly included measures related to the *effectiveness* dimension.

Finally, it was evident that the *informal* management culture evident in IW4 was a constraint to developing effective TPMS. Teams were not accustomed to managing with measures and team members appeared to be sceptical about the value and benefits of TPMS.

(4) Strategy deployment

The introduction to the cross-team analysis highlighted the differences in the quality of the TPMS between the teams to which strategy is adequately deployed and the rest. It is a crucial part of the TPMS design process to clearly identify the company strategy, in order to align it to the performance measures. The team, therefore, needs to have a good understanding of the company strategy, which means that a mechanism to deploy strategy should be in place.

During the workshops, the usability of the construct was affected by the knowledge of the teams on organisational data related to strategy. The need to link this data with the TPMS design process meant that teams with low business strategy awareness found going through the process more difficult.

For the teams that had little understanding of the business strategy (IW1a, IW1b, IW1c, IW3, IW4) it was very useful to have a manager participating in the workshop because she/he often facilitated the definition of the company's strategic goals. This allowed the teams to continue working on the rest of the stages of the construct. As IW7 stated *'the process requires a good pre-understanding of organisational data regarding strategy and performance measures'*.

The contents of the business strategy also affected the quality of the final TPMS. The fact that in a number of companies the strategic objectives only focused on financial figures (IW1, IW3, IW6) meant that teams mainly focused on deploying these objectives by linking the team strategy with the company strategy. These teams appeared to be more sceptical about designing measures that are not directly linked to the business strategy.

(5) Use of organisational PMS

The impact of this factor was also highlighted at the beginning of the cross-case analysis. For those teams that were already using performance measurement systems (IW2, IW3, IW5, IW6, IW7, IW9, IT1, IT2) it was easier to design their TPMS because the could see the link between TPMS and business-wide measures. Also, these teams already had experience in managing with measures and this affected the perception of team members as to the benefits of measures and their knowledge of designing effective measures.

The contents of the performance measurement system were also an important element affecting the design of TPMS. For example, IW7 was using the Balanced Scorecard as a business-wide PMS, which meant that the measures deployed to the team would relate to a number of dimensions.

(6) Systematic use of quality frameworks

The data collected during the workshops did not provide enough evidence to support the view that the systematic use of quality framework facilitates the development of effective TPMS. Teams within those companies using recognised quality frameworks, however, proved to be more accustomed to managing with measures. In particular, those teams (i.e. IW7, IT1, IT2) using frameworks where performance measurement plays a key role (e.g. EFQM, Six Sigma) showed that performance measurement is an important part of their management system. Again, this appeared to have a positive impact on the perceptions of teams of the value of measurement and the experience and knowledge of teams in using and design TPMS.

(7) Purpose and benefits of using TPMS

Teams expressly attended the workshops to learn how to design an effective TPMS. Whether or not they saw the benefits of having an effective TPMS was not an issue that had a real impact because a key activity of the workshops was to design their own TPMS. Had this task been part of their daily activities, teams might have taken a very different approach. The observations gathered from the teams that were more sceptical about the benefits of TPMS (IW1, IW3, IW4), made this researcher realise that gaining the support of the team to design TPMS would be difficult.

The scepticism about the value of TPMS could have been the reason why some teams (e.g. IW6) perceived team performance measurement as a high resource consuming task in that it increases the workload of the team and the efforts required from team members.

The workshops demonstrated that the lack of belief in TPMS could be overcome by a high level of management commitment. Managers who clearly recognised the need to use effective TPMS, and who were committed and involved in the process, got the rest of the team member's involved.

The teams that clearly recognised the need for effective TPMS (IW5, IW7, IW8, IW9, IT1, IT2) were more receptive to all the concepts introduced during the workshops. They all highlighted the need to measure and manage a balanced set of dimensions and drivers of team performance in order to facilitate the development of the teams.

(8) Team maturity

The analysis of the workshops showed that the maturity or developmental stage of teams is a critical factor affecting the design of effective TPMS. Those groups of individuals that were further developed as a team (in particular IW7, IW9, IT1, IT2) had a clearer understanding of the key factors affecting team performance. Also, they had a wider view of team performance that was not just related to the satisfaction of the requirements of the customer and the parent company. They all saw great value in defining measures against each of the four dimensions of team performance and, as a result, they all found using the construct a straight forward and natural process.

On the other hand, teams that were in the early stages of development (IW1, IW3, IW4, IW6) did not have such a good awareness about the critical drivers of performance and they did not see the importance of some of the dimensions of team performance (in particular *learning and growth*) as clear as the more mature teams. As a result, some of these teams struggled through some of the stages of the TPMS design construct, especially those related to the identification of the drivers and the definition of the corresponding performance measures.

The maturity of the team is closely related to several of the factors previously discussed. For example, there is a close relationship between the organisational structure and the maturity of the teams. Those teams operating in organisations with clearly defined business processes (IW7, IW9, IT1, IT2) evidenced a higher level of performance. Similarly, the more mature teams had previous experience in designing and using performance measures and a better strategic awareness. Again, as discussed in the literature review sections (Chapter 2 and Chapter 5) these two factors (strategic awareness and performance measurement) have been recognised as key elements of high-performing teams. Considering that a mature team incorporates several of the previously discussed factors (i.e. clear view of the end-to-end processes, previous experience in managing performance measures and good strategic awareness), team maturity can be considered a critical factor affecting the design of effective TPMS.

Team maturity also explains the differences in opinions about the usability of the construct. Those teams that were in the initial stages of the team development scale and had little experience in managing with measures (e.g. IW1, IW3, IW4, IW6) found it more difficult to go through the different steps of the workbook. These teams took a very rigid approach to using the workbook, literally sticking to every piece of information provided in the workbook. However, the workbook was developed with the aim of facilitating the design of TPMS while providing teams with enough flexibility to allow free-thinking and creativity. Teams that had a good understanding of team performance and had previous experience in using measures proved to be more comfortable in using the workbook and designing the TPMS.

(9) Focus and content of appraisal and reward systems

Due to time limitations it was not possible to study the appraisal and reward systems of all participating companies. However, the information collected provided strong evidence of the impact of this factor.

Information about appraisal and reward systems was collected from 5 organisations. IW1 did not have a structured appraisal system but rewarded its employees based on business wide performance. The other four companies had structured systems for appraising and rewarding their employees. Two of them (IW7, IW8) were using individual-based appraisals and rewards, while the other two (IT1, IT2) combined team-based and individual-based appraisal and rewards. IW7 highlighted that the individual-based system they had in place had a negative impact on all the team management systems, including performance measurement. IW8 had a similar view of their system.

"The existing individual-based rewards system encourages an individualistic environment and jeopardises team culture....it is a contradiction to measure team performance while only rewarding individual members" – IW7

On the other hand, IT1 and IT2 combined team-based with individual-based appraisals and rewards. Even the individual rewards were agreed by the others team members when they believed that certain individuals within the team had made an outstanding contribution towards improving team performance. For these teams, the process of designing TPMS was very natural as this formed the platform for appraising and rewarding their performance.

All four teams recognised the powerful effect that appraisal systems and rewards have on individuals, which will directly affect the pre-disposition of team members towards designing effective TPMS.

(10) Structured and comprehensive approach for TPMS design

The earlier sections of this chapter highlighted the usefulness and impact of the TPMS design construct. In fact, taking into account the performance measures that some of the teams were previously using and the scepticism of certain team members, the probability of designing an effective TPMS without the support of the TPMS design construct would have been remote. Similarly, certain teams evidenced a lack of a structured strategy management process, little experience in using and designing performance measures and a lack of understanding of the meaning of team performance (i.e. drivers and dimensions), all of which constrained the development of effective TPMS. The workshops showed that the negative impact of these elements could be overcome, or at least minimised, through the application of the TPMS design construct. This shows the relevance and impact of having a structured approach to design TPMS.

It was clear from the workshops that the usability of the construct was improved by the existence of a team member leading the TPMS process. This was especially true in those teams that were sceptical about TPMS or were in the early stages of team development.

Similarly, the role of the two facilitators (including this researcher) during the workshops proved to be essential. It was very important to support the teams by clarifying terminology, further explaining certain stages of the workbook and keeping them on the right track. In fact, the TPMS design construct (see Appendix C) explicitly mentions that the facilitator and/or leader should be involved during the entire design process. Although during the workshops the process leader and facilitator were two different people, generally the same person will carry out these two roles.

9.5. Further learning from the workshops

The data collected from the workshops provided new learning on several issues surrounding the design of effective TPMS.

(a) Teams at different stages of development require different performance measures

It has been previously stated that teams with a higher level of maturity tend to design more effective TPMS than those teams still in the early stages of development. This is mainly due to the higher strategic awareness, better experience in using measures and better understanding of the meaning and drivers of team performance that mature teams have. It is important to remember, however, that a TPMS that is effective for one team will not necessarily be effective for another team because all teams have their own unique features and requirements.

It was evident from the workshops that teams at different developmental stages required different performance measures. It was clear that for some teams (especially those that were starting to work as a team) the use of measures related to the four dimensions could be a constraint to focus of team efforts in the same direction. Although they saw the benefits of measuring each of the four dimensions, they believed that these could be valuable in the latter stages, once the teams had settled and achieved certain level of performance.

For instance, the aim of IW1, IW3 and IW4 was to get to a certain level of performance by achieving the most critical short–term objectives (e.g. cost, productivity, delivery). For these teams, performance was mainly related to the achievement of the task related objectives. As a result, it was not a priority for these teams to define measures other than those related directly to the team task objectives. Although they were aware of some of the longer-term drivers of team performance, they believed that it would be more appropriate to design measures only related to the critical short-term objectives and to start setting specific action plans to improve some of the drivers related to the longer-term objectives. In contrast, IW7 thought that it was essential to design measures related to the each of the four dimensions and it found a straightforward process to do so. This team had been managing with measures for a long time and it was already performing at a high level. Their current efforts, therefore, were focused on the areas that would ensure the future competitiveness of the team and so, they defined several drivers and measures related to *learning and growth* (e.g. innovate management processes, improve best-practice transfer processes) and *efficiency* (e.g. improve customer-supplier relationships).

Finally, some of the teams were not familiar with using measures and so, it was important to design measures that did not require complex data collection methods. In particular, these teams were sceptical about the use of descriptive measures.

(b) The impact of the team task

Although most of the teams participating in the workshops had tasks with clear and tangible outputs (e.g. cargo barriers, digital camera), this was not the case for three of the teams (IW5, IW8, IT2). These teams were in charge of management activities instead of producing a physical product. They provided a service (e.g. strategic plan, direction, process design) to other parts of their organisations.

Current research (Jones and Schilling, 2000; Zigon, 1998) recognises that white-collar and knowledge-based teams are more sceptical to measurement. As a result, it could be argued that the nature of the team task can be a factor affecting the design of TPMS. The workshops, however, showed that it is not the nature of the task that affects the design of TPMS, but it is the team and the management recognising the need for an effective TPMS. IW5, IW8 and IT2 had a clear understanding of the benefits that an effective TPMS would bring and, as a result, they were convinced of the usefulness of the TPMS design process despite the more 'intangible' type of tasks they were responsible for.

(c) The TPMS design construct complements other performance management systems

An important function of the construct is to facilitate the link between existing performance management approaches and the TPMS. The feedback from the workshops and experts suggested that the construct would be an ideal complement to other existing performance measurement system design approaches. In fact, the construct fills some of the gaps of these approaches by creating a clear link between strategic level and team level PMS and by facilitating the development of a PMS that supports cross-functional integration and focuses on the particular needs of the team.

(d) Different factors have a different degree of impact on the quality of the TPMS

The cross-case analysis of the workshops demonstrated that the impact of some factors on the quality of the TPMS is bigger than others'. In other words, the importance of some factors outweighs the importance of others. Management commitment, for instance, proved to be a critical factor when designing TPMS, because it allowed the teams to minimise the negative effects of a lack of strategy deployment and organisational PMS and of the negative perceptions about TPMS.

It is not the aim of this research to assess the impact of each factor in isolation but developing an understanding of the relative impact of each factor would provide valuable learning for designing effective TPMS. This would facilitate the identification of the factors that can block and those that will drive the process of TPMS design.

(e) There is a close relationship between different factors

Following on from the previous point, it was evident from the workshops that several of the factors are closely related to each other. For example, it is evident that having a *strategy deployment* mechanism and *the use of organisational PMS* tend to go hand by hand. Similarly, the *business process view* is related with *team maturity.* At the same time, it was evident that mature teams usually operate in an environment with structured strategy deployment mechanisms and PMS. Again, a clear understanding of the relationships between the different factors would provide valuable insights into the design of TPMS.

9.6. Chapter conclusions

This chapter described the findings from the application of the TPMS design construct. The objectives of the industrial workshops and seminars where the construct was applied and discussed were as follows:

1. to assess the validity of the TPMS design construct
2. to assess the impact of using the TPMS design construct
3. to validate the potential factors affecting the design of TPMS identified in Chapter 7

The data gathered during the workshops (supported by the expert feedback) showed that the construct meets the criteria for a good quality construct and fills the gaps of other existing approaches. The TPMS design construct is a novel and valid approach to design effective TPMS.

The industrial workshops also enabled the researcher to assess the impact of using the construct. This provided an answer to research question 5 as follows:

RQ5. *What is the impact of using the TPMS design construct in industrial organisations?*

Answer:

1. Saves time and effort

2. Focuses team efforts on managing the key drivers for team success

3. Provides a continuous improvement and learning platform

4. Increases accountability and commitment of teams and its individual members

5. Increases management commitment and support

6. Encourages team development, cross-functional integration and a teamwork culture

7. Increases the probability of success of the TPMS

8. Minimises the negative impact of the constraining factors

Several of the impacts defined above are related to the benefits of measuring team performance (i.e. *focuses team efforts on managing key drivers, provides a continuous improvement and learning platform, increases accountability and commitment, facilitates team development*) and these are already addressed in current literature (Katzenbach and Smith, 1993; Meyer, 1994; Zigon, 1995, 1997; Viken, 1995; Brannick et al, 1997; Hunt, 1999; Hacker and Lang, 2000; Jones and Schilling, 2000). Other areas of impact, however, are specific to the use of the construct (i.e. *saves time and effort, increases management commitment and support, encourages cross-functional integration, increases the probability of success of the TPMS, minimises the negative impact of the constraining factors*) and are not addressed by current research. Identifying the impacts of the construct, therefore, contributes to existing knowledge.

The last part of this chapter focused on the factors that enable and/or constrain the design of effective TPMS. The industrial workshops validated the potential factors identified in Chapter 7 and provided a final answer to research question 2:

RQ2: What are the factors that enable and/or constrain the design of effective TPMS?

Answer: The factors that enable and/or constrain the design of effective TPMS are:

1. Management commitment
2. Type of organisational culture
3. Understanding of the purpose and benefits of TPMS
4. Strategy deployment
5. Use of organisational PMS
6. Systematic use of quality frameworks
7. Business process view
8. Team maturity
9. Focus and contents of appraisal and reward systems
10. Structured approach for TPMS design

The identification of these factors contributes to knowledge by filling a gap in current research. Some of these factors are already addressed in the change management and PMS literature but they were not studied before in the context of TPMS. Of particular interest are the 3 factors specific for the context of TPMS design, *business process view, team maturity* and *focus and content of appraisal and reward systems*. Existing literature (Morhman et al, 1992; Lawler and Cohen, 1992; Amstrong and Murlis, 1998; Zobal, 1998; Cacciope, 1999) highlights the need for TPMS in those companies using team-based appraisal and rewards. In addition, previous research highlights that rewards have an important impact on the way that companies manage their PMS and that a better understanding of the relationships between PMS, rewards and individual behaviours is required (Kaplan and Norton, 2001; Franco and Bourne, 2003). Evidence from the initial fieldwork study (Chapter 7) and the industrial workshops contributes to this area by describing the impact that appraisal and reward systems can have on the behaviour of individuals depending on their focus and content and the relationship of individual behaviour with the design and implementation of TPMS. The other two factors (i.e. business process view and team maturity) have not been addressed in the literature and as a result, they make a novel contribution to theory on TPMS design.

Appendix D4 summarises the impact of these three factors on TPMS design and implementation.

Regarding the impact of organisational culture, although previous research addresses the impact of culture on the implementation of PMS (Kaplan and Norton, 2001; Bourne et al, 2002; De Waal, 2002; Vakkuri and Meklin, 2003), this study generated new insights by revealing certain features of the organisational culture that have an impact on the design of effective TPMS. It identified three features of the culture that can potentially constrain the design of effective TPMS (i.e. *loose/informal/disorganised*, *competitive/individualistic, centralised power on critical functions* and *command and control*) and another three that provide the most suitable environment for designing effective TPMS (i.e. *high performance, flexible and adaptable, centralisation of power on teams*). Appendix D4 describes in more detail each of these cultural features and their impact on TPMS design and implementation.

The workshops showed that although all ten factors have an impact on the design of TPMS, the degree of impact considerably varies from one factor to another. In fact, it appears that some of these factors could act as blockers and/or drivers of the TPMS design process no matter what other factors are in place. In order to further refine the understanding of the factors that affect the design of effective TPMS, it is important to understand (1) the relative impact of different factors and (2) the relationships between them.

The main limitation of the findings described in this chapter is that teams were not in their natural environment while designing the TPMS. Teams exist within dynamic organisational contexts, which influence their behaviour. This limits the validity of team experiments conducted in controlled, isolated environments (Sundstrom, 1990; Hackman, 1990). For example, data related to areas like *management commitment* or *organisational culture* would appear to be more reliable when collected inside the context where teams operate. In order to increase the understanding of the factors (and their relationships) affecting TPMS design it is important to carry out a study 'in-situ'.

Similarly, the assessment of the usefulness and impact of using the TPMS construct was based on the impressions of the teams after the workshops. It was, however, necessary to assess the usefulness and impact of a structured TPMS design approach during a more thorough and detailed application exercise. This required the researcher to get involved in a longitudinal study.

Chapter 10 describes the TPMS design project that was carried out in a Scottish natural mineral water company using an action research approach.

10. DESIGNING AND IMPLEMENTING A TPMS IN HIGHLAND SPRING LTD.: AN ACTION RESEARCH STUDY

Uisge beatha – the water of life

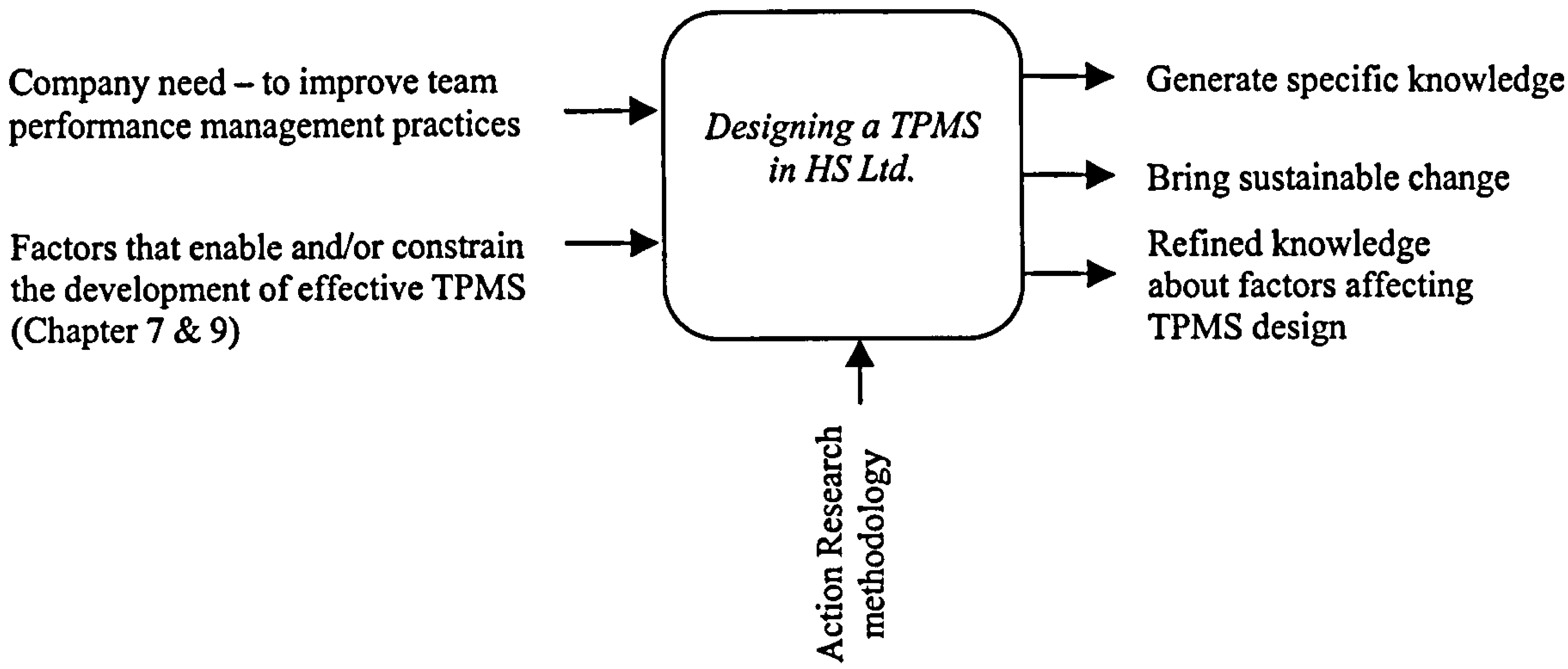

Figure 10.1: Chapter 10 input-output diagram

The following chapter describes the TPMS design and implementation study carried out in Highland Spring (HS), a natural mineral water company in Scotland. The purpose of the study was to refine and further extend the knowledge generated in previous chapters by designing and implementing a TPMS in the real context where teams operate. For doing so, the researcher adopted an action research (AR) approach. The objectives of this AR study were concerned with refining the understanding of:

(1) the impact of the factors affecting TPMS design

(2) the relationships between these factors

(3) the process for designing TPMS

(4) the impact of using a structured TPMS design approach

This study not only allowed learning about the design aspects but also about the implementation of TPMS.

Although this chapter is described at this particular point of the thesis, it is important to highlight that the AR study took place in parallel to the development of the TPMS design construct (Chapter 8) and the industrial workshops (Chapter 9).

10.1. Rationale of the AR study

HS was one of the four organisations actively collaborating since the start of this research project back in 2000. At that time HS was fully involved in a project to redesign the production lines. HS had agreed a key contract for 3 years with one of the leading UK supermarkets and, in order to cope with the future demand, was installing advanced bottling machinery.

The representative from HS collaborating in the project was the Project Manager. He was in charge of the manufacturing department and the management of the investment project. He was aware that, in order to cope with the fast rate of growth, HS required a global change of the business structure and the internal systems. The issues that HS was facing were typical for a company that had grown exponentially in a short period of time. They had increased in size from approximately 80 to 200 employees and sales had increased 100% in 4 years. HS was highly successful and had a very prosperous future ahead but its growth required changes in the way that the business was managed. They not only needed to invest in the latest equipment and machinery but also to develop new working practices and skills at all organisational levels. This meant challenging the existing culture of the organisation.

The initial focus of the change project was on the manufacturing department where all the investment on equipment was taking place. The manufacturing department was split into different functions and the Project Manager knew that these needed to be better integrated if the new bottling lines were to be efficient. As a result, improving the existing teamwork practices was high in his agenda.

After the initial study of the company (which was summarised in Chapter 7), a report that highlighted the areas for improvement regarding teamwork and performance measurement practices was prepared and presented to the Company. This opened the door to extending the collaboration with HS through an industrial secondment supported by the EPSRC.

From a research perspective, this industrial secondment provided a great opportunity to refine previous findings and to understand issues related to the design and implementation of TPMS in action, while working with a real team. This would give the researcher access to study several aspects of the organisation that would not be possible by using other research strategies (e.g. case studies).

This AR study started at the beginning of June 2001 and lasted for 12 months. During this time the researcher spent approximately 60% of his working time on-site.

10.2. Scope and industrial objectives of the study

AR studies need to make a contribution to practice as well as generate new theory. The objectives of the project are, therefore, split into industrial objectives and research objectives. The research objectives of this study were pointed out in the introduction to this chapter. From the perspective of HS, this AR project had two main objectives:

- to form a team at an operational level from 3 to 6 disparate departments, aligned to the manufacturing process
- to design and implement a performance measurement and management system for the Production Team

This study focused on the Production Team for two main reasons. Firstly, there was huge pressure coming from top management to improve manufacturing efficiency. In spite of all the investment, sales figures were 13% less than budget, efficiency figures were low and labour and overhead costs were increasing. As a result, it was critical to get the Production Team up to speed with the new machinery. Secondly, the Project Manager had authority over the manufacturing side of the business. Getting the commitment from other departments within the order fulfilment process would require plenty of negotiation prior to starting the project and this would jeopardise the accomplishment of the objectives of the AR study.

10.3. Introduction to the Company and the Team

HS is the UK's biggest British brand of natural mineral water exporting to over 50 countries worldwide. HS employs 200 staff and plays an important part in the local community.

HS currently produces two brands, each of them operating in two different markets: the Company's own brand and the Retail brand. HS water is available in still and sparkling with a wide range of packs and sizes to choose from

10.3.1. Structure of the Production Team

The Production Team is aligned to the product manufacturing process. Figure 10.2 shows the basic operation flow and the different functions involved in the process.

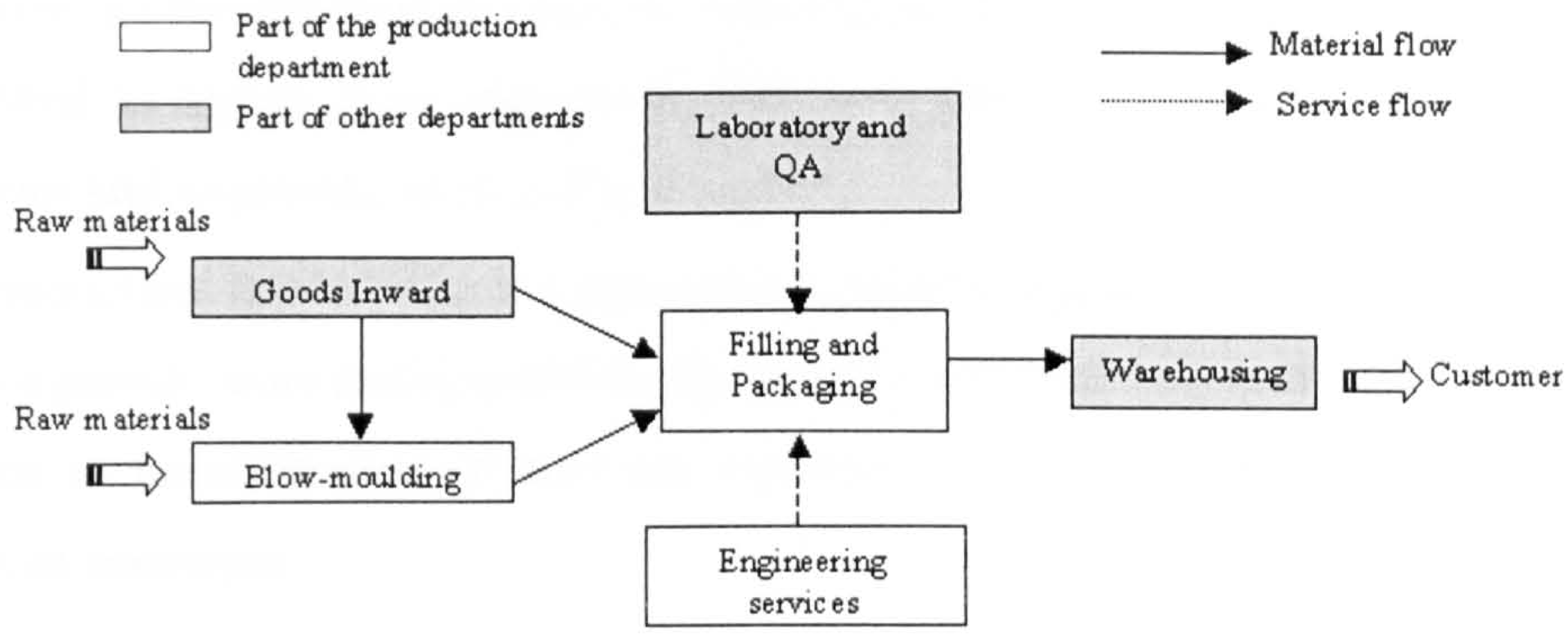

Figure 10.2: Product manufacturing process

The Production Team consists of 12 members (including the Project Manager) and includes members from three functions, i.e. *blow-moulding, filling and packaging*, and *engineering.* The rest of the functions involved in the process are part of other departments outside the scope of authority of the Project Manager and that is why they did not initially get involved in the project.

10.3.2. Findings from the background study

The researcher had previously done a preliminary study of the Company during the exploratory research phase (Chapter 7). The main findings from this initial analysis were the following:

- Functionally structured organisation with a clear distinction between different department and functions. This results in a lack of cross-functional communication and a blame culture between the three functions that form the Production Team. The existing structure is a barrier for the team members to understand the common goals of the production process.

- Paternalistic and disorganised culture. Although some managers are keen to empower employees, there is still a paternalistic type of management where managers told their staff (and these expected to be told) what to do. The company uses very informal and unstructured procedures for decision-making, communication and performance management. There is a loose and informal management style with very approachable management at all levels.

- There is not a structured strategy management process in place and so, strategy is not translated into operational goals for the Production Team. As a result, team members have an evident lack of business awareness.

- There is not any structured PMS recognisable within the organisation. At the top-level the company only uses lagging financial measures such as sales and profit figures. The only measure used by the Production Team is 'line efficiency', which is too generic and is not clearly linked to higher level objectives. This is a barrier for eliminating the causes of inefficiencies and improving team performance.

❑ The Production Team does not behave like a team, it is just a group of people. It can be defined as a *pseudo team* and it is still in the early days of the *forming stage*. Team members have a lack of understanding of the team concept and in some cases there is a negative perception of teamwork.

10.4. Designing the AR study

The first task of this study was to develop a research framework that would serve as a platform to guide the AR project (see Figure 10.3). This framework consisted of three elements, including the *research frame, AR process* and *operating principles.*

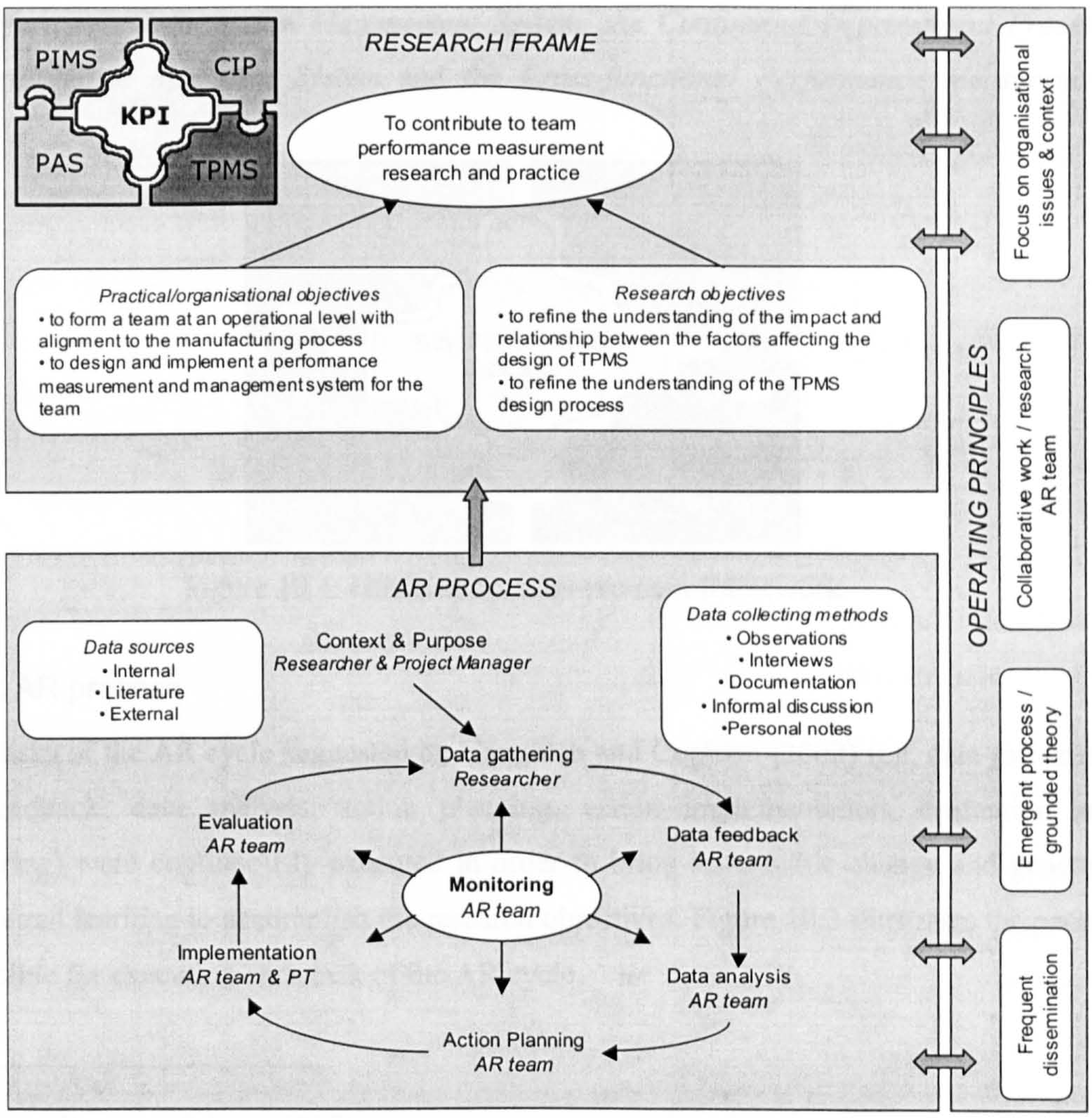

Figure 10.3: The AR framework

10.4.1. The research frame

The research frame puts the study into context and defines the practical and research objectives of the study. On entering HS the researcher realised that this study had to be an integral part of a bigger business improvement project. There were two other Teaching Company Scheme[17] (TCS) improvement projects starting within the Production department and both had a clear relation to this AR study. The objectives of these two projects were to:

- improve the performance related information management systems of the production process, with a special focus on upgrading the data capturing systems
- embed a continuous improvement culture within the Production department

There were several overlapping areas between the three projects and these were integrated within a department wide improvement project (see Figure 10.4). *Key Performance Indicators (KPI)* were at the centre of the improvement project and they formed the basis for the *Performance Information Management System, the Continuous Improvement Process, the Performance Appraisal System* and the *Cross-functional Performance Measurement System.*

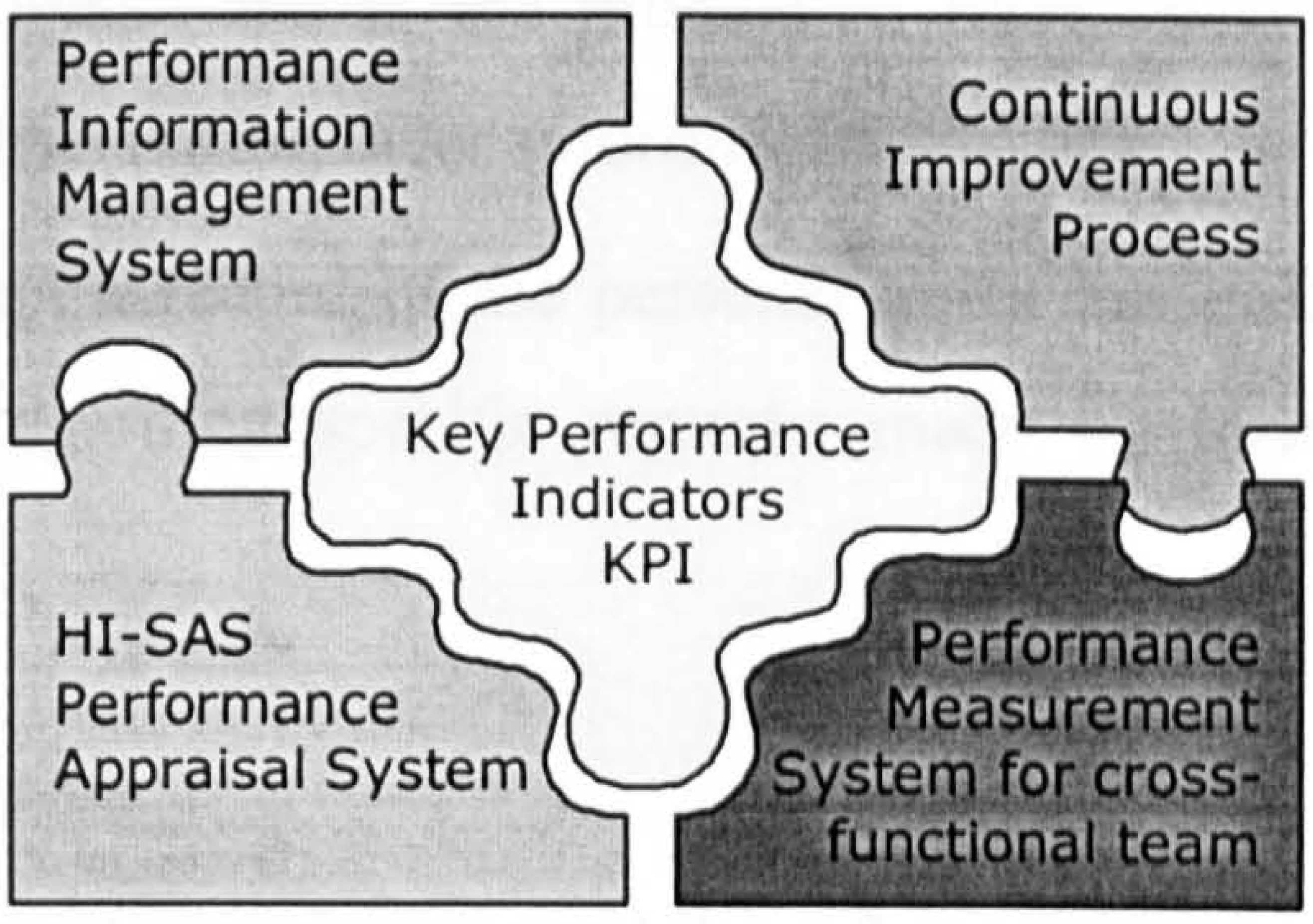

Figure 10.4: HS business improvement framework

10.4.2. AR process

The 7 tasks of the AR cycle suggested by Coughlan and Coghlan (2002) (i.e. data gathering, data feedback, data analysis, action planning, action implementation, evaluation and monitoring) were continuously executed in order to bring sustainable change and generate the required learning to accomplish the research objectives. Figure 10.3 illustrates the people responsible for executing each task of the AR cycle.

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[17] Teaching Company Scheme (TCS) is a programme supported by the UK government that supports the close collaboration between universities and industry. The academic liaison for the above two projects was the Centre for Strategic Manufacturing, University of Strathclyde.

10.4.2.1. Data sources

There were three main sources of data used during this study: (1) *internal sources* within HS; (2) the data available in the *literature* and (3) data from *external sources* (i.e. visits to other companies and the industrial workshops).

10.4.2.2. Data collection methods

The data collection methods used included *participant observations, interviews, documentation, informal discussions* and *personal notes.* Data was collected during team meetings, presentations and other situations that involved interacting with the employees.

Interviews were carried out at the beginning of the study. This provided a clear understanding of the views and concerns of the employees with regard to TPMS. During the course of the project, several one-to-one discussions were held with the team members in order to assess their feelings and concerns regarding the several changes that were taking place.

A very valuable data collection method was informal discussions held with team members during the coffee/lunch breaks and at the production lines. Staff usually made the most sincere and honest comments during these informal discussions.

Finally, the researcher kept a record of the personal notes made during the project. These provided valuable data regarding specific remarks made by team members and related observations.

10.4.3. Operating principles

The operating principles guided and supported the AR process towards the accomplishment of the end goals. They also provided a platform to ensure that a rigorous and reliable research approach was followed and to increase the quality of the overall AR study. These were the following:

10.4.3.1. Focus on organisational issues and context

For the purpose of this study, the researcher entered the Company with knowledge gained from the previous phases of the research project (i.e. the factors affecting the design of TPMS and the features of the TPMS design process). This provided a degree of focus for the study. The researcher, however, tried to challenge these assumptions by keeping an open mind to any aspects that would bring new insights into the design of TPMS.

10.4.3.2. Collaborative work and research

One of the first tasks was to create a steering committee (AR team) that was responsible for planning, implementing and evaluating the improvement actions. The AR team consisted of five members including the two TCS associates, the Project Manager, the Engineering Manager and this researcher. In addition, two academics (i.e. PhD and TCS supervisors) were supporting the project in order to bring the academic and industrial perspectives closer together.

The AR team provided continuous support to the Production Team on their everyday activities. This close cooperation was deemed necessary to achieve sustainable change and to increase the degree of acceptance of the improvement project from the Production Team members.

10.4.3.3. Emergent process / grounded in theory

This AR study was executed by continuously diagnosing the situation, planning the required actions, implementing the actions and evaluating the effect of these actions. The findings of the study was continuously compared with the existing literature and findings from previous phases of this research in order to find confirming and/or disconfirming aspects.

10.4.3.4. Frequent dissemination

During this study, findings were first discussed with the members of the steering committee and then presented to the Production Team in order to get the feedback. The findings were also continuously discussed with other colleagues at the University.

10.5. Story of the AR study

The following section narrates the AR study focusing on the most relevant stages:

10.5.1. Project initiation

The AR study started with a presentation to the Production Team members, functional managers and several senior directors (i.e. Operations Director, Finance Director and Marketing Director). After the presentation the researcher arranged a meeting with each of the attendees in order to better understand their views and concerns.

The key issue was going to be bringing all team members on board the project. Some team members were unaware of concepts like 'business process' or 'cross-functional team' and they did not have a good understanding of the purpose and benefits of using performance measures.

An initial assessment of the production team highlighted the following areas:

- A very reactive management style with little emphasis on planning and problem solving activities
- A complete lack of information regarding the performance of the production lines apart from the 'line efficiency' figures. Downtime was not recorded and analysed, which minimised improvement opportunities
- No performance goals. The team members had a lack of understanding of the impact of their role in achieving the overall goals of the organisation. They did not see the relationship between machine breakdowns and profit figures.

As a result of this initial assessment, the AR team designed an improvement process (Figure 10.5) that was presented and discussed with all functional managers and team leaders. This improvement process included an action plan to tackle several of the factors affecting the design of TPMS (i.e. process mapping, education on measurement, policy deployment, appraisal and reward systems), all of which would also improve team performance.

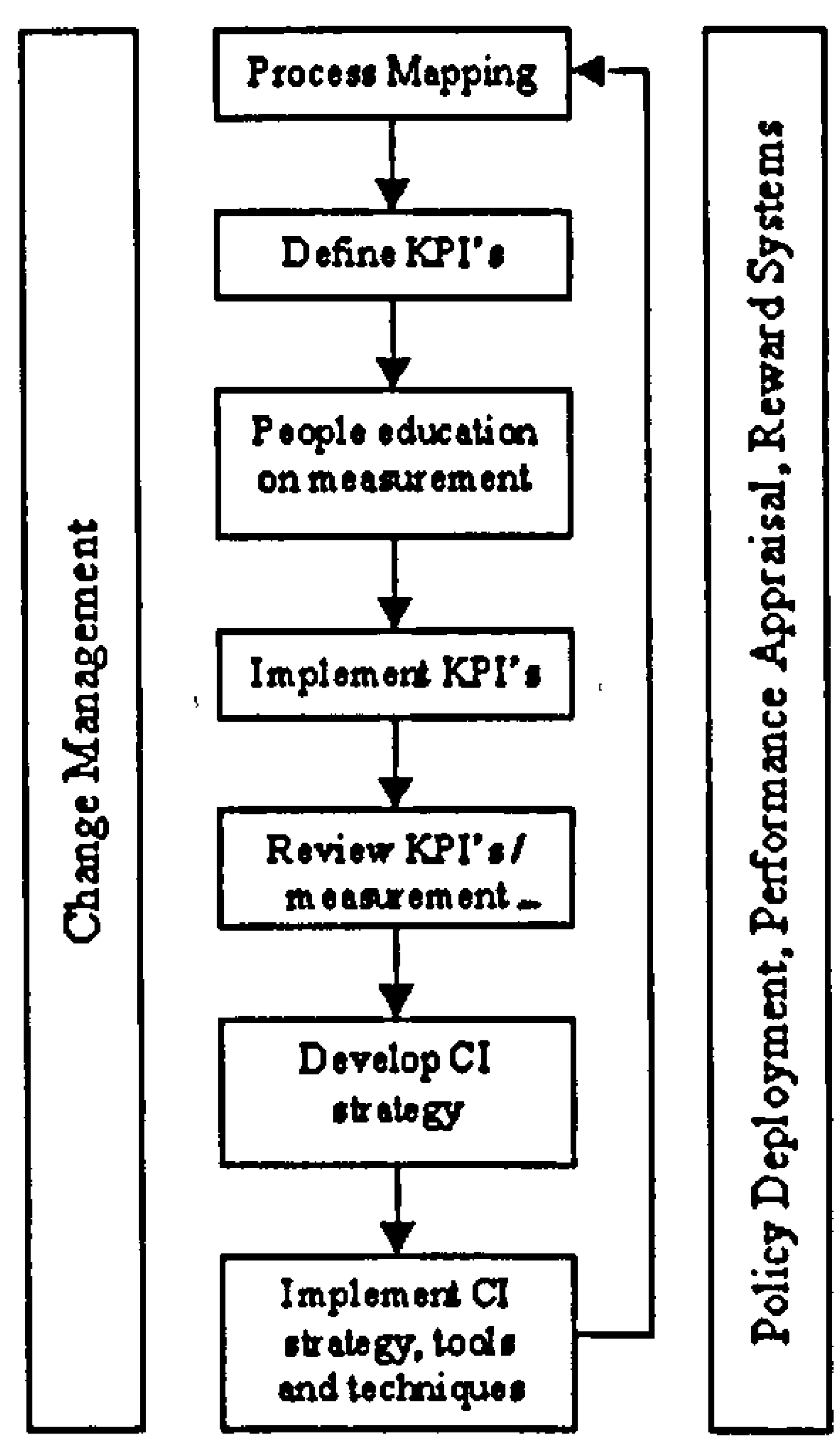


Figure 10.5: The improvement process

10.5.2. Designing the TPMS for the Production Team

The following section describes the activities carried out while designing the TPMS for the Production Team. It starts by illustrating the specific TPMS design process used in HS.

10.5.2.1. The TPMS design process

As previously mentioned in Chapter 9 (p.210), due to the limited duration of the industrial workshops, it was important to carry out a more in-depth and longitudinal study to evaluate the usefulness and impact of TPMS design construct.

The TPMS design construct developed as part of this research (Chapter 8) was not directly applied in HS. Instead, the process for designing the TPMS was developed 'organically' by the Production Team. There were two main reasons for that. Firstly, the construct was being developed in parallel to this study and as a result, the researcher did not have a finalised version of the workbook ready at the time when this AR study started. Secondly, because of previous experiences, the Production Team did not appear to be keen on adopting tools (the TPMS design construct in this case) proposed by external sources. In order to increase the participation and commitment of all the team members, it was necessary that the team members themselves, with the support and facilitation of the AR team, developed the process for TPMS design.

The logic behind the process used by the Production Team was very similar to the process that the TPMS design construct follows (Figure 10.6). The only difference was that it was customised to the needs of HS. Applying this TPMS design process in HS allowed the researcher to further evaluate the usefulness and impact of using the construct.

The HS process started from the identification of company strategy and the requirements of the customer as the only stakeholder of the team. The idea behind this was to keep all the efforts of the team focused on satisfying the customer while contributing to the company strategy. The AR team also decided that deploying the team objectives to each of the three functions that formed the Production Team was a critical activity. Team members were still thinking in terms of functions and so it was important to show them how each function supported the team strategy.

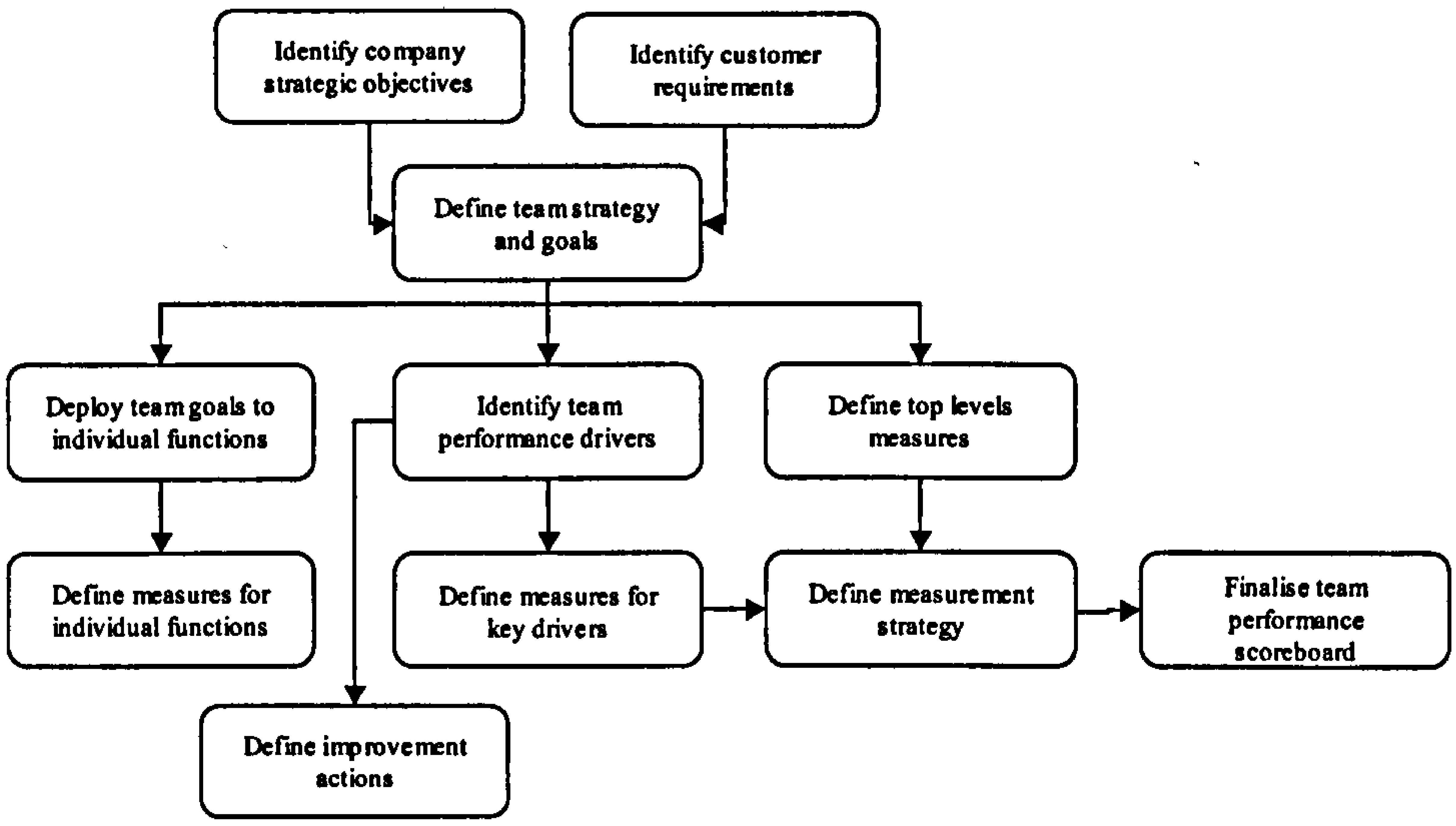


Figure 10.6: Process for designing the TPMS in HS

10.5.2.2. Identifying team objectives

Developing a performance measurement system for the Production Team was a difficult task without having clear goals for the Operations department. In addition, the Company's strategic goals were not clear to everyone. The first task, therefore, was to define appropriate goals for Production.

The strategic goals for the business were to (1) *increase profit* and (2) *increase market share.* From these strategic objectives the vision for the Production Team was clear. The vision was *to be a low cost producer.* On the other hand, the key requirement from the customer was *responsiveness.* It was, therefore, critical for the Production Team not to be a low cost producer at the expense of flexibility.

HS operates in a very fast growing and unpredictable market. Two days of hot weather could turn the monthly sales forecast, and consequently the production plan, upside down. In addition, Production had to cope with a broad range of products and the continuous changes in the labels and packaging format for special promotions. All this meant that the team had to develop production processes that were highly efficient while increasing its flexibility to be responsive to customer demands.

The identification of strategic goals, the vision for the team and the customer requirements facilitated the identification of the objectives for the Production Team as follows:

1. to minimise manufacturing cost per case
2. to increase customer satisfaction
3. to increase new product introduction (NPI) capabilities

All efforts soon focused on the first of the objectives, to minimise manufacturing cost per case. In fact, customer satisfaction and NPI capabilities were closely related to the first objective. A reduction in manufacturing cost per case meant an increase in line efficiency and product quality, both of which had a direct impact on responsiveness and on customer satisfaction. Minimising manufacturing cost per case also meant stabilising line performance and having most variables under control, which in turn increased the capabilities for successfully introducing new products.

10.5.2.3. Managing cost per case

Cost per case is a variable affected by several factors (Figure 10.7). The Production Team could make the biggest impact on this variable by reducing production and labour costs.

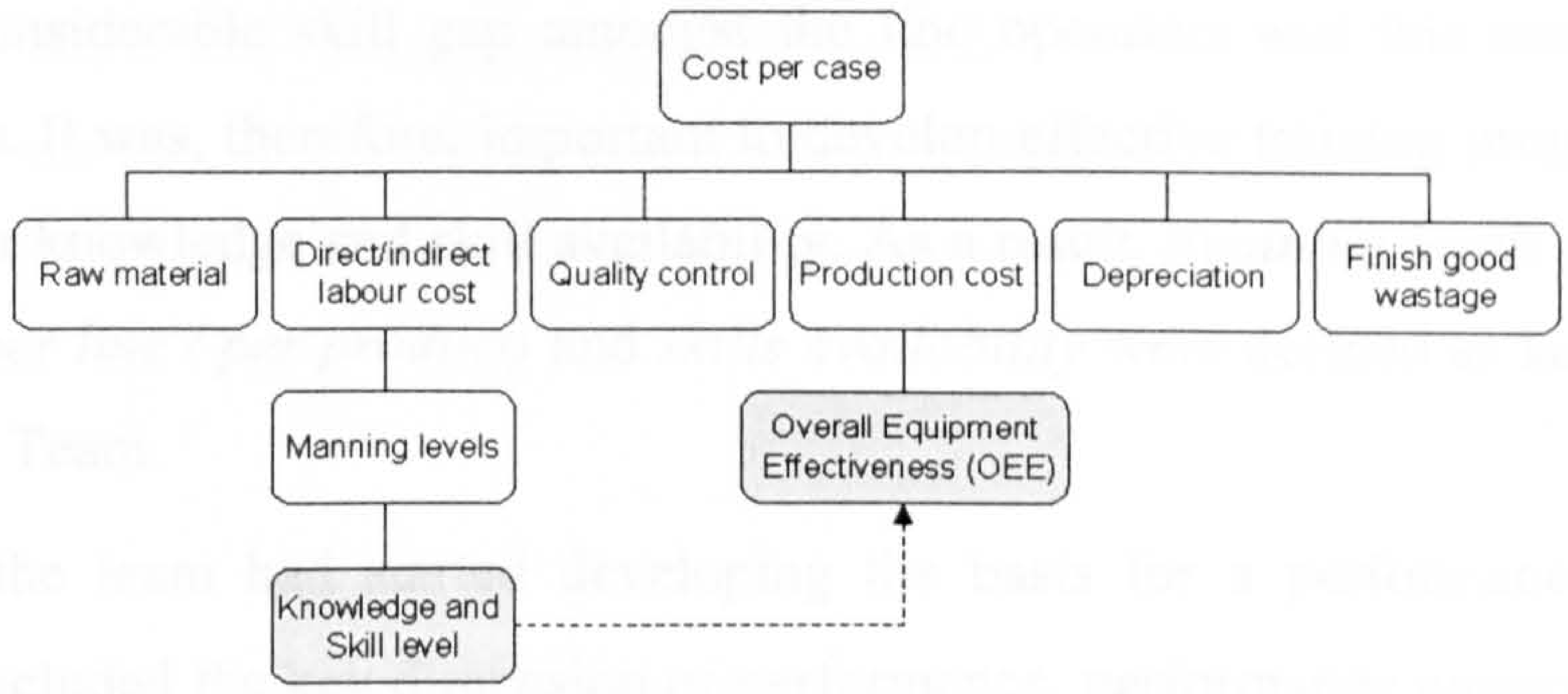


Figure 10.7: Analysis of cost per case

In order to reduce production costs it was critical to increase line efficiency levels. *Line efficiency*, however, was a measure that provided very little information about the overall line performance. This measure did not take into account variables such as quality, changeovers times or availability, all of which had a big impact on manufacturing cost and provided a richer view of line performance. A common measure in continuous processes like the one in HS is Overall Equipment Effectiveness (OEE), which combines *quality, availability* and *performance* figures. In order to collect data related to OEE, however, a more advanced data capturing system was required.

A key factor affecting OEE were line changeovers. The number of changeovers was continuously increasing and the Company expected this trend to continue. The Production Team was aware that line efficiencies during the first hour of production after changeovers tended to be very low. In fact, when first hour efficiency was high the rest of the product run would also run in high efficiency levels. Therefore, *first hour efficiency* was defined as a key performance measure for the Production Team. First hour efficiencies tended to be higher when lines where properly tested before production and when the changeover crew and the

Production Team had a 'handover meeting' to explain any issues occurred during the changeover.

Another factor that needed to be monitored was *changeover time.* Reductions in changeover time provided more time to test the lines so that they were adequately set-up prior to production. This had a positive impact on the entire production run. In line with this measure, the AR team and changeover crew started studying the changeover process in order to identify areas for improvement.

The other variable having a big impact on *cost per case* was *labour cost.* The main reasons for the increasing labour costs were high overtime and over budget manning levels. Manning level was closely related to the knowledge and skills of the line operators. It was evident that there was a considerable skill gap amongst the line operators and this resulted in higher manning levels. It was, therefore, important to develop effective training programmes and to closely monitor knowledge and skill availability. As a result, m*anning levels (=actual minus targeted men per line / per product)* and *skills availability* were defined as key measures for the Production Team.

By this time the team had started developing the basis for a performance management system. This included the key dimension of performance, performance measures and several improvement activities (Table 10.1).

Key dimension	Measures	Improvement activities
Manufacturing cost per case	OEE Line efficiency First hour efficiency Changeover time (only for changeover crew) Manning levels Skills availability	To develop an effective data capturing system To study and improve changeover process To hold effective 'handover meetings' between changeover and production and different production shifts To develop training programmes and training matrixes

Table 10.1: Initial TPMS

The next step was to get the team members into the habit of using the measures. For doing this, the first action was to improve the existing data recording and analysis systems. The existing information regarding line performance was not sufficient to identify the root causes of poor performance and generate appropriate improvement action. A data-recording sheet was designed to facilitate team leaders in recording the required information. Team leaders started supervising the overall running of the lines in order to better understand the origin of the problems and to identify and prioritise key improvement areas.

10.5.2.4: Translating and deploying Production Team goals

Turning the Production Team goals into operational goals for each of the functions (i.e. blow-moulding, filling and packaging, and engineering) was a critical task. Team members could not think in terms of team goals because they were still focusing on functional goals. It was, therefore, important to show them how each function could affect the common goals of the Production Team. Members of the AR team worked alongside the Production Team in order to link the strategic objectives for the Production Team with the key areas of responsibility for each function. Special emphasis was placed on those areas that had a major impact on manufacturing cost per case (i.e. OEE and manning levels).

10.5.2.5. The complete TPMS

Going through the TPMS design process allowed the Production Team to identify the key variables that needed to be managed in order to enhance the competitiveness of the Production Team (Figure 10.8). This resulted in the development of the TPMS for the Production Team.

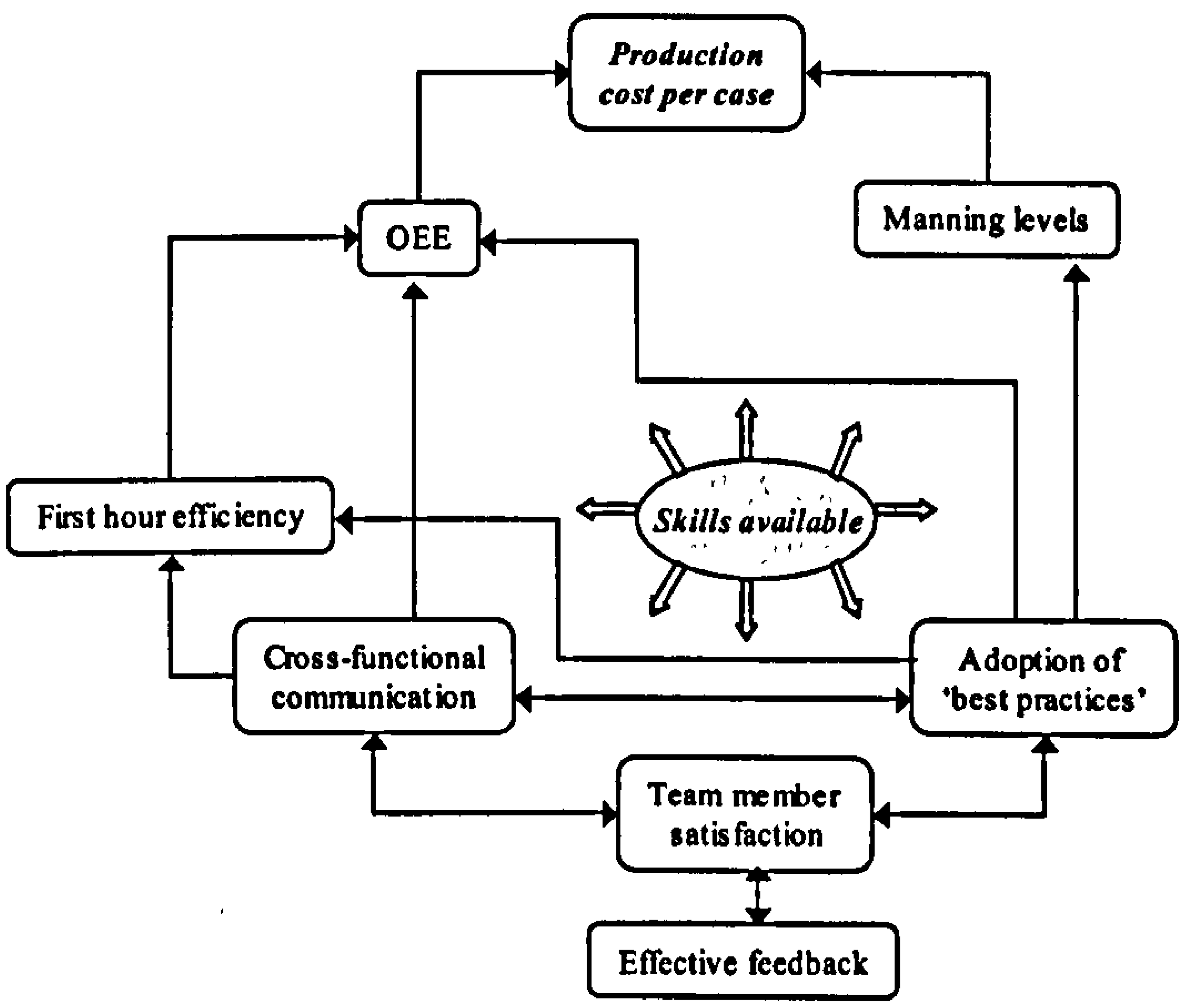


Figure 10.8: Relationships between key variables

Figure 10.9 illustrates the Production Team scoreboard, which includes the key dimensions for measurement. The scoreboard included variables related to the team outcomes and the drivers of performance. The outcome variables covered the four key dimensions represented in the team performance model (Chapter 5), i.e. effectiveness, efficiency, team learning and growth, and team member satisfaction. It also determined the source of data for each of the measures (see Table 10.2). The sources of data varied depending on the measures, and included the SCADA (Supervisory Control And Data Acquisition) system that was being implemented as part of the improvement project, the ERP system, training records, surveys and observations.

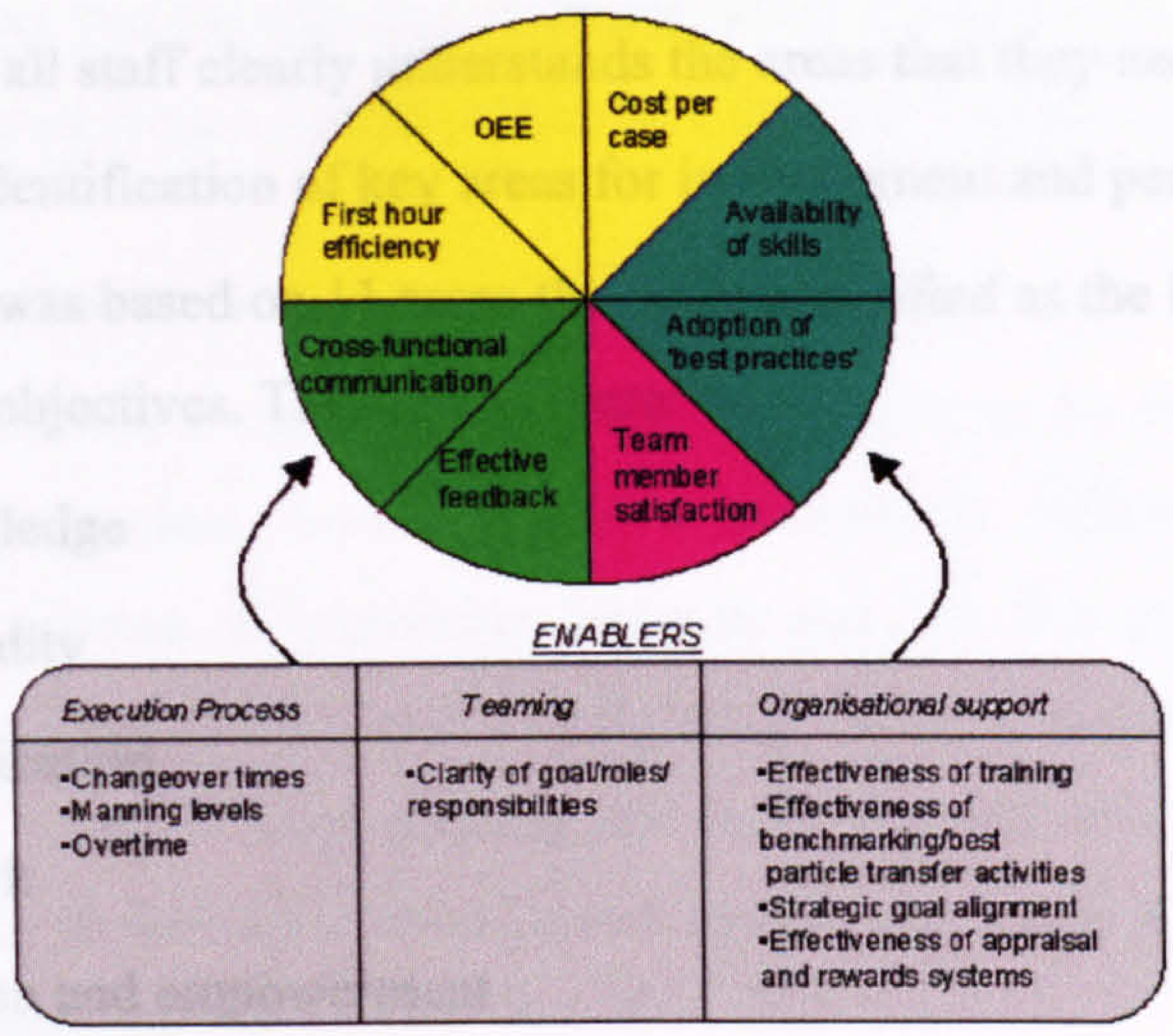


Figure 10.9: Production Team scoreboard

Dimension	Measure	Data source
(1) Effectiveness	(1) Overall Equipment Efficiency	SCADA system
	(2) First hour efficiency	SCADA system
	(3) Cost per case	ERP system
(2) Efficiency	(4) Cross-functional communication	Communication survey Observations
	(5) Effective feedback	Employee survey Observations
(3) Leaning and growth	(6) Skills shortage	Observations Performance appraisal Training records
	(7) Adoption of 'best practices'	Observations Benchmarking exercise
(4) Team member satisfaction	(8) Team member satisfaction	Employee satisfaction survey

Table 10.2: Dimensions, measures and data sources for Production Team PMS

10.5.3. Other parallel activities

While designing the TPMS the AR team carried out parallel activities to support the TPMS design process and to improve overall team performance

10.5.3.1. Developing a performance appraisal system

The development of an appraisal system would support the design of a TPMS by increasing the focus on the team and individual objectives. The objectives of the performance appraisal system were:

(1) to provide effective feedback to staff on their performance;

(2) to align all team efforts towards the same common goals;

(3) to ensure that all staff clearly understands the areas that they need to excel at; and

(4) to allow the identification of key areas for improvement and personal development.

The appraisal system was based on 11 areas that were identified as the key drivers to achieve the Production Team objectives. These areas were:

1. Job knowledge
2. Work quality
3. Communication
4. Teamwork
5. Motivation and empowerment
6. Training
7. Systems and tools availability
8. Environment management
9. Ability to cope with new product introduction
10. Policy compliance
11. Departmental management

10.5.3.2. Re-structuring the Production Department

The AR team was aware that the introduction of the new measures and the appraisal system would not be enough for the Production Team to be competitive in the medium term. It was important to re-structure the department around the production process and to adopt a structure similar to that shown in Figure 10.10. This would enable the Production Team to operate better as a team and to improve the overall line performance.

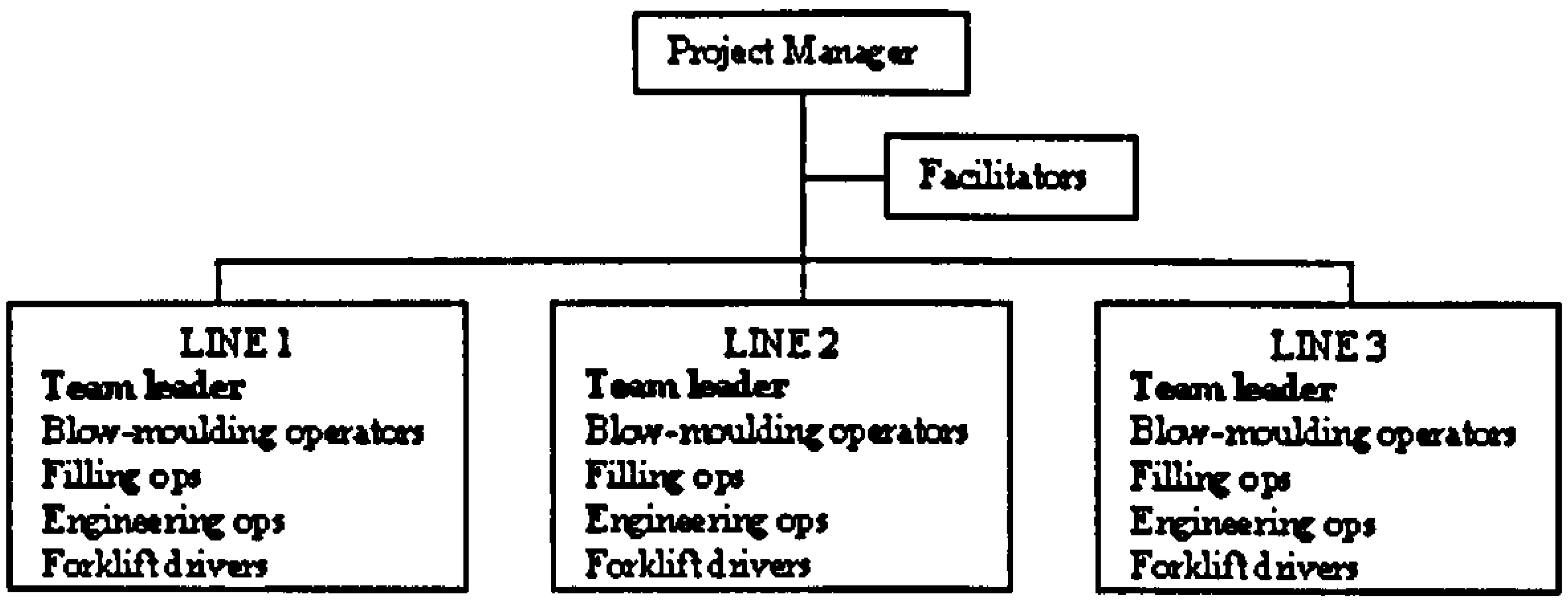


Figure 10.10: Future structure for Production

In order to increase the flexibility of the team it was also important to develop a multi-skilled workforce. This was especially relevant to improve the capabilities to do the changeovers. At that time there was only one crew capable of doing the changeovers, which always took place overnight. This limited the flexibility of Production. It was important, therefore, to ensure all line operators had the required skills for doing changeovers. This was essential to allow Production to move from a 2-shift pattern to a 24-hour 7 days-a-week pattern.

10.5.4. Factory acceptance test: alarms go off!

The design of the TPMS was a useful and stimulating experience for everyone involved. The implementation of the system, however, was a completely different story. There was pressure from above because of increasing demands and low line performance. Managers and team leaders spent most of their time 'fire fighting' rather managing the lines. The prime responsibility was to keep the lines running and there was still the feeling amongst team members that using the performance management system was 'extra work' and not a support mechanism for improvement.

That was the situation when the time for the Factory Acceptance Tests arrived. The objective of these tests was to do the final assessment to the new lines in order to sign off the contract with the machine suppliers. During the tests, only 2 out of the 9 product runs achieved the output targets. The test results showed that most of the downtime was caused by problems internal to HS like set-up problems and long periods for problem solving. These results 'activated the alarms' across HS. The machine suppliers had done their job and now it was time for the Production Team to achieve the expected performance levels.

10.5.5. A metamorphic change

In January 2002 (six months after the AR study commenced) the company brought in management consultants to do an assessment of the overall situation of the business. This sent a strong message to all employees throughout the company. This time the CEO was fully committed to finding the root causes of the problems and solving them. The assessment report provided by the consultants highlighted the same areas that the AR team was starting to manage. The key difference on this occasion was that the CEO was driving the project from the top. The management consultants were acting as a link between the CEO and Operations.

10.5.6. Managing with measures

Once the CEO started driving the project, the whole picture of the project changed. The CEO started requesting performance related information in order to assess the progress of the project and 'constructively questioning' performance levels. As a result, the Production

Team started actively using the measures related to 'line efficiency', 'first hour efficiency' and 'changeover time' in order to achieve their key objective (i.e. *to minimise manufacturing cost per case*) and vision (i.e. *to be a low cost producer*).

Hourly meetings were held with the Production Team to review the performance of the lines, review any problems that occurred and take the adequate actions. In addition, every morning an overall review of the previous days performance was carried out.

All the performance related data was being put into an IT-based reporting tool, which generated all the performance reports. These reports were accessible via the intranet system. The performance reports were also displayed next to the production lines in order to enhance the visibility of the information and provide feedback to all operators.

Management also started providing the resources to ensure that all the required skills for minimising manufacturing cost per case were developed. As a result, training matrixes with the corresponding training programmes were developed and displayed.

Although developing measures and identifying drivers against the four dimensions of team performance (Figure 10.9) had shown to be very useful, not all of these measures were implemented during this study. There were several reasons for this. Firstly, due to the urgent need to improve efficiency levels, it was critical for the team to fully focus on the objectives related to line performance. At the same time the team started defining improvement actions to improve and manage the drivers of performance (e.g. cross-functional communication, availability of skills) but without including the correspondent measure in the TPMS. Secondly, the team was still in the early days of working as a team. Some team members did not have a clear understanding of the real meaning of teamwork and team performance and so, they did not clearly understand the value of measuring some of the dimensions. Finally, measuring variables such as *cross-functional communication* or *effective feedback* required the use of descriptive measures and experienced raters that the team did not have at the time. These observations support the view that teams with different levels of maturity require different measures. This was earlier discussed in Chapter 9 (Section 9.7).

10.5.7. Project termination

The AR study concluded in June 2002 with a presentation to the Production Team, the Operations department managers and the TCS programme supervisors. Both the TCS programmes would continue for one more year and therefore, the improvement project went ahead. A final report was also prepared and sent to the EPSRC[18] reviewers.

In March 2003, the Company moved to a 24/7 production approach (4-shift pattern). This resulted in a major re-structuring of the Production department. The role of the functional manager (i.e. blow-moulding, changeover, filling and engineering) has disappeared. In the new structure, team leaders are responsible for the operators along the entire process. In addition to the team leaders, there is now a shift manager responsible for the shift performance and for supporting and coaching staff. He also acts as a link with other functions. The current structure is similar to the one described in Figure 10.10.

During a recent conversation with a shift manager (who was a member of the AR team) he stated that the measurement system is currently used proactively for decision-making and continuous improvement. Although HS is still mainly using process related measures (i.e. OEE, first hour efficiency, cost per case) the plan is to start introducing the new measures, together with the appraisal system, as soon as people are settled into the new structure. Due to the high number of new operators, requiring intensive training, there is a high variance in performance between different shifts and the Production Team is not yet achieving the targeted levels which will enable it to meet the vision of *low cost producer.*

The SCADA system is fully implemented and allows the Production Team to have accurate data in order to analyse line performance and define improvement actions. The Company is also using the COGNOS reporting tool to create performance related reports, which can be viewed though the intranet system. Since the team started using the performance measures and putting them in the intranet system, a more proactive management style is evident at all organisational levels.

More recently, the figure of the Order Fulfilment Manager has emerged with the aim to streamline the order fulfilment process and better integrating Operations, Sales and Customer Support.

10.6. Business impact of the AR study

Assessing the impact of the AR study in isolation is a difficult task. The aim of the study was to design a TPMS for the Production Team but this was part of a bigger improvement project. In fact, the impact of designing a TPMS *per se* would not be the same without

[18] Appendix E shows the final assessment and evaluation feedback of the EPSRC project from two independent referees.

having an effective data capturing and reporting system and a wider performance management system. The following discusses the impact of the improvement project:

(1) Increased business awareness by explicitly defining and communicating the vision (i.e. to be a low cost producer) and strategic objectives (i.e. to minimise manufacturing cost per case) to the Production Team. Team members have a better understanding of their contribution towards the business goals and the critical areas that they need to focus on.

(2) Enhanced continuous improvement culture through the identification of critical success factors for the Production Team (and for each of the functions). Team members are more aware of the key factors that affect their performance and so, they are carefully measuring and managing them. As a result, considerable improvements were achieved in the following areas:

- 25% reduction in changeover times
- Increased flexibility of staff. 80% of line operators capable of doing the changeovers (previously there was a specialised crew) and running more than one machine.
- Increase of 40% in 'first hour efficiency'

(3) Improved teamwork culture. The identification of common team objectives and performance measures has increased collaboration and cohesiveness between team members.

(4) Improved data capturing and communication via SCADA, COGNOS and intranet.

(5) More proactive and improvement orientated management style. The systematic use of performance measures affected the way managers (from CEO to team leaders) work. Currently, the PMS is actively used for decision-making and improvement.

(6) Increased accountability of team members. The increased accuracy and transparency of the performance analysis resulted in team members becoming more accountable for their actions.

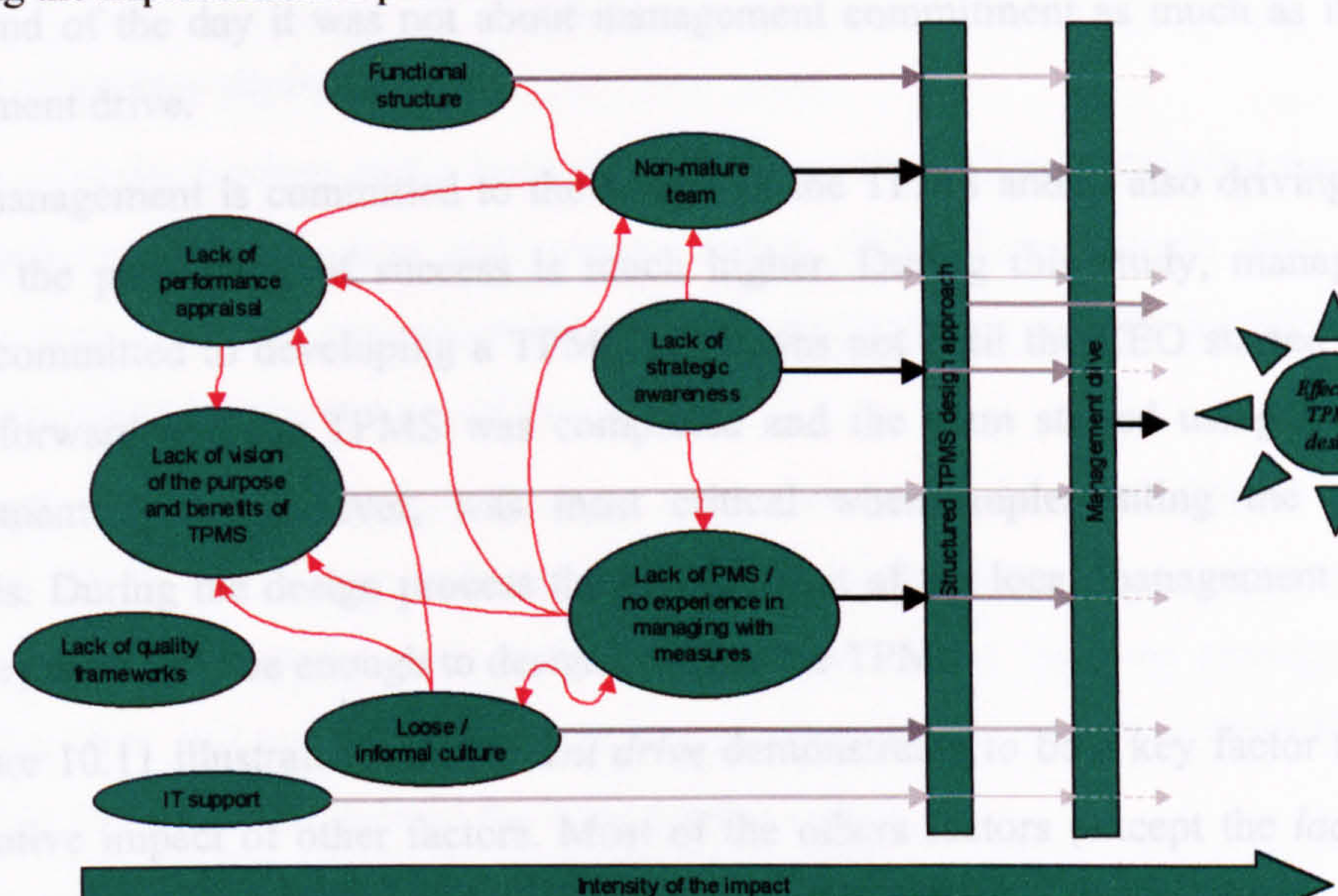
(7) Increased management commitment and support. From the CEO to the rest of the Operations department managers, the improvement project increased company-wide awareness of several areas that were critical in order to increase performance. As a result, there is now an increased support for training purposes, the re-structuring of the Production department and the emergence of the Order Fulfilment Team.

10.7. Reflection of the study

The research objectives of this AR study were to refine the knowledge gained during previous phases of the research regarding (1) the impact of the factors affecting the development of TPMS, (2) the relationships between these factors, (3) the TPMS design process and (4) the impact of using a structured TPMS design. This section discusses the particular learning for the context of HS for later extrapolating this learning into the wider context.

10.7.1. Impact of the factors and their relationships

Figure 10.11 illustrates the impact of the factors affecting TPMS design and their inter-relationships for the particular context of HS. It was evident during the HS study that the phases of design and implementation overlap. In other words, new measures were being designed as others were implemented and used by the team. As a result, some of the factors illustrated in Figure 10.11 not only had an impact on the design but also during the implementation of the TPMS. In fact, the impact of some of the factors was more evident during the implementation phase.



Note: The more towards the right of the bottom arrow the factor is located the higher its intensity or impact. Similarly, the darker and thicker the arrow coming out of the factor, the higher its intensity or impact.

Figure 10.11: Impact of factors affecting TPMS design in HS

This study showed that all factors, except the *lack of quality frameworks,* had a clear impact on the design of the TPMS. Some of these factors, however, were more critical than others. It was evident that the impact of two of the factors (i.e. *management drive* and *the structured TPMS design approach*) acted as a 'shield' to reduce the negative impact of the rest of the factors.

The following is a more detailed analysis of the impact of the factors that affected the design of the TPMS:

(1) Management drive

During this study, there was a factor that overshadowed the rest: management drive. In fact, there was a point when things took a 180-degree turn. That was when, after reviewing line performance during the *factory acceptance tests*, the CEO decided to drive the improvement project.

Most managers had always seen the potential benefits of the improvement project and they all had shown commitment and belief in the project. This project, however, was not at the top of their priority list as they were also involved in other projects. This time the drive for the project was coming right from the CEO. He started closely monitoring the progress of the project and this sent a strong message to all Production Team members and other manager within the Operations department. Suddenly, all staff within Operations (not only production but also, Planning, Distribution and Quality) got actively involved in the project. At the end of the day it was not about management commitment as much as it was about management drive.

When management is committed to the design of the TPMS and is also driving the design process, the probability of success is much higher. During this study, management was always committed to developing a TPMS but it was not until the CEO started pushing the project forward that the TPMS was completed and the team started using it proactively. Management drive, however, was most critical when implementing the performance measures. During the design process the involvement of the local management (i.e. Project Manager) showed to be enough to design an effective TPMS.

As Figure 10.11 illustrates *management drive* demonstrated to be a key factor to overcome the negative impact of other factors. Most of the others factors (except the *lack of quality frameworks* and the *structured approach for designing TPMS*) were negatively affecting the design of the TPMS. As soon as top management started driving the project, however, the negative impact of all these factors was considerably reduced, to the extent that an effective TPMS was designed and implemented.

(2) Structured approach for designing the TPMS

The TPMS design approach used in HS was developed 'in-house' but followed the same logic as the TPMS design construct (Chapter8). This proved to be a very valuable element not only to facilitate the design of the TPMS but also to overcome the negative impact of other factors.

The following is a more detailed analysis of the impact of the factors that affected the design of the TPMS:

(1) Management drive

During this study, there was a factor that overshadowed the rest: management drive. In fact, there was a point when things took a 180-degree turn. That was when, after reviewing line performance during the *factory acceptance tests*, the CEO decided to drive the improvement project.

Most managers had always seen the potential benefits of the improvement project and they all had shown commitment and belief in the project. This project, however, was not at the top of their priority list as they were also involved in other projects. This time the drive for the project was coming right from the CEO. He started closely monitoring the progress of the project and this sent a strong message to all Production Team members and other manager within the Operations department. Suddenly, all staff within Operations (not only production but also, Planning, Distribution and Quality) got actively involved in the project. At the end of the day it was not about management commitment as much as it was about management drive.

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Although the TPMS was partially implemented, going through the TPMS design thinking process focused all team members on the key strategic goals and identified the drivers affecting the performance of the team. As a result, the team fully focused on managing and improving these key drivers (e.g. changeovers, manning levels).

The design process also identified that the drivers required the support from management. For instance, it highlighted that, in order to enhance line performance, senior management had to provide the required resources for training and face variances in line performance during the times when line operators were being trained. This sent a strong message to management, that team performance would not improve without the required support from management.

The structured process for designing the TPMS also reduced the impact of a lack of strategy deployment. It encouraged the team to think about company goals and, based on them, to define team goals. The definition of objectives and measures for the entire Production Team encouraged process-thinking, which reduced the negative impact of the existing functional structure.

(3) Lack of strategy deployment

The lack of understanding of the business strategy was a barrier to defining team measures and objectives. The definition and communication of the key strategic objective (i.e. to minimise manufacturing cost per case) to the team members and the identification of the drivers was critical to the success of the project.

The negative impact of the low strategic awareness was minimised due to the use of a structured TPMS design approach and, in particular, through top management drive. These two factors encouraged the team to think and focus on the business strategy. They also provided a clear and unambiguous statement of what the business was expecting from the Production Team and this formed the basis for the TPMS.

(4) Lack of experience of team members in managing with measures

The lack of an organisational PMS and the team members' lack of experience in using structured performance management systems negatively affected the process of designing, implementing and using the TPMS. Team members had little understanding about how to use and manage the performance measures and so, they required to be educated on the subject.

The lack of experience was due to the fact that HS did not have a structured process for deploying and communicating strategy. As soon as the Production Team's vision and key strategic objective were defined, the team developed and implemented a number of performance measures.

The negative impact of the lack of experience was also minimised by the use of a structured TPMS design approach and the top management drive. The drive from the CEO to collect, analyse and present performance data accelerated team learning on the subject of performance measurement.

(5) Low maturity and developmental level of the Production Team

At the beginning of this study the Production Team was described as a *pseudo team* that was just starting to grasp the concept of teamwork. Team members focused on maximising the performance of their function rather than the performance of the entire Production Team. They were not aware of what team performance meant and what the critical drivers affecting team performance were. Without this awareness, designing an effective TPMS was difficult.

The low maturity level of the Production Team was closely related to several of the other factors, in particular to the functional structure of the business. The focus on functions rather than on the order fulfilment process discouraged the collaboration between the different functional members that formed the Production Team.

Again, the structured TPMS design approach and the drive from top management played a vital part in overcoming the negative impact of the low maturity of the team. The TPMS design approach facilitated the identification of the key drivers of performance, which the team started managing.

(6) Functional business structure

Team members were focused on improving functional performance rather that process performance. The company as a whole was functional, which meant that other departments providing inputs (Planning) and receiving outputs (Distribution, Sales) from the Production Team were not adequately integrated. As a result, there were not specific objectives for the process and team members could not think in terms of process performance. This was an important constraint to develop and implement team performance measures.

(7) Loose and informal organisational culture

The culture of HS was paternalistic, loose and informal. Until management started driving the project forward, team members did not show a participative and proactive behaviour.

HS had a management style based on informal procedures and relationships, in which managing with measures was not contemplated. Team members were reluctant to start using the measures proactively because they thought these were a mechanism to threat and control staff rather than an effective way to manage team performance. A team leader that witnessed the impact of this informal culture stated in relation to the use of performance measures: *'I don't want to upset anyone who I'll meet in the pub two hours later'*. The impact of culture was stronger during the implementation phase than during design.

This study showed that there is a bidirectional relationship between organisational culture and the existence and use of performance measures. The loose and informal organisational culture in HS was a barrier to design and use the PMS. At the same time the lack of a structured PMS encouraged an informal culture and management style. As soon as the team designed and started using performance measures, there was an evident change in the way team members and managers were managing performance. Performance measures become the basis for decision taking and a more structured management style started taking place.

(8) Lack of understanding of the purpose and benefits of using TPMS

Initially team members did not have a clear idea of the purpose and benefits of using TPMS. They had a negative predisposition towards using performance measures. It was not until the CEO started requesting performance reports on a regular basis that the team members began actively collecting and analysing performance data. As a result, the AR team focused on educating team members on the benefits that using effective measures could bring to the Production Team.

The lack of understanding of the purpose and benefits of TPMS was as a result of the team members' lack of previous experience in managing with measures and by HS's loose and informal culture.

(9) Lack of a performance appraisal system

HS did not have any appraisal system in place. This was very much related to the fact that teams and individuals did not have clearly defined objectives and performance measures. The lack of a performance appraisal resulted in the team members not being completely aware of their roles and responsibilities. It also meant that team members did not see the need for a TPMS that would monitor their performance.

HS only used business-wide rewards related to profit figures. The study did not show either a negative or a positive impact between business-wide rewards and the design of effective TPMS.

(10) Lack of quality frameworks

Previous chapters highlighted that the systematic use of quality frameworks has a positive impact on the design of TPMS. This study, however, did not show a clear relationship between the lack of quality frameworks and the design of effective TPMS. Although the positive impact of using quality frameworks is evident, it may be that the lack of quality frameworks has a neutral impact rather than a negative one.

(11) IT support

A factor that did not emerge during the exploratory phase, but that was important during this study, was the existence of appropriate IT systems to support the TPMS. The impact of the IT systems, however, was more closely related to the implementation phase rather than the design phase of the TPMS.

The implementation of the SCADA system for data collection, the use of the COGNOS reporting tool and the intranet system showed to be key success factors for managing the TPMS. The SCADA system captured accurate data regarding line performance and played a key role when designing and implementing measures such as OEE or first hour efficiency. The high accuracy of the data captured through this system means that team members are more confident in making decisions based on the measures. The use of the COGNOS reporting tool and the intranet made the performance reports clear and visible to all organisational levels. Previous research highlights the importance of having appropriate IT systems during the implementation and use of PMS (Neely, 1999; Kueng et al, 2000; Bourne et al, 2002; Nudurapati and Bititci, 2003).

10.7.2. Findings about the process for designing the TPMS

One of the key findings related to the process of designing the TPMS was that team members need to be adequately trained in the subject of performance measurement prior to and during the design process. In order to get the buy-in from the team members, it was very important to clearly explain the purpose and benefits of using a performance measurement system. It was also critical to ensure that the team members had a basic understanding of the concepts related to performance measurement.

During the TPMS design process one of the steering committee members took the role of leading and facilitating the process. This study showed that it is very important to have a person leading and facilitating the process, especially when the team is in the early stages of development. In the case of HS, it would not have been possible to design an effective TPMS without the support and guidance provided by the steering committee.

10.7.3. Impact of using a structured TPMS design approach

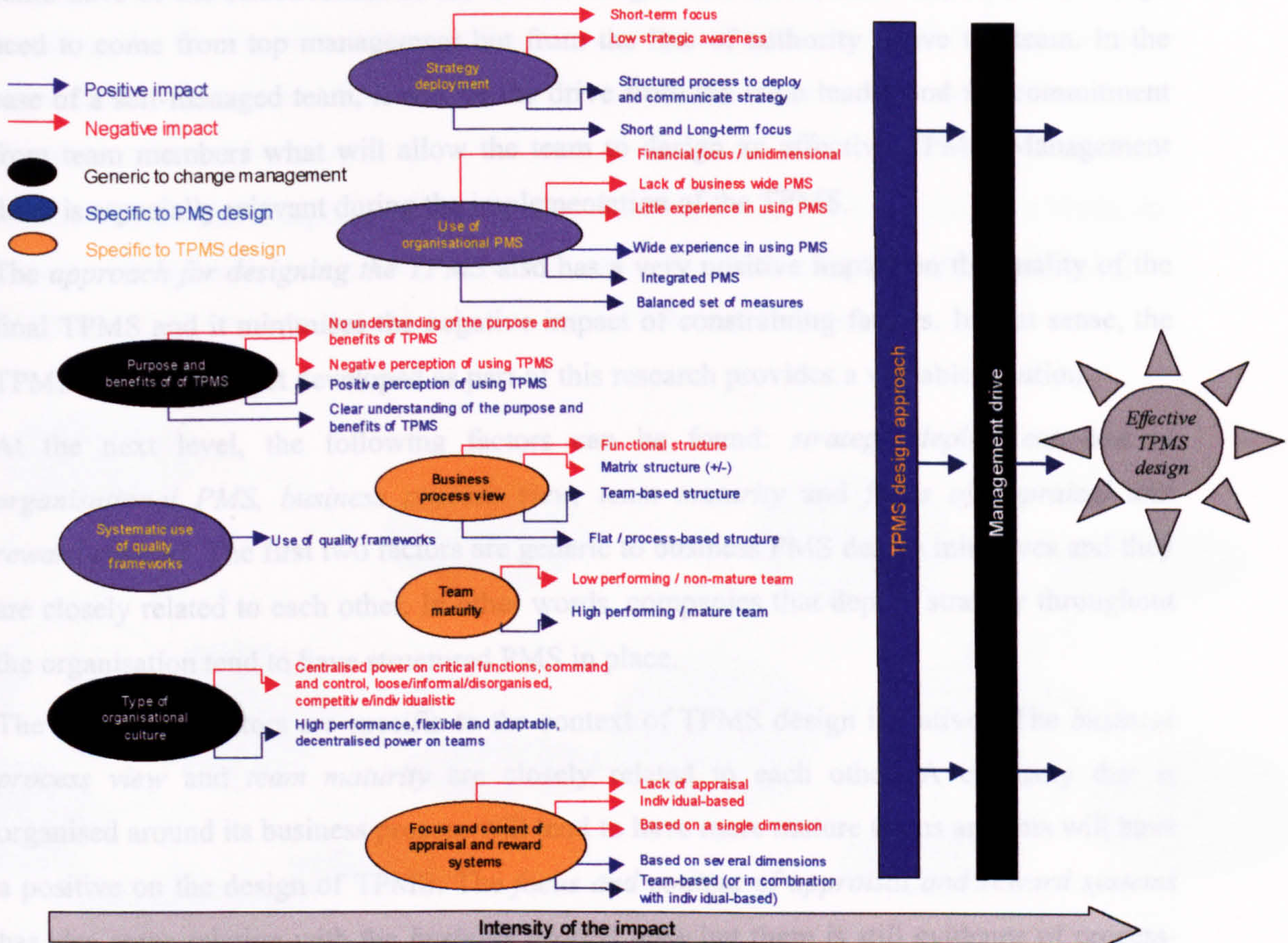
The impact of using a structured TPMS design approach in HS supports the findings from the industrial workshops (Chapter 9, Section 9.3). The specific impact in HS was discussed in Section 10.7.1.

10.8. Extrapolation to a broader context

This AR study generated specific knowledge for the unique environment of HS. The triangulation of the findings from this AR study with those from the exploratory phase (Chapter 7) and the industrial workshops (Chapter 9), however, generate findings applicable to the wider context.

10.8.1. Impact of the factors and their relationships

The specific findings from the AR study regarding the intensity of the impact of each factor and the specific relationships between the different factors can be extrapolated to a broader context. Figure 10.12 summarises the learning about the factors affecting TPMS design extracted from the different phases of this research study. It illustrates the relative impact on the design and use of TPMS and the different modes of impact of each factor.



Note: The more towards the right of the bottom arrow the factor is located the higher its intensity or impact.

Figure 10.12: Factors affecting the design and use of effective TPMS

Figure 10.12 shows that each factor can have a positive or negative impact on the design of effective TPMS. The only exception is the *systematic use of quality frameworks*, which only has a positive impact as long as the company and the team use them for managing performance. Of special relevance are those frameworks that include performance measurement as a core element and focus on managing and measuring a number of different dimensions of the organisations. For instance, teams within those companies using the EFQM model in a systematic way will have more experience in managing with measures and they will developed better balanced PMS.

Management drive is the single most important factor. If management is committed, supportive and driving the design of TPMS, the quality of the final outcome will considerably improve. Also, it will considerably reduce the negative impact that other factors could have of the effectiveness of the TPMS design. This drive, however, does not always need to come from top management but from the line of authority above the team. In the case of a self-managed team, it will be the drive from the team leader and the commitment from team members what will allow the team to design an effective TPMS. Management drive is especially relevant during the implementation of the TPMS.

The *approach for designing the TPMS* also has a very positive impact on the quality of the final TPMS and it minimises the negative impact of constraining factors. In that sense, the TPMS design construct developed as part of this research provides a valuable solution.

At the next level, the following factors can be found: *strategy deployment, use of organisational PMS, business process view, team maturity* and *focus of appraisal and reward systems.* The first two factors are generic to business PMS design initiatives and they are closely related to each other. In other words, companies that deploy strategy throughout the organisation tend to have structured PMS in place.

The latter three factors are specific to the context of TPMS design initiatives. The *business process view* and *team maturity* are closely related to each other. A company that is organised around its business process will tend to have more mature teams and this will have a positive on the design of TPMS. The *focus and content of appraisal and reward systems* has also some relation with the *business process view* but there is still evidence of process-based organisations that have not re-engineered their support processes. In order to support the teamwork culture of an organisation, it is critical that TPMS, appraisals and rewards are aligned. If a TPMS is to be designed and implemented then the appraisal and reward system should be team-based. This will avoid conflicts between team and individual objectives and performance measures. In addition, the design of TPMS is positively affected when team members are appraised and rewarded based on several dimensions of team performance.

The impact of *purpose and benefits of TPMS* and *organisational culture* was also evident during the case studies. Their impact, however, can be minimised by other factors. Take for example *organisational culture*. A loose and informal culture will discourage the design and implementation of effective TPMS. If management, however, decides that a PMS is required, this will be designed and implemented, which will overcome the negative impact of the organisational culture. In fact, the rest of the factors can help to shape the organisational culture, which will also change the impact of this on the design of TPMS. Similarly, as soon as a company starts using a PMS, team members' understanding of the purpose and benefits of using performance measures will radically change. These two examples were evident during the study carried out in HS.

The intensity of the impact of each factor will vary depending on its specific mode of impact. For example, the negative impact of the *focus of appraisal and rewards* will be stronger when the company uses individual-based appraisal and rewards than when there is no appraisal and reward in place.

Factors do not exist independently but closely inter-relate with other factors. As a result, the impact of an individual factor will be affected by other factors that are related to it. Figure 10.13 and 10.14 illustrate the generic relationships between the factors.

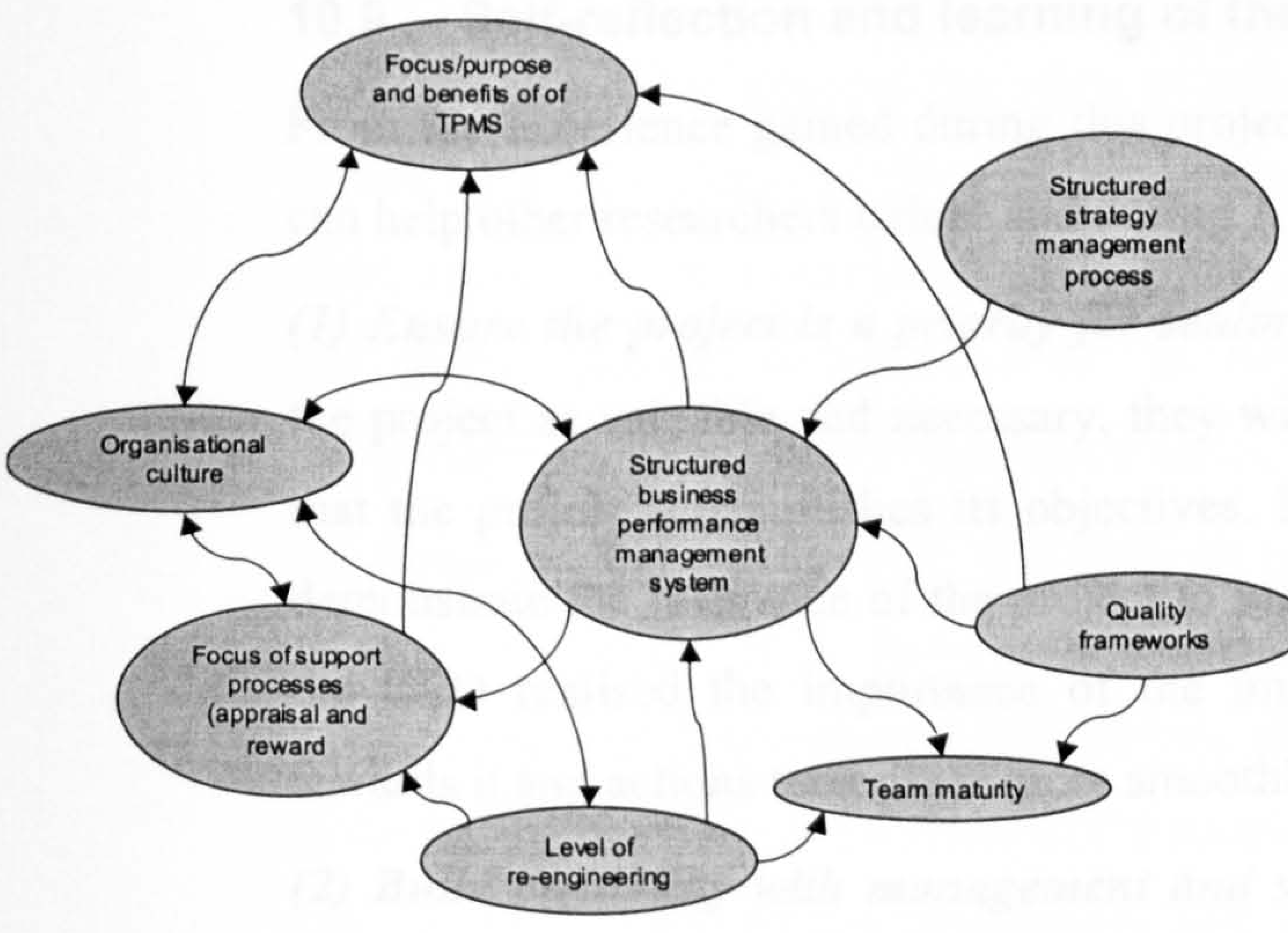


Figure 10.13: Relationships between factors (1)

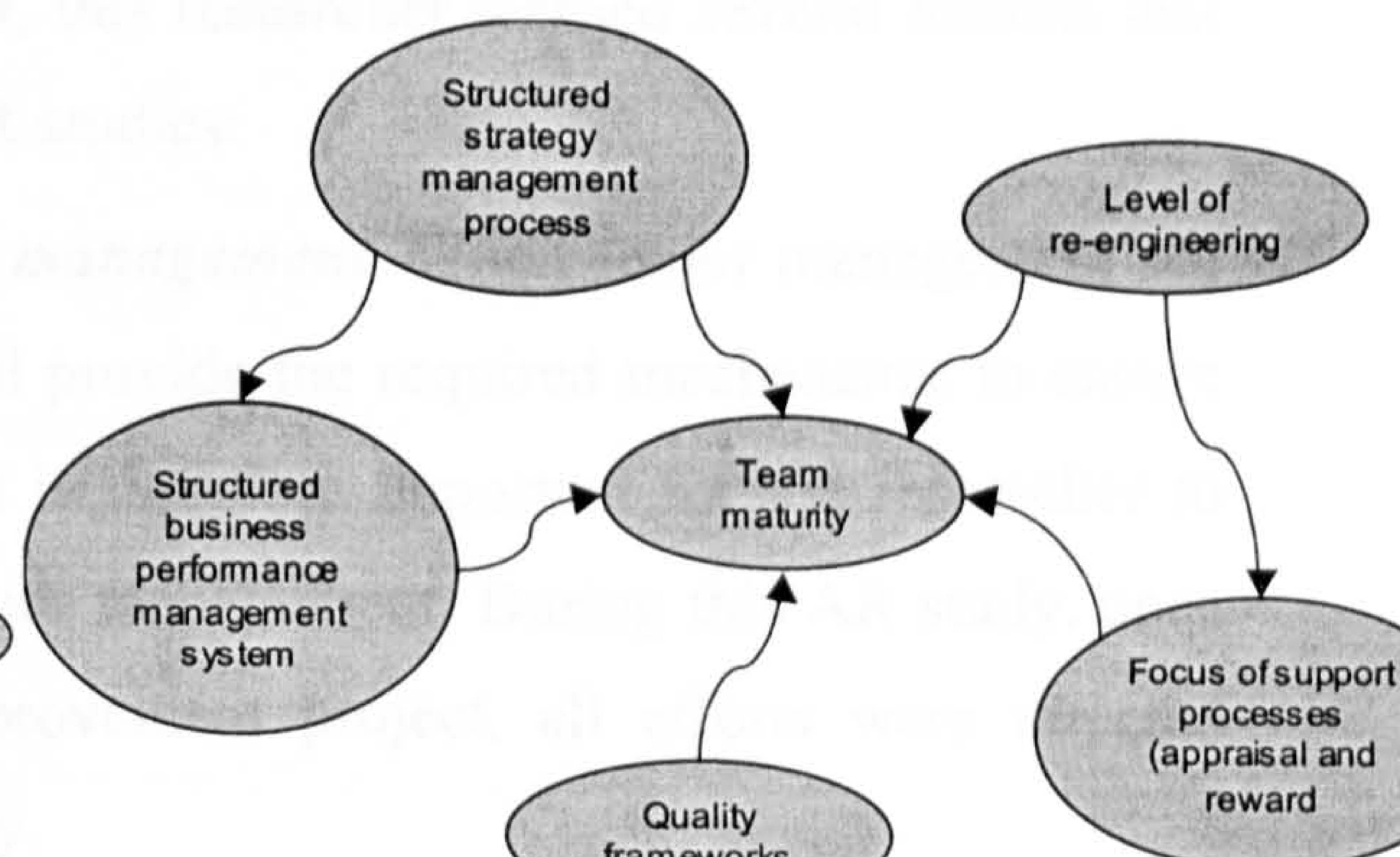


Figure 10.14: Relationships between factors (2)

The intensity of the relationships will vary depending on the factors and on the company under study. For example, the impact of *using quality frameworks* on the *maturity of a team* will not be the same as the impact of the *business process view* on that same factor.

Similarly, even if in the case of HS, the impact of the appraisal and reward systems (or the lack of them) on the culture of the organisation was not evident, in companies like IBM, Holden & Castrol, Polaroid and Honeywell, the existing appraisal and reward system had a very strong impact (negative in the former two, positive in the latter two). Taking the above comments into consideration, it is therefore important to study each team or organisation independently because of the unique impact and relationships of the factors in that context.

10.8.2. The TPMS design process

Both the AR study and the industrial workshops (Chapter 9), demonstrated that a key ingredient for designing an effective TPMS is the knowledge and experience of team members on the topic of TPMS. Teams with little understanding of the concepts surrounding performance measurement will be more sceptical about the value of TPMS and it will be difficult for them to go through the TPMS design process. The TPMS design process should therefore include the following extra first step; *Stage 0: Educate team members on the topic of performance measurement and management*

The importance of having a person for leading, guiding and facilitating the TPMS design process was also evident during the industrial workshops and the AR study. As a result, the typology for TPMS design, defined in Chapter 6 (Table 6.9), should also include the following element; *Identify process leader and facilitator.*

10.9. Self-reflection and learning of the action researcher

From the experience gained during this project, this researcher learned several lessons that can help other researchers before and during AR studies:

(1) Ensure the project is a priority for senior management. When senior management see the project as valuable and necessary, they will provide the required mechanisms to ensure that the project accomplishes its objectives. It is therefore important for the researcher to demonstrate the relevance of the project to senior management. During this AR study, once the CEO realised the importance of the improvement project, all efforts were directed towards it and actions took place more smoothly.

(2) Build credibility with management and staff. In order to gain commitment from staff and management, it is important for the researcher to gain credibility early in the project. It is critical that management and staff clearly see the potential benefits of the project. Although this researcher knew most of the team members and managers from previous visits to HS he was still an 'outsider' for many of them. During the initial weeks, therefore, in order to gain the required degree of trust and commitment, much of the time was spent making sure that they all understood the benefits of the project and that the researcher understood their jobs and concerns.

(3) Define the research framework. The time spent planning and designing the AR study prior to entering HS was critical to achieve the objectives. This provided guidance to the study, especially during times when the project appeared to be deviating from its original objectives. It also ensured that key elements that provide reliability to the findings (e.g. operating principles) were being considered at all times.

(4) Take a holistic approach of the study. One of the strengths of AR is that it generates new knowledge in the context of the study. It is important to take into consideration the history and context of the study in order to increase the validity of the interpretation. During this study, the researcher not only focused on the internal dynamics of the team but also fully considered the elements of the context (e.g. culture, strategy, management) within which the team was operating.

(5) Develop a pre-understanding of the business environment prior to entering the field. The wider the knowledge the action researcher brings into the field, the more reliable the findings will be. It was important for the researcher to have an understanding of certain areas such as corporate management, production and operations management, human resource management and organisational psychology, in order to interpret each particular situation. Gummesson (2000) also identifies this issue as being relevant to AR studies.

(6) Design an AR team. Creating the AR team at the beginning of the project proved to be very valuable. This allowed the team to bring in different perspectives for assessing and reflecting on the status of the project. Although they were not an integral part of the AR team, there were two academics collaborating in the project. Their experience on previous AR studies proved to be essential. In fact, Eden and Huxham (1996) highlight the importance of including an experienced action researcher in the team.

(7) Develop appropriate skills. It is difficult to have all the required skills the first time one does an AR study. It is, however, important to know what type of skills (i.e. research, consultancy and intermediation/facilitation skills) are most important when doing AR in order to increase the self-awareness of the action researcher. This way, the action researchers can carefully work on the weaknesses and capitalise on the strengths. For instance, this researcher had little experience in facilitating teams during change projects, and so he continuously tried to create the appropriate mechanisms to ensure effective facilitation (e.g. continuous communication with team members).

(8) Don't panic! Frequently step back and reflect. The uncertainty and lack of control over AR studies can create anxiety in the action researcher, in particular, with inexperienced researchers (Eden and Huxham, 1996, p.84). At times, this researcher found himself involved in situations that did not appear to contribute to the achievements of the research objectives. For example, during the 3 weeks of the *factory acceptance tests,* the project seemed to be paralysed. These tests, however, ended up being a critical part of the AR study. They completely changed the direction of the project because they 'switched on' the alarms and the CEO decided to drive the project. This resulted in the team proactively using the performance measures.

In fact, one of the strengths of AR is the knowledge gained through the unexpected events. It is essential that the action researcher remains flexible at all times in order to learn from these situations. The researcher must frequently step back and reflect on what the new situation means within the scope of the AR objectives.

10.10. Chapter conclusions

This chapter described the design and implementation of a TPMS for the Production Team at HS. The study generated particular knowledge to HS that could be triangulated with the findings from previous phases of the research. It discussed the factors affecting TPMS design, with a particular emphasis on the their impact and the relationships between them. The impact of these factors and their relationships were graphically illustrated in Figures 10.12, 10.13 and 10.14. These not only identify the factors affecting TPMS design, but also provide a clear understanding of the particular modes of impact of each factor. Companies can benefit from this because it provides a clear indication of what are the areas that they need to carefully manage in order to create the right conditions to design effective TPMS.

In summary, the probability of designing an effective TPMS will increase when an organisation has the following attributes:

1. Management is committed to the design and implementation of TPMS
2. The company has a flexible and adaptable culture in which power is decentralised to the teams
3. Managers and team members clearly understand the purpose and the benefits of using TPMS
4. Flat and process-based organisational structure with clearly defined business processes
5. Structured process for communicating and deploying strategy.

6. Existence of an integrated and balanced business wide PMS deployed down to teams and individuals. Employees actively use the PMS for decision-making, and managing performance
7. Quality frameworks are integrated within the strategy and performance management process.
8. Performance appraisals and rewards are designed to fit into team-based structures. Appraisals and rewards are based on several dimensions of team performance.
9. Teams are highly developed and team members have a good understanding of the dimensions that determine and factors that affect the short- and long-term competitiveness of the team
10. Teams have a structured approach to design of the TPMS

The study also showed that the phases of TPMS design and implementation are closely interlinked. As a result, many of the factors that affect the design phase will also have an impact on the implementation of TPMS.

Regarding the TPMS design process, the combination of the particular findings from the AR study and the industrial workshops highlighted the need for an extra stage for the TPMS design construct;

Stage 0: Educate team members on the topic of performance measurement and management

and highlighted the need for another feature to be added to the typology for TPMS design defined in Chapter 6;

Identify process leader and facilitator (under the *development process requirements* category)

Regarding the usefulness and impact of following the TPMS design process, this AR study supported the findings from the industrial workshops. This provided the final evidence to satisfactorily validate the TPMS design construct.

Finally, a key contribution of this chapter has been to explicitly address the learning this researcher gained by reflecting on the experience of this particular AR study. The researcher highlights 8 key points that other researchers embarking on AR studies should consider for ensuring the success of their projects.

Chapter 11 will provide a summary of the lessons learned during the different phases of this research by summarising the work carried out in relation to each research question.

11. DISCUSSION

Learning is not compulsory... neither is survival (W. Edwards Deming, 1900-1993)

Figure 11.1: Chapter 11 input-output diagram

The purpose of this chapter is to demonstrate that the objectives of this research have been achieved by providing an explicit and unambiguous answer to each of the research questions that form the core of this thesis.

Previous chapters described the work carried out in order to find a reliable answer to each of the research question. In this chapter, the researcher provides a brief summary of that work and the findings related to each of the research questions.

The chapter concludes with a number of other findings and observations that have emerged from this research work.

11.1. Answers to the research questions

The initial research issue of this thesis was team performance measurement (TPM) in industrial organisations and, in particular, the design of effective team-based performance measurement systems (TPMS). Industrial collaborators had shown a lack of understanding of how to design effective TPMS and this researcher decided to further investigate this area.

The research started with a generic question - *How can we help organisations design effective TPMS?* - which was refined after the initial review of the literature. The initial review clearly identified gaps in current research on TPM and defined the first two research questions (Table 11.1).

Current TPM research fails to:

- Explicitly address issues related to the process of designing effective TPMS
- Address the factors that enable and/or constrain the development of effective TPMS
- Integrate with research on performance measurement and team effectiveness carried out by other research disciplines
- Provide empirical studies illustrating the development of TPMS and the associated learning

Research questions:

RQ1. *What are the characteristics of a comprehensive TPMS design process?*

RQ2. *What are the factors that enable and/or constrain the development of effective TPMS?*

Table 11.1: Gaps in current research and initial research question

The other three research questions emerged as new findings were unfolding. The key issue that triggered the definition of the next research question was the fact that, during the initial exploratory phase (Chapter 7), industrial organisations expressed a need for a practical approach to facilitate the design of effective TPMS. The following are the other three research questions included in this thesis:

Research questions:
RQ3. *Is there a need for a new construct to facilitate the design of effective TPMS?*
If yes,
RQ4. *What should a TPMS design construct include?*
RQ5. *What is the impact of using the TPMS design construct in industrial organisations?*

Table 11.2: Industrial need and additional research questions

The following section provides a clear answer to each research question and a brief summary of the work carried out in relation to each of the questions:

RQ1. *What are the characteristics of a comprehensive TPMS design process?*

Although the discussion on RQ1 started in Chapter 2 (*Putting the research into context*) the main insights emerged from the synthesis of the literature in Chapter 6 (*Development of the TPMS design typology*). This synthesis of the literature integrated research on team performance and PMS design from a number of research disciplines, such as human resource management, organisational psychology, socio-technical systems, strategic management, operations management and accountancy. In doing so, it overcomes one of the limitations of existing research on TPM (see Table 11.1).

The main contribution of Chapter 6 was the typology for TPMS design that describes the characteristics of a comprehensive TPMS design process. Remember that a comprehensive TPMS design process needs to have the desirable features of a TPMS design process and to develop a set of well-designed team performance measures that provide a true representation of team performance. In that sense, the typology for TPMS design highlights the desirable features of (1) a TPMS design process, (2) well-designed team performance measures and (3) the dimensions of team performance.

While designing TPMS during the industrial workshops (Chapter 9) and in Highland Spring (Chapter 10), it became apparent that is was important to have a person leading and facilitating the design process. Another feature therefore had to be added to the typology; *Identify process leader and facilitator.*

One of the conclusions in developing the typology is that most of the current research on business PMS design is also applicable to TPMS design. There are, however, a number of features that are unique to teams and these will play a key role in designing effective TPMS.

The answer to RQ1 is shown in table 11.3:

Development process requirements	Team performance measure characteristics	Dimensions of team performance
Review and evaluate existing TPM system Enable identification of company's strategic objectives Enable identification of team's stakeholders' requirements *(T)* Enable the identification of team strategy/purpose *(T)* Enable development of performance measures Focus on areas that the team is accountable for *(T)* Enable goal prioritization Involve key users of the TPM system *(T)* Provide a maintenance and review structure Top management support Full team members support *(T)* Clear and explicit objectives Set timescales for design and implementation of TPM system Facilitate the identification of key drivers of team performance *(T)* Facilitate the understanding of causal relationships Assign individual responsibility for the measurement, communication and improvement tasks associated with each goal *(T)* Be flexible and require low resource consumption *(T)* Identify process leader and facilitator *(T)*	Derive from the stakeholders represented within the team membership *(T)* Clearly defined/explicit purpose Relevant and easy to maintain Simple to understand and use Provide fast, accurate feedback Stimulate continuous improvement Clearly defined data collection and methods of calculating the level of performance Clearly defined frequency of measurement Applied at team and individual level *(T)* Related to both, team outcome and process *(T)* Capture the dynamic nature of teamwork *(T)* Reliable, valid and acceptable	Effectiveness *(T)* Efficiency *(T)* Team learning and growth *(T)* Team member satisfaction *(T)*
Note: Those requirements marked with a '*(T)*' are unique to the context of TPMS		

Table 11.3: Typology for TPMS design

RQ2. ***What are the factors that enable and/or constrain the development of effective TPMS?***

The initial discussions on RQ2 emerged in Chapter 2 (*Putting the research into context*) but the main findings unfolded during Chapter 7 (*Exploratory research)*, Chapter 9 (*The TPMS construct in practice*) and Chapter 10 (*Designing a TPMS in Highland Spring Ltd.)*. The initial fieldwork study described in Chapter 7 identified ten potential factors affecting the design of effective TPMS through the cross-case analysis of ten organisations.

These potential factors were validated and refined through the application of the TPMS design construct in 13 teams from 10 different organisations (Chapter 9) and the action research study in Highland Spring (Chapter 10).

The answer to RQ2 (i.e. the key factors that enable and/or constrain the development of effective TPMS) is shown in table 11.4:

	Factor	Description
Generic to change management	1. Management drive	The level of involvement, support and drive from management towards the design of effective TPMS
	2. Type of organisational culture	The values and beliefs embedded in the organisation and the type of management style promoted by the company
	3. Understanding of purpose and benefits of TPMS	The perceived focus, purpose and benefits of the TPMS from managers and team members
Generic to PMS	4. Strategy deployment	Systematic and structured process for communicating and deploying business strategy.
	5. Use of organisational PMS	Existence of PMS that is deployed and integrated throughout the entire organisation and includes a balanced set of measures. The company actively uses the PMS for managing performance. Employees have certain experience and knowledge in using PMS.
	6. Systematic use of quality frameworks	The degree to which organisations demonstrate a systematic use of quality frameworks and initiatives for managing and improving business performance
	7. Structured TPMS design approach	The existence and use of a clearly structured, defined and understood process for designing TPMS.
Specific to TPMS	8. Business proves view	The degree to which the company has defined the internal key business processes and has organised its internal structure around those processes
	9. Focus and contents of appraisal and reward systems	The degree to which performance appraisal and rewards are designed to fit in with the team-based culture and to whether these are based on a single or multiple dimensions of team performance.
	10. Team maturity	The developmental stage and performance level of the team.

Table 11.4: Factors that enable and/or constrain the design of effective TPMS

The identification of these factors fills a gap in current research. By comparing these findings with the existing literature, it is evident that the ten factors can be grouped into three categories depending on the area of applicability of each factor. *Management drive, organisational culture* and *understanding of the purpose and benefits of TPMS* fall into the change management category and they are addressed in change management literature (e.g. Kotter, 1996; Lanning, 2001). This study, however, provided new insights by revealing certain features of the organisational culture that have an impact on the design of effective TPMS. It identified three features of the culture that can potentially constrain the design of effective TPMS (i.e. *loose/informal/disorganised, competitive/individualistic, command and control, centralised power on critical functions*) and another three that provide the most suitable environment for designing effective TPMS (i.e. *high performance, flexible and adaptable, centralisation of power on teams*).

Similarly, *strategy deployment, use of organisational PMS, systematic use of quality frameworks* and *structured TPMS design approach* are generic for PMS projects. Existing literature (e.g. Kaplan and Norton, 1996; Schneiderman, 1999; Hacker and Lang, 2000; Bourne et al, 2000) recognises the impact of these factors on PMS projects.

The other three factors (i.e. *business process view, focus and contents of appraisal and reward systems* and *team maturity*) are specific to TPMS design and implementation. This is a novel contribution to knowledge because previous research did not fully address the impact of these factors.

The combination of the particular findings from the AR study with the findings from the initial fieldwork study and the industrial workshops allowed the research to identify the specific modes of impact of each factor and, to a certain extent, the intensity of the impact and the inter-relationships between different factors.

The main conclusion from the analysis of the impact and inter-relationships of the factors are the following:

- All the factors can act as enablers and/or constraints for designing effective TPMS depending on their particular characteristics
- The impact on TPMS design considerably varies from one factor to another and from one mode of impact of the factor to another
- Factors are inter-related with each other. As a result, the impact of one factor can reduce and even eliminate the impact of other factors.
- The positive impact of m*anagement drive* and of using a *structured approach to TPMS design* will considerably minimise the negative impact of the constraining factors.

RQ3. ***Is there a need for a new construct to facilitate the design of effective TPMS?***

One of the conclusions from the fieldwork study described in Chapter 7 was the industrial need for a practical tool to support the design of effective TPMS. Even those companies that had effective TPMS in place pointed out that it would be beneficial to have a tool that captures the knowledge of the current processes for designing TPMS and makes this knowledge explicit so that it can easily be transferred to other areas of the company.

The next step, after identifying the industrial need, was to look for currently available approaches that support the design of TPMS and to assess their validity. The first part of Chapter 8 (S*ection 8.1 – Current approaches to TPMS design*) evaluated six approaches for TPMS design. To do this, the researcher first developed the criteria for evaluation based on constructive research theory and the typology for TPMS design.

The detailed analysis of the existing approaches showed that these fail in fulfilling the established criteria and so they do not provide an effective solution to the industrial problem. The areas that existing approaches do not fulfil are the following:

- Clear link to team performance theory
- Enable the identification of team stakeholders' requirements
- Facilitate the identification of key drivers of team performance
- Facilitate the understanding of the causal relationships between measures
- Capture the dynamic nature of teamwork
- Enable the definition of measures against the four dimensions of team performance

Therefore, *the answer to RQ3 is:*

'Yes, there is a need for a *new* *construct to facilitate TPMS design'*

RQ4. ***What should a TPMS design construct include?***

This research question refers to the identification and description of the contents that will ensure the successful application of the TPMS design construct with real teams. It is not only the contents (e.g. step, guides) of the construct that RQ4 is concerned with, but also the design features (e.g. format, structure, style) of the construct.

The second part of Chapter 8 (*Section 8.2 – Developing the construct*) describes the activities carried out for developing the construct. The first task was to define the criteria for a good quality construct (Table 8.5) that would form the basis for developing the construct. The criteria is the same as the one used for evaluating existing approaches (i.e. based on constructive research theory and the typology for TPMS design) with the addition of the requirements from the industrial collaborators.

Several versions of a TPMS design process were developed and then translated into a workbook. The process included 10 stages for designing effective TPMS and the workbook supported the process by clearly defining the *purpose*, the *staff involved*, the *specific activities to carry out* and the *support tools* for each stage. The TPMS design construct consists of a TPMS design process and a workbook.

The TPMS design construct was applied with 13 teams in a series of workshops and presented and discussed in several seminars, both of which are described in Chapter 9 (*The TPMS design construct in practice)*. These workshops and seminars facilitated the assessment of the validity of the construct through the evaluation of its *contents, usability, usefulness* and *applicability in other environments* (Section 9.2). The feedback collected showed that the construct fulfils most of the criteria of a good quality construct and that it is a valid approach to design effective TPMS. There are several areas regarding the *usability* of the construct that need some modifications. These changes will be included in the next version of the construct. The TPMS design construct is novel because it builds upon new theory on TPMS design and fills the gaps of previous approaches.

The workshops and the action research study in Highland Spring (Chapter 10), in particular, highlighted the importance of educating the team on the topic of performance measurement. This led to the realisation that it is necessary to add an extra stage to the existing 10 stages of the TPMS design – *Stage 0: Educate team members on the topic of performance measurement and management*

To summarise, in looking for an answer to RQ4, this researcher proposes a TPMS design construct that includes an 11-stage TPMS design process (Figure 11.2) and a workbook based on that process. The TPMS design process is connected to existing theory on team performance through the team performance model (Chapter 5, Figure 5.3) and to theory on team performance measurement design through the typology for TPMS design (Chapter 6, Table 6.9). In fact, the connection of the process to novel theory on TPMS design also makes the construct theoretically novel. The workbook provides guidance to teams by describing the activities to carry out, the people to be involved and the support tools to be uses at each stage of the design process (see Appendix C).

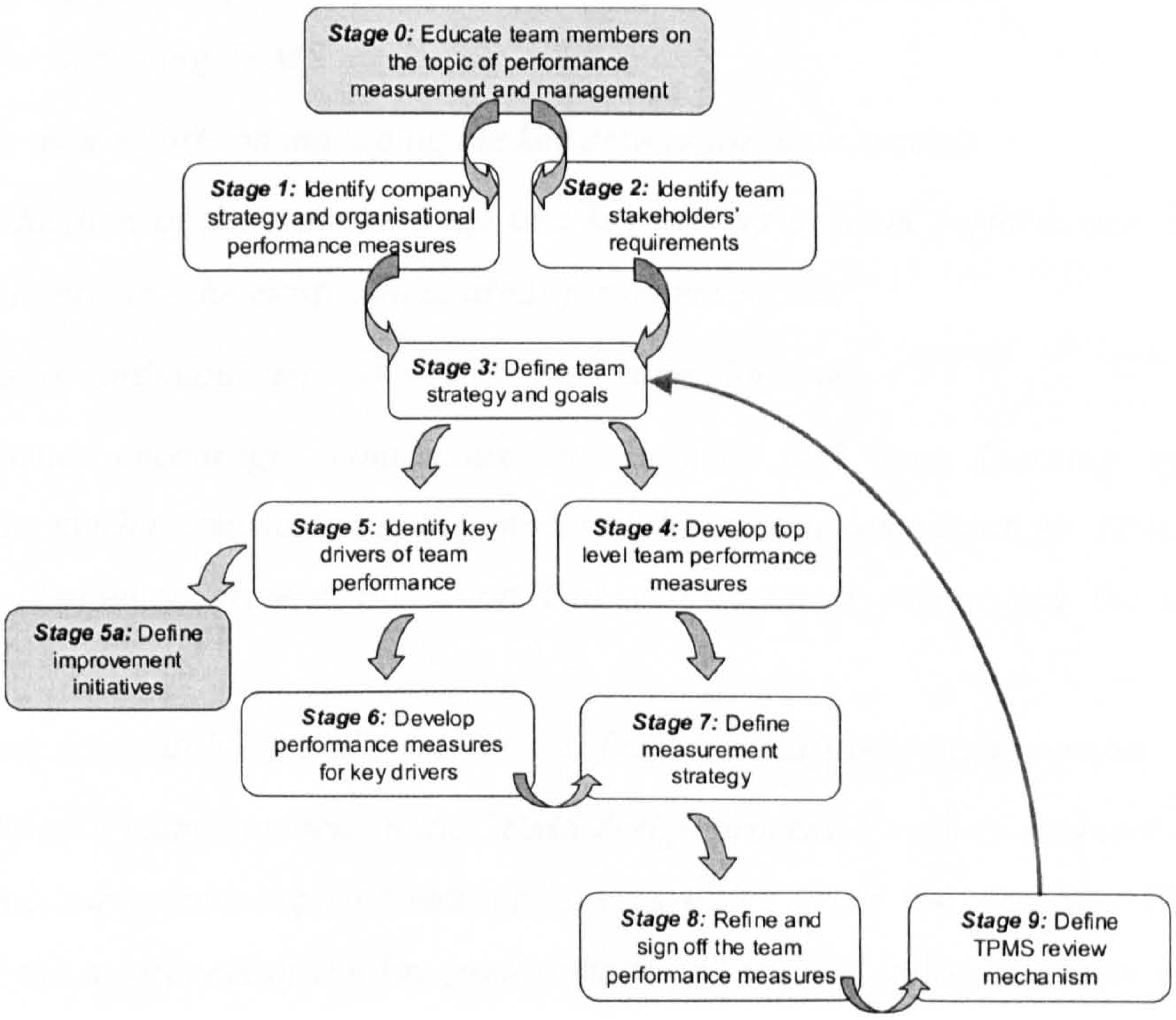


Figure 11.2: The TPMS design process

RQ5. ***What is the impact of using the TPMS design construct in industrial organisations?***

The purpose of the last research question of this thesis was to assess the impact of using the TPMS design construct. The impact of using the construct was assessed during the workshops described in Chapter 9 (*The TPMS design construct in practice)*. In addition, the action research study in Highland Spring described in Chapter 10 allowed assessment of the impact of using a TPMS design process developed 'in-house'. This process followed the same logic as the TPMS design construct.

It is important to remind the reader what type of impact RQ5 is trying to assess. The impact of using the TPMS construct is based on the perceptions of the teams and managers participating in the workshops and on the personal observations of the researchers that facilitated the workshops. The expert feedback collected during the seminars also allowed the researcher to triangulate data. Due to time constraints, it was not possible to assess the impact of using the TPMS design construct on the overall team and business performance in the longer term. Yet, the findings focused on the initial impressions of the teams and managers using the construct and on its impact on a 'real' case.

The answer to RQ5 is:

The main impact of using the TPMS construct in industrial organisations is:

1. Saves time and effort

The construct provides valuable guidance and support and reduces the time and effort required for designing TPMS

2. Focuses team efforts on managing the key drivers for team success

The identification of the team strategy and key drivers of team performance focuses team efforts on improving the most critical areas for team success.

3. Provides a continuous improvement and learning platform

The construct encourages continuous improvement and team learning by providing appropriate mechanisms to assess the impact of the existing team strategy, TPMS and status of key performance drivers. Based on that assessment it encourages the definition of improvement actions.

4. Increases accountability and commitment of teams and its individual members

By involving all team members in the TPMS design process, they become more accountable for the measures and improvement actions resulting from the process. The construct increases the awareness of the key performance drivers that individual team members can *directly affect. This encourages them to take more responsibility over the management of the drivers.*

5. Increases management commitment and support

The commitment and support from top management will increase by involving the managers in the TPMS design process and in particular, by allowing them to clearly identify the resources required by the team for improving performance in the short- and long- term.

6. Encourages team development, cross-functional integration and a teamwork culture

The construct encourages constructive discussions between team members that can lead to the development of improved approaches for managing team performance. The construct facilitates the definition of objectives and measures for teams that include members from a number of different functions. This enhances the integration and cooperation between functions, which drives forward the overall teamwork culture.

7. Increases the confidence over the TPMS

The use of a structured approach to TPMS design that has a strong theoretical basis and integrates most of the aspects that ensure the design of an effective TPMS, increases the confidence of the team over the final outcome (i.e. the TPMS).

8. Reduces the negative impact of other factors

The use of the TPMS design construct overcomes the potential negative impact of factors affecting the design of effective TPMS. This has a positive impact on the overall quality of the TPMS

11.2. Additional learning

There are a number of other findings that emerged while looking for suitable answers to the above research questions. These findings also contribute to extending current knowledge on the topic of team performance measurement.

11.2.1. The dynamic nature of TPMS

To ensure that the TPMS remains effective over time, this needs to be dynamic. In other words, the performance measures within the TPMS need to evolve in parallel to changes in (1) the company's strategic objectives, (2) team stakeholders' requirements and (3) development or maturation stage of the team. The TPMS, therefore, needs to include the appropriate mechanisms to monitor the above changes.

This research demonstrates that teams with different degrees of maturity, or at different developmental stages, require different performance measures (see Section 9.7 and section

10.8). There are three main reasons for this. Firstly, teams at different stages of development have a different understanding of the meaning of team performance. For the TPMS to be effective, the measures designed need to be aligned to that specific understanding and so, these measures will vary depending on the degree of maturity of the team. Secondly, due to the dynamic nature of teams, their requirements (i.e. dimension and drivers of performance) change as teams evolve. This requires a review and re-design of the measures too. Thirdly, measuring certain types of variables (in particular intangible variables such as team knowledge, and cooperation) requires team members to have previous knowledge and experience of managing performance measures.

To facilitate the evolution of the TPMS, the team needs to define certain features or instances that will indicate a change in the level of development of maturity and include the corresponding measures in the TPMS. For example, a team might consider that the next level of maturity will be achieved when the team members (1) start providing effective feedback to each other and (2) adequately manage conflicts between them and with other employees. The team will then design measures (descriptive measures in this case) to monitor these two features that will indicate when the team has moved to a new maturity or development level. These measures will act as a trigger to review the TPMS.

11.2.2. The TPMS design construct as a local management tool

The dynamic nature of teamwork also affects the approach for designing the TPMS. Teams offer higher flexibility to carry out a wide variety of tasks and to adapt to changing conditions. In order to adapt to the continuously changing conditions, teams require an approach to design TPMS that is flexible and requires low resource consumption. Business wide PMS approaches (e.g. Balanced Scorecard, Cambridge PMS process, Performance Prism) are management-driven top-down processes, which require a considerable amount of resource utilisation when designing a TPMS. Teams, however, cannot afford to wait for too long to design their TPMS and thus, they require a locally applicable tool driven by the team.

The feedback collected during the workshops and the action research study showed that the TPMS design construct (the 'in-house' process in the AR study) can be used as a local management tool by the team without having to wait to implement other business-wide approaches. In fact, a high-performing and mature team using the TPMS design construct will not always require management to be involved in the process and this considerably increases the flexibility of the tool. The TPMS design construct provides a bottom-up approach to management and an effective solution to the industrial need.

11.2.3. The impact of culture and socio-economical context

This study showed that the type of organisational culture has an impact on the design and use of TPMS. There are, however, a number of factors that will contribute to shaping the culture of an organisation. Studying companies from three different regions (i.e. Scotland, Australia and Basque Country) showed that there are certain distinctive features having an impact on the organisational culture and, as a consequence, on the adoption of TPMS. Current research (Schein, 1985; Pheysey, 1993) also recognises the link between national culture, organisational culture and leadership style.

It was evident from the companies studied that the *nature of the business* and *socio-economical context* had an impact on the culture and management style of the organisation. For instance, the environment in which the three companies from the Basque Country operate has its own unique features. This region is characterised by its many indigenous organisations within which it is common to have several family relatives, neighbours or school friends working together. In this environment, maintaining good social processes and employee relations are key aspects for the success of these organisations. This in turn has an impact on the organisational culture and, consequently, on the rest of the performance management processes, including TPMS. Highland Spring was very similar, where most of the employees come from the local community.

Another unique feature of the socio-technical context of the Basque Country is the support given to industry from the local government. There the government encourages and recognises organisations for adopting quality frameworks (in particular the EFQM model). This has a positive impact on the design and use of TPMS.

The socio-economical context in Scotland is characterised by the high percentage of multinationals (from the electronic sector in particular) and the cultural diversity. These two aspects also affect the organisational culture and, as a consequence, the adoption of TPMS.

A feature in Australian organisations are the trade unions. Most of the companies that the researcher talked to in Australia referred to the fact that the trade unions often view the use of PMS with scepticism and, naturally, this is a barrier to develop and implement TPMS.

The *type of ownership* can also have an impact on the culture of the organisation and consequently on the adoption of TPMS. For example, in the Basque Country, the two cooperative companies (Irizar and Maier) had embedded in their culture values such as democracy, equality and socio/economical/community well being. It was not only about achieving great financial results but also about satisfying the social needs of the employees and the communities around. These priorities were reflected in the strategic objectives and the performance measurement systems of these organisations. Similarly, Schein (1985) found that individual plants within a multinational organisation had very similar cultures and operating principles no matter what country they where located in.

The purpose of this study was not to assess and compare the impact of different national cultures on the design and use of TPMS. The studies carried out in 3 different regions, however, brought to light the fact that the socio-technical context in which a company operates can affect the design and use of TPMS. This is an observation made by the researcher during the study and is by no means a proved and reliable conclusion. Further research is required to understand in more detail the relationship between different socio-technical contexts, organisational cultures and the design and use of TPMS.

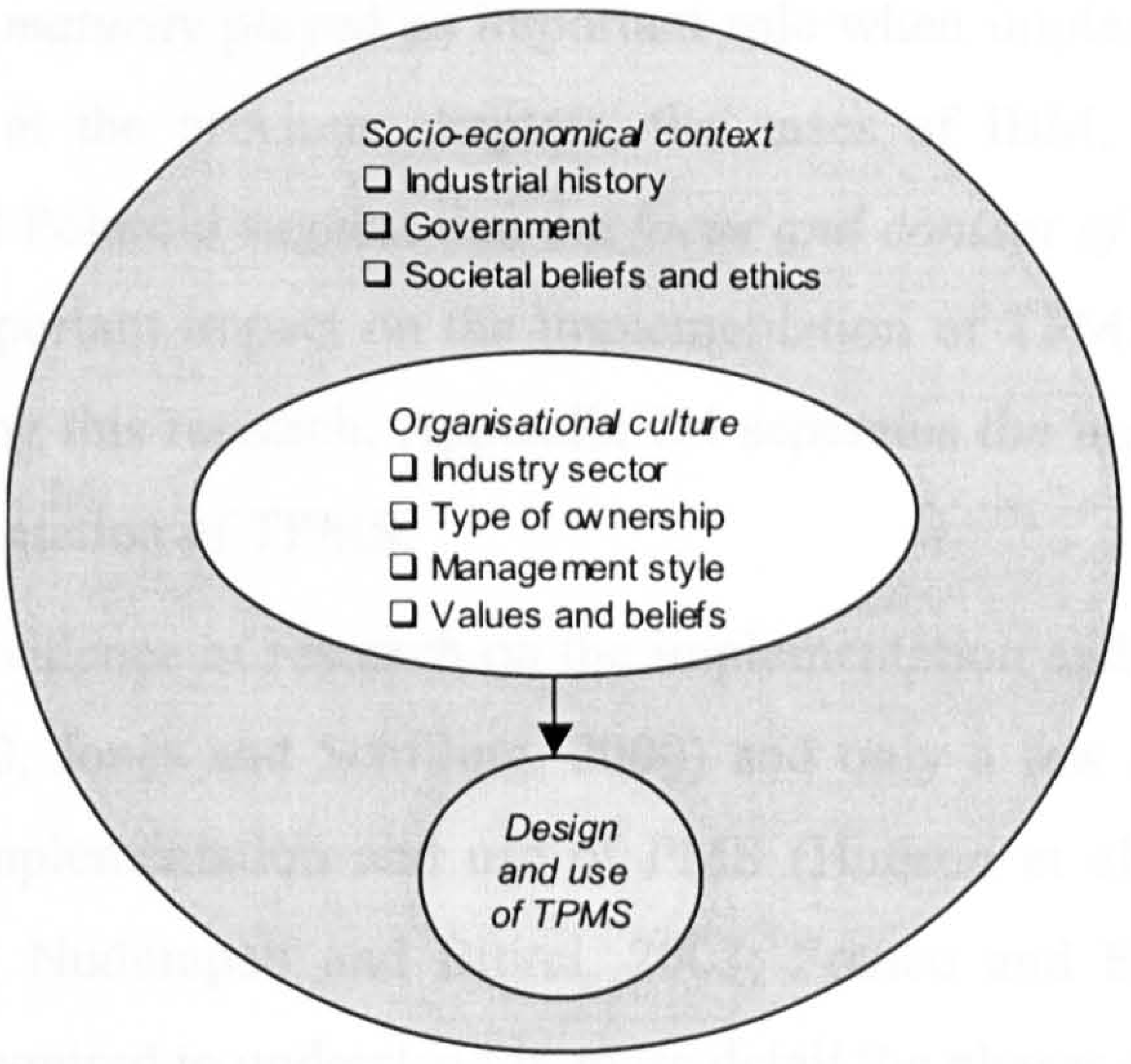


Figure 11.3: Socio-economical context, organisational culture and TPMS

11.2.4. Find a balance between the investment and benefits of TPMS

As with any other project, the return of investment on performance measurement is a key aspect to consider. Designing and implementing a performance measurement system requires an investment in terms of time, effort and systems. In particular, data collection methods can have a high resource consumption. Descriptive measures generally require raters and/or observers to collect and analyse the data. Similarly, surveys also involve a considerable amount of time and effort to design the survey and collect, analyse and present the data.

The action research study in Highland Spring highlighted the importance of having an adequate IT infrastructure for colleting and presenting data. This also needs considerable investment. A team has to compare the potential benefits that certain measures can bring against the resources required to implement and manage those measures. This will increase management buy-in and the probabilities of success of the TPMS.

11.2.5. Close overlap between TPMS design and implementation

The AR studying Highland Spring showed that often the phases of TPMS design and implementation overlap. In this case, the team started using some of the measures (e.g. manufacturing cost per case, changeover times) while designing others (e.g. availability of skills, effectiveness of training, strategic goals alignment). This supports the view of Bourne et al (2000) that the phases of design and implementation of TPMS are conceptual. In practice, both phases overlap. As a result, it can be argued that this iterative nature of TPMS design and implementation means that the factors affecting one phase can potentially affect the other. It was evident during the study in Highland Spring that factors like *management drive*, *understanding of purpose and benefits of TPMS, organisational culture, business process view* and *team maturity* played an important role when implementing and using the TPMS. Looking back at the previous chapters, the cases of IBM, Rank Xerox, Holden Castrol, Honeywell and Polaroid suggest that the *focus and content of appraisal and reward systems* also has an important impact on the implementation of TPMS. From the empirical evidence gathered during this research, Appendix D4 separates the impact of each factor on the design and implementation of TPMS.

To date, there is little evidence of research on the implementation and use of TPMS (expect Hacker and Lang, 2000, Jones and Schilling, 2000) and only a few studies looking at the factors affecting the implementation and use of PMS (Hudson et al, 2001; Bourne et al, 2002; De Waal, 2002; Nudurapati and Bititci, 2003; Franco and Bourne, 2003) Further research is, therefore, required to understand in more detail the phases of implementation and use of TPMS.

11.2.6. The value of cross-disciplinary research

A key element of this thesis has been the new lessons learned through crossing the boundaries of several research disciplines. The initial review of existing research (Chapter 2) showed the need for more cross-disciplinary research. This thesis integrates research on team performance and PMS design from several disciplines. The integration of these disciplines enabled the researcher to further develop the understanding of performance measurement in the context of teams and to increase the overall quality of the research findings.

11.2.7. Tips for AR researchers

While reflecting on the experience of the AR study, the researcher pointed out a number of aspects that can contribute to the success of other AR studies. The lessons of the AR study were discussed in Chapter 10 (Section 10.9).

11.3. Chapter conclusions

This chapter summarised the main findings of this research study. The first section provided a clear and explicit answer to each of the research questions forming the basis of this thesis. This first section also included a brief description of the work carried out when answering the research questions. The second section highlighted the additional learning gained during the different phases of this research. Although this learning is not necessarily directly related to the research questions, it still provides valuable contribution to the field of team performance measurement.

The next chapter will conclude this thesis by evaluating the overall quality and validity of the research findings.

12. CONCLUSIONS

Try not to become a man of success but rather to become a man of value (Albert Einstein, 1879-1955)

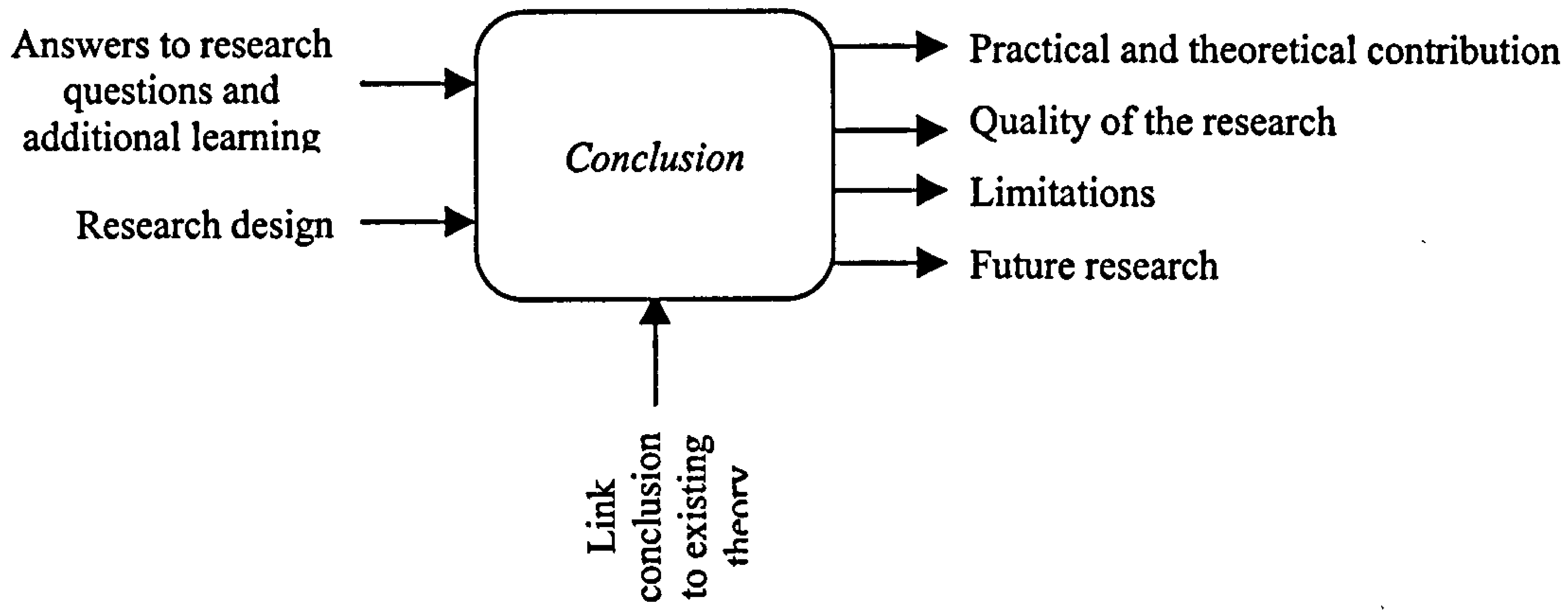


Figure 12.1: Chapter 12 input-output diagram

The following chapter will draw this thesis to a conclusion emphasising the followings aspects:

- Novelty of this research work in terms of contribution to theory and practice
- Overall quality of the research
- Limitations of the research
- Areas for future research

The chapter finishes by identifying the lessons learned during this research experience and setting the scene for future research.

12.1. Advancing the thesis

In a research paper presented during the 2002 Performance Measurement Association Conference held in Boston, Marr and Schiuma (2002, p.359) pointed out the following three aspects as the major research challenges for the field of Performance Measurement:

1. Further advances in terms of frameworks and approaches are needed. Research is encouraged to develop and test integrated PM approaches. Especially those integrating intangible assets measurement as well as stakeholder perspectives.

2. The field would contribute from a larger range of methodologies in order to triangulate research findings. Especially the innovation action research needs to be discussed further. In addition, research conducted in other parts of the world would be encouraged in order to test

the generalisability of the theories currently developed and tested mainly in the Anglo-American environment.

3. Above all cross-disciplinary research is strongly encouraged. There seems to be immense scope to learn from each other and avoid replications of research in academic silos. Few concepts and authors manage to bridge the disciplinary boundaries and influence a wide range of scholars.

Looking back at this study, there is a clear link between the work carried out during this research and the three aspects described above. Firstly, this study developed and tested a novel approach that overcomes the limitations of previous approaches for designing effective TPMS. This approach encourages the design of performance measures related to intangible assets that have an impact on team performance (e.g. team knowledge). Secondly, this research combines case study, action research and constructive research methodologies. This facilitated the triangulation of the research findings, which increases the internal validity of the research. Of special relevance is the action research study because it provided new learning (i.e. to understand the impact and relationships between the different factors affecting TPMS design) that would not have been possible with any other research strategy. Also, this research included organisations from three different regions, which increased the generalisability of the findings and identified differences between the regions (i.e. impact of socio-economical and organisational culture). Thirdly, as discussed in previous chapters, an initial objective of this research was to cross the boundaries of several research disciplines. The cross-disciplinary nature of this research played a key role in further developing the understanding on TPMS design.

Figure 12.2, which was earlier presented in Chapter 3 (p.39), summarises the work carried out during this research. The following were the main stages of the research:

- The point of departure was an industrial problem that this researcher identified while working with industrial collaborators – i.e. lack of understanding of how to design effective TPMS.
- The initial literature review focused on existing knowledge on business process management, teamwork and performance measurement, as these were the areas that could have a major impact on the use of TPMS. This initial review identified gaps in current research and defined the initial two research questions.
- Based on these questions, a detailed research design was developed. This included the research strategies that were going to be used, the final criteria to evaluate the research and the specific tactics that the researcher would use to make sure that the criteria was fulfilled.

- The second review of literature focused on specific knowledge on team performance and on PMS design. The synthesis of the literature facilitated the development of the typology for TPMS design that describes the characteristics of a comprehensive TPMS design approach; the first major contribution[19] of this research.

- The exploratory research, including 10 case studies, identified a list of potential factors that can affect the design of effective TPMS. Also, the industrial need for a practical TPMS design approach was clearly identified.

- An evaluation of current TPMS design approaches was carried out based on the criteria developed from existing theory. A new construct for TPMS design was developed based on the criteria, on the feedback from the end-users and on the limitations of current approaches. This is a key practical contribution of this research[20].

- The TPMS design construct was tested during a number of workshops with 13 teams. The feedback gathered from the workshops demonstrates the validity of the construct. These workshops also facilitated the assessment of the impact of using the construct and the validation of the factors that affect the design of TPMS.

- The researcher then carried out a TPMS design project using an action research approach. The triangulation of the findings from this study, and from the industrial workshops, refined the understanding of the impact of the factors affecting TPMS design and the relationships between them.

- The additional learning gained during this research was then explicitly addressed. This additional learning also makes a contribution as it identifies areas for future research.

- The final task of this research was to critically assess the quality of the research against the criteria defined during the research design phase. The evaluation of the research quality demonstrates that this research is valid and reliable[21].

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[19] Section 12.2.1 describes in more detail the contribution to theory and practice

[20] Section 12.2.2 describes in more detail the practical contribution of this research

[21] Section 12.3 describes a detailed assessment of the quality of the research

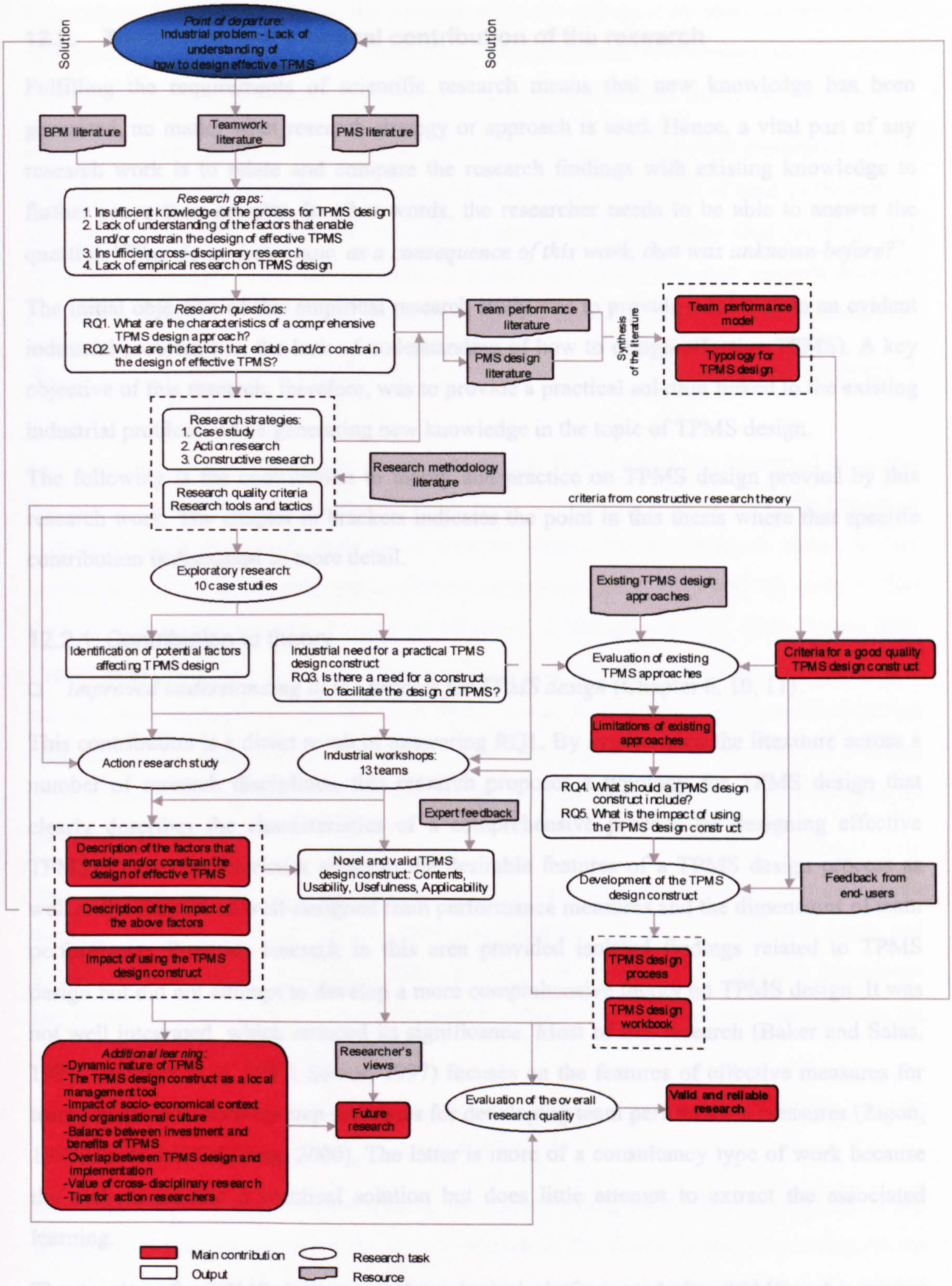

Figure 12.2: Summary of the research process

12.2. Theoretical and practical contribution of the research

Fulfilling the requirements of scientific research means that new knowledge has been generated, no matter what research strategy or approach is used. Hence, a vital part of any research work is to relate and compare the research findings with existing knowledge to further prove their novelty. In other words, the researcher needs to be able to answer the question '*What do we know now, as a consequence of this work, that was unknown before?*'

The initial objective of this empirical research study was to provide a solution to an evident industrial problem (i.e. the lack of understanding of how to design effective TPMS). A key objective of this research, therefore, was to provide a practical solution linked to the existing industrial problem, while generating new knowledge in the topic of TPMS design.

The following is the contribution to theory and practice on TPMS design provied by this research work. The chapter in brackets indicates the point in this thesis where that specific contribution is discussed in more detail.

12.2.1. Contribution to theory

- *Improved understanding of the process for TPMS design* (Chapter 6, 10, 11)

This contribution is a direct result of answering RQ1. By synthesising the literature across a number of research disciplines, this research proposes a typology for TPMS design that clearly describes the characteristics of a comprehensive process for designing effective TPMS. These characteristics relate to the desirable features of a TPMS design process as well as the features of well-designed team performance measures and the dimensions of team performance. Previous research in this area provided isolated findings related to TPMS design but did not attempt to develop a more comprehensive theory on TPMS design. It was not well integrated, which reduced its significance. Most of this research (Baker and Salas, 1997; Brannick et al, 1997; Senior, 1997) focuses on the features of effective measures for teams or provides step-by-step processes for developing team performance measures (Zigon, 1999; Jones and Schilling, 2000). The latter is more of a consultancy type of work because the authors provide a practical solution but does little attempt to extract the associated learning.

The typology for TPMS design provides a logical platform to design TPMS and increases the significance of previous research. It describes and further expands the features that make a TPMS design process successful. As a result, it fills a gap in current research, contributes to theory and closes a gap between theory and practice.

Some of the features included in the typology were not addressed by previous research and as such, they make a novel contribution. These features include *measurement dimensions, be flexible and required low resource consumption* and *identify process leader and facilitator.*

During the development of this typology, the researcher provided a clear description of the meaning of team performance. Apart from the drivers and dimensions of team performance, this research identifies the specific variables related to each dimension (Section 6.4). This facilitates the design of specific measures of team performance. Previous research does not describe to this level of detail the specific variables for each dimension of team performance.

- *Improved understanding of the factors that enable and/or constrain the development of effective TPMS* (Chapter 7, 9, 10)

This contribution is a direct result of answering RQ2. This research has identified 10 factors that can affect the design of effective TPMS. Also, it describes in more detail the impact of each factor depending on its mode and/or specific feature. Previous research covers the key success factors for developing and implementing business wide PMS and this study further extends that knowledge into the context of teams. Although some of these factors have already been identified within the change management and PMS literature, until now, they had not been extrapolated into the team environment. In addition, this research identified three factors (i.e. team maturity, focus and content of appraisal and reward systems, business process view) that are specific to TPMS design and that have not been fully addressed by previous research.

Also, existing research on TPM tends to focus on theoretical frameworks, with little work done on studying TPM in practice (with the exception of, Zigon, 1998 and Jones and Schilling, 2000; Hacker and Lang, 2000). Instead, this research links previous knowledge and theory on TPM with a number of empirical studies. This provides new insights into the factors that affect TPMS design.

- *Description of the modes of impact of the factors affecting TPMS design and the relationships between them (Chapter 7, 9, 10)*

This contribution emerged while refining the understanding of the factors affecting TPMS design. This research identifies the impact of each of the above factors, depending on the specific modes (see Figure 10.11). Previous research does not explicitly address the relation between the different modes of each factor and TPMS design. Of particular relevance and novelty is the relationship between the three unique factors for the context of teams (i.e. team maturity, focus of appraisal and reward system, business process view) and TPMS design, as well the different modes of impact of organisational culture.

This research also provides a generic description of the relationships between the different factors. As a result, it identifies two factors (i.e. *management drive* and *structured TPMS design approach)* that can minimise the negative impact of the constraining factors.

- *Improved understanding of the impact of using a structured TPMS design approach* (Chapter 9, 10)

This contribution is a direct result of answering RQ5. It contributes to existing knowledge by clearly identifying the impact of using a structured approach to design TPMS (the TPMS design construct in this case).

Certain areas of impact identified during this research are related to the benefits of measuring team performance (i.e. focuses team efforts on managing key drivers, provides a continuous improvement and learning platform, increases accountability and commitment, facilitates team development) and these are addressed in the current literature (Katzenbach and Smith, 1993; Meyer, 1994; Zigon, 1995, 1997; Viken, 1995; Brannick et al, 1997; Hunt, 1999; Hacker and Lang, 2000; Jones and Schilling, 2000). Other areas of impact, however, are specific to the use of the construct (i.e. saves time and effort, increases management commitment and support, encourages cross-functional integration, increases the probability of success of the TPMS, minimises the negative impact of the constraining factors). These are not addressed by current research and they therefore make a contribution to existing knowledge.

12.2.2. Contribution to practice

- *Development of a valid and novel practical construct that facilitates the design of effective TPMS* (Chapter 8, 9)

One of the outputs of this research work has been the TPMS design construct that was developed in order to fulfil an industrial need. The construct proved to be a useful tool for teams and team leaders who are willing to develop a TPMS. Not only does the construct facilitate the development of an effective TPMS but it also acts as a continuous improvement platform for developing team performance.

Although the tool has a generic nature and does not provide an 'off-the-shelf' solution for each specific type of team, it has a wide range of applicability for teams of different types, at different organisational levels and across several industrial sectors.

The key strength of the construct is that it is built upon a sound theoretical basis. In fact, the close link of the construct with theory on team performance (through the team performance model, Figure 5.3) and theory on TPMS design (Table 6.9) shows the robustness of the construct. The fact that the construct was developed with a clear link to novel theory on TPMS design, and that it overcomes the limitations of other existing approaches, also demonstrates the theoretical novelty of the construct.

- *Facilitates the development of the 'ideal' context for TPMS design* (Chapter 10)

The identification of the factors, their specific modes and the impact of these on TPMS design provides a practical platform for developing an environment with the right conditions for designing effective TPMS (Chapter 10, Section 10.10). This is especially relevant for three groups of industrial practitioners including senior managers, human resource specialists and team leaders. This work gives senior managers a clear indication of the areas that they need to manage and the support they need to provide to create the right conditions to design and implement TPMS (e.g. management drive, structured strategy and performance management systems, organisational culture, quality frameworks). Human resource specialists can benefit from the knowledge related to the required input from a human resource management perspective towards building effective TPMS and improving team performance (e.g. need to re-engineer training, performance appraisals, rewards, and career development; increased focus on managing culture, leadership, inter-team relationships, employee satisfaction and/or employee growth). Finally, team leaders can use these findings to adopt a structured approach to TPMS design and to highlight those areas that need to be improved to design effective TPMS and improve overall team performance.

- *Identification of the limitations of currently existing methodologies for designing TPMS (Chapter 8)*

The identification of the limitations of existing approaches to design TPMS increases the awareness of industrialists and allows them to develop the appropriate systems to overcome these limitations.

12.3. Quality of the research

So far, this thesis has taken the reader from the definition of the research problem to the specific answers to the research questions. In order to reach a high research quality standard, however, it is important to critically assess this research. This will demonstrate whether this research is valid or not.

The research criteria for evaluating this research was discussed in Chapter 4. It combined the criteria to assess the three research strategies used during this research work, i.e. case study research, action research and constructive research. That same chapter also highlighted the specific tactics that the researcher was going to apply in order to ensure the overall quality of the research (Chapter 4, Table 4.8).

The following section discusses the assessment in more detail and this is summarised in Table 12.1.

12.3.1. Contribution to knowledge

Contribution to knowledge is a key aim of any research work and it will determine the quality of case study, action and constructive research (Easterby-Smith at al, 1991; Eisenhardt, 1989; Stake, 1995; Voss et al, 2002; Kasanen et al, 1993; Kekale, 2001; Eden and Huxham, 1996; Coughlan and Coghlan, 2002).

The contribution to knowledge from this research was discussed in Section 12.2.1. This research has contributed to knowledge by the four means previously described.

12.3.2. Rigor of the research process

The rigor of a research study is demonstrated through a logical and rational research design (Yin, 1994; Easterby-Smith, 1999). Generally, four tests are applied to assess the rigor of the research process. These are: *construct validity, internal validity, external validity and reliability.*

12.3.2.1. Construct validity

Construct validity refers to the establishment of the appropriate operational measures or variables for the concepts being studied (Yin, 1994, p.33). In other words, the research design needs to fully address the research questions and objectives (Yin, 1994; Easterby-Smith, 1999, Martinez and Albores, 2003). According to Yin (1994, p.34) the researcher must be sure to cover two steps:

1. Select the specific types of changes that are to be studied (in relation to the original objectives of the study), and
2. Demonstrate that the selected measures of these changes do indeed reflect the specific type of change that have been selected

These steps were covered by defining the research issue, the problem domain and by decomposing detailed research questions from the research problem. This way, the measures used in the course of the study were connected to the research problem. The initial fieldwork study identified ten potential factors that have an impact on the design of effective TPMS and the need for a TPMS design construct, which cover the first of the steps. The second step was covered by confirming the existence and impact of those factors and by developing and testing the construct through a number of workshops and an action research study.

To increase construct validity, Eisenhardt(1989), Kasanen et al (1993), Yin (1994), Kekale (2001) and Voss et al (2002) suggest a numbers of tactics, including *enfolding literature, use of establishing a chain of evidence, have a draft case study report reviewed by respondents* and *using multiple sources of evidence* (data source triangulation).

During this study the researcher focused on continuously creating a link with existing literature. Prior to identifying the factors affecting TPMS design a critical review of the literature was carried out to evaluate current knowledge in the area. The findings regarding the relationships between specific factors and TPMS design identified through the case studies and action research (methodological triangulation) were also cross-examined with the existing literature to sharpen the theory, prove the novelty of the research and to increase internal validity. Data source triangulation was used to reach those findings and to increase construct validity. Data was collected from several organisations (which enabled the researcher to establish a chain of evidence) and from different people within each organisation through a mixed set of instruments (i.e. interviews, questionnaire, documentation, informal discussion and observations). Finally, each case study was documented and reported back to the companies in order to get feedback from the respondents.

The TPMS design construct was also developed and evaluated making a clear link to the existing literature. As a result, the theoretical soundness and novelty of the TPMS design construct were demonstrated, both of which increase its validity. During the evaluation of the construct, three different researchers were involved. The triangulation of data from the observations made by each of the researchers (investigator triangulation) further increases the validity of the construct.

12.3.2.2. Internal validity

Internal validity is related to explanatory or causal studies. It is concerned with the establishment of causal relationships, in which the researcher determines that certain conditions lead to other conditions (Yin, 1994, p.33). For example, if a research demonstrates that a variable A causes B to happen then the research is said to be internally valid. However, if the actual reason for B to happen is a third variable C, this test will fail.

Based on these causal relationships, the researcher will gain an increased understanding of the cases and this will allow him to make reliable inferences.

For a research to be internally valid the researcher needs to be sure that full access to the knowledge and meanings of informants has been gained (Easterby-Smith et al, 1991). Yin (1994) suggests pattern-matching and explanation-building as tactics to deal with this test. However, most of the methods described in Chapter 4 (section 4.7.3) could also be used.

During this study, data source and methodological triangulation were used to better understand the causal relationships between specific factors and TPMS design. In the majority of case studies, data was gathered from several people from each organisation, at different times and using a number of data collection instruments (i.e. interviews, documentation, observations, informal discussions). In addition, the triangulation of data from the case studies and the action research study (methodological triangulation) further refined the understanding of the factors affecting TPMS design. This increased the internal validity of the research.

In order to analyse data from the case studies, cross case analysis was used to identify patterns of data that would identify the key factors affecting TPMS design. In addition, the potential factors identified in the exploratory research phase were coded in order to facilitate their validation.

During the AR study a number of tactics were adopted for ensuring validity of the study. These included, *developing a research framework*, *creating an AR team*, *continuously enacting the AR cycle* and *subjecting assumptions to public testing.*

The findings from each case study and the AR study were consistently structured, documented and reported for discussion with the organisations.

12.3.2.3. External validity

External validity or generalisability is concerned with knowing whether a study's findings are applicable beyond the immediate case. More precisely, it refers to the domain to which the research findings can be generalised (Yin, 1994, p.33).

Research strategies close to the phenomenological paradigm, such as case studies and action research, have been criticised for their lack of external validity or generalisability. Yet, it is important to bear in mind that the primary objective of case studies and action research studies is not to generate universal knowledge but to gain a better understanding of a phenomenon in the context of that particular case (Stake, 1995; Eden and Huxham, 1996; Meredith, 1998; Coughlan and Coghlan, 2002).

In qualitative studies, the researcher uses *theoretical replication logic* to confirm whether the patterns and concepts from one particular case can be applied in other environments (Eisenhardt, 1989; Yin, 1994; Stake, 1995; Meredith, 1998) instead of traditional sampling methods. This will enable the researcher to refine, extend and sharpen theory, which has a positive impact on external validity. Other tactics to increase external validity include using multiple case studies and data triangulation (Stake 1995; Eden and Huxham, 1996 Meredith, 1998).

During this study, multiple case studies (10 organisations during the initial fieldwork study and 13 teams during the application of the TPMS design construct) and an AR study were used, all of which permitted application of theory replication logic in order to increase external validity. This allowed the researcher to refine and validate the findings by describing and comparing the factors between companies with effective and ineffective TPMS (Chapter 7) and carrying out TPMS design exercises within different types of companies (Chapter 9, 10). Data from these organisations and teams was triangulated, which supported the development of findings that can be generalised to a wider context.

The initial focus of this study was on manufacturing organisations. The case studies and industrial workshops, however, included companies from various industrial sectors (i.e. manufacturing, construction, public service, accountants) and a wide variety of teams (i.e. cross-functional, self-directed, management, operational). As a result, the final findings of this study regarding the factors that affect the design of effective TPMS are not specific for manufacturing organisations or particular type of teams but generalisable to the industrial sectors and type of team identified above. Still, it remains to be seen whether these findings are applicable to other types of organisations (e.g. sports, arts, non-profit, extended enterprises) and teams (e.g. virtual, extended / strategic alliances).

The generalisability of the TPMS design construct was evaluated and discussed in Chapter 8 (Section 8.2.4). The feedback from the workshops demonstrated that the construct is also applicable within the above industrial sectors and types of teams.

12.3.2.4. Reliability

Reliability refers to the repeatability of the research. A research is reliable when the process of study is reasonable and consistent over time and when the process, if used by different researchers in the same environment, achieves the same results and draws the same conclusions (Miles and Huberman, 1994; Yin, 1994; Easterby-Smith et al, 1991). In qualitative studies, however, because the variables within a particular case will be continuously changing and findings are often based on subjective observations, consistently achieving exactly the same results is difficult and not always desirable. In addition, replicating a mixed set of research methods that are often used in qualitative research can also be a difficult task (Jick, 1979).

In qualitative studies, the key to reliability is to demonstrate, through argument and analysis, that the process of exploration (i.e. data generation and analysis) has been appropriate to answer the research questions as well as thorough, careful, honest and accurate (Eden and Huxham, 1996; Lanning, 2001). This will reduce potential biases of the study. Therefore, one prerequisite for allowing future investigators to repeat an earlier study is a *structured documentation and reporting* of the procedures followed (Yin, 1994; Stake, 1995; Coughlan and Coghlan, 2002). Other tactics to deal with reliability include using a *case study protocol, case study database, interview guide* and *pilot case studies* (Yin, 1994; Miles and Huberman, 1994; Eisenhardt, 1989; Voss, 2002).

This thesis has clearly documented the process and logic followed to link the research problem and questions with the final conclusions. The quality criteria to evaluate the research was clearly defined in the early stages of the research. This led to the adoption of specific tactics (e.g. case study database, case study protocol, within/cross case analysis, pattern matching and enfolding literature) that demonstrated that the process of data generation and analysis was appropriate.

In order to increase the reliability of the research process and reduce researcher bias, the reporting of the AR study in Chapter 10 places special emphasis on clearly describing the steps taken by the researcher. This includes the early definition of the research framework (Figure 10.4), which linked the objectives of the AR study with the data collection and analysis instruments and the key operating principles.

12.3.3. Contribution to practice

A key objective of this research was to solve an existing industrial problem (i.e. lack of understanding of how to design effective TPMS). Making a practical contribution was, therefore, a key criteria to assess the quality of the research results (Kasanen et al, 1993; Kekale, 2001; Eden and Huxham, 1996; Coughlan and Coghlan, 2002).

The contribution to practice of this research was discussed in Section 12.2.2. This research has clearly contributed to practice by the three means described previously.

12.3.4. Sustainable change

A key requirement of action research studies is to bring sustainable change to the particular system (the Production Team in this case) by instilling improved and durable systems, tools and/or working practices rather than just making a 'one-off' practical contribution. During the AR study in Highland Spring, the sustainable change did not come by developing an approach to design effective TPMS or even by designing the particular TPMS. These two aspects brought considerable benefits to the team but the bigger impact of the project came by (1) adopting the TPMS as a tool to manage the daily activities of the team and (2) embedding a culture of teamwork and continuous improvement through performance measurement. These two aspects brought change that can now be sustained over time.

12.3.5. Summary of the research quality evaluation

Table 12.1 summarises the evaluation of this research against each of the criteria above described. The evaluation has shown that this research fulfils the quality criteria. Therefore, the main conclusion is that *this research is valid and reliable.*

Quality criteria	Was it satisfied?	How?
1. Contribution to knowledge	Yes	Identification and description of the features of comprehensive TPMS design process Identification of the factors that enable and/or constraint the design of effective TPMS Description of the impact of the above factors Impact of using the TPMS design construct in industry
2. Rigor of the research design and process	Yes	By demonstrating construct validity, internal validity, external validity and reliability
2.1. Construct validity	Yes	Selection of multiple data collection techniques data sources (data source and methodological triangulation), enfolding literature, establishing a chain of evidence, structured reporting, investigator triangulation.
2.2. Internal validity	Yes	Data source and methodological triangulation, cross case analysis and pattern matching, coding, enfolding literature, structured reporting, develop a research framework, create AR team, conscious and deliberate enactment of the AR cycle, subject assumptions to public testing
2.3. External validity	Yes	Multiple case studies, Theory replication logic, data source triangulation
2.4. Reliability	Yes	Early definition of research quality criteria, case study database, case study protocol, cross case analysis and pattern matching, enfolding literature, structured reporting, conscious and deliberate enactment of the AR cycle
3. Contribution to practice - i.e. practical relevance and usefulness	Yes	Develop a novel and valid construct to facilitate TPMS design Guidelines to create an 'ideal' context for TPMS design Describe the limitations of other approaches to develop the appropriate systems
4. Sustainable change	Yes	Adoption of the TPMS as a tool to manage the daily activities of the team Embed a culture of teamwork and continuous improvement through performance measurement

Table 12.1: Summary of evaluation of the research

12.4. Limitations

There is always a limit to what a researcher can achieve during a research study. Recognising the limitations of a study strengthens the validity of the findings and the reliability of the research process.

The limitations of this particular work can be divided into two main categories: *research results* and *research methodology.*

12.4.1. Limitations of the research results

The first limitation is concerned with the generic nature of the research findings. Previous sections of this thesis pointed out that the research findings are not specific for a particular type of team. There were two main reasons for adopting a generic approach to TPMS design. Firstly, as described in Chapter 5, there are a wide number of variables by which teams can be categorised and so, labelling teams under a specific category can sometimes be misleading. Often, the performance expectations and drivers of performance for these teams will vary considerably. Secondly, there was evidence from the industrial collaborators that the problem of designing effective TPMS was common for a wide variety of teams. As a result, the researcher decided not to focus on a specific type of team.

The generic nature of the TPMS design construct was an area that certain teams (especially those that were in the early stages of development) struggled to deal with. This generic nature increases the applicability of the construct but it does not make explicit what performance drivers and measures correspond to each type of team.

The second limitation is that the results from this research will not necessarily ensure the effectiveness of the TPMS. The effectiveness of the TPMS heavily depends on the appropriateness of the existing business strategy and performance measurement system. If the company strategy is not adequately aligned to the business value proposition, then the objectives and measures deployed to the team will probably be inadequate. This will jeopardise the effectiveness of the TPMS and the overall performance of the team. This research highlights the importance of having an adequate strategy and PMS but it is not its purpose to assess its appropriateness. An inaccurate or inadequate input into the TPMS design construct will result in an ineffective TPMS.

The third limitation is that this research focuses mainly on the design of effective TPMS. The success of the TPMS, however, depends on the design as well as on the implementation, use and review of the TPMS. Some of the factors affecting TPMS design identified during this research will also affect its implementation, use and review. Also, the use of the TPMS design construct will assist in overcoming some of the problems for implementation (e.g. lack of clearly defined data collection methods). Further steps, however, need to be taken in order to ensure the overall success of the TPMS.

The fourth limitation of this research, and in particular the AR study, is that is was not possible to assess the impact of the TPMS design project in isolation. Designing effective TPMS was part of a wider improvement project, in which all specific projects were closely interlinked. In fact, it is important to remember that TPMS should be an integral part of the bigger performance management process and so, it is a complex and not necessarily desirable task to assess its impact in isolation.

12.4.2. Limitations of the research methodology

A key limitation for most research work is time constraint. This research was not an exception as it had to be completed in the time period required for doctoral submission. As a result, the main limitation of the methodology adopted during this research work is the lack of longitudinal studies. These would facilitate the assessment of the impact of using an effective TPMS in the longer-term performance of teams and a better understanding of the issues surrounding the implementation and use of TPMS. Although the AR study identified some of the benefits that the team gained from using the TPMS, this was only partially implemented and so, it was not possible to assess the impact after full implementation. The full implementation of the TPMS, however, would have required at least one more year as the team needed to gain more experience prior to implementing some of the measures.

Although the teams studied during this research came from a number of industrial sectors, most of them belong to the manufacturing sector. This can limit the potential for generalising the results because one might argue that having only one team from a different sector is not enough to justify the applicability of the results. As a result, it would have been adequate to study more teams from the same industrial sector apart from manufacturing (e.g. public service, accountancy). It is, however, important to remember that generalisability in qualitative studies is not related to statistical sampling (i.e. number of cases) but to theoretical replication (i.e. applicability of concepts in other environments).

Two final limitations of this research are the lack of experience in action research and the subjective nature of the study. The lack of experience in action research was a barrier that the researcher had to overcome, in particular during the early days of the AR study and those times where things did not seem to be moving on. The careful and detailed design of the research framework and process for the AR study minimised the impact of the lack of experience. Subjectivity is a key ingredient of qualitative research and so, it should not be considered as a limitation. In qualitative studies the researcher needs to minimise the bias from his observations and final conclusions to ensure the validity of the research. Again, the carefully designed research process ensured that the required steps and tactics to minimise bias (e.g. data triangulation, pattern matching) were adopted.

12.5. Future research

As the study progressed, the researcher identified several areas for further investigation. These are as follows:

- The investigation of the factors that affect the implementation, use and review of TPMS would be an ideal follow-up study to this research. This investigation would require several longitudinal studies to carry out TPMS implementation exercises. An action research strategy would be the most suitable approach to adopt for this type of investigation.

- Again, based on longitudinal studies and preferably using an action research strategy, it would be interesting to investigate applicability of TPMS as a team development tool. This study would analyse the relationship between the evolution of TPMS and team development.

- Virtual, distributed, strategic alliance and or extended teams have been attracting the attention of many researchers and practitioners in recent years. In fact, this researcher is currently involved in a 5^{th} framework EU project (K-FLOW[22]) that focuses on managing knowledge in the Extended Enterprise[23], with a particular emphasis on the new organisational forms and structures. An interesting piece of research would be to study the use of effective TPMS for managing and improving the performance of virtual, distributed and extended teams (i.e. teams which are formed by individuals distributed across time, space and individuals from different organisations). A first attempt to assess the applicability of the TPMS design construct with distributed design teams is currently in process.

- An investigation of the impact of organisational culture and socio-economical context on the design and implementation of effective PMS (as discussed in Section 10.2). This study should combine studies from a number of regions across the globe. Of particular interest would be to incorporate studies of regions that are rarely cited in the literature and with a

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[22] K-FLOW: Advanced methodologies and tools for the knowledge management within the extended manufacturing enterprise. For more details see www.kflow.org

[23] Extended Enterprise is a knowledge-based organisation which uses the distributed capabilities, competencies and intellectual strengths of its members to gain competitive advantage and to maximise the performance of the overall extended enterprise (Bititci et al, 2003)

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unique socio-economical context. In this case, using an action research strategy could have high resource consumption and so, if that was not feasible, a case study approach could be used to carry out this research. A survey across different types of organisations located in several countries could also facilitate an initial assessment of the relationships between national culture, organisational culture and the design and use of PMS.

❑ As with many other systems, teams can be viewed from a structural and/or a cultural perspective. In that sense, the drivers of team performance could also be classified along the structural and cultural dimensions (Figure 12.2). Although in recent years, research has been shifting towards the 'softer' cultural side of team performance, most of current research on team performance and TPM focuses on the management of the structural issues. Cultural issues are becoming increasingly important for managing team and business performance but there is still a need to better understand how companies can measure, manage and develop these issues. An empirically-based investigation that focuses on the measurement and management of the cultural dimensions of teams would fill a gap in current research and provide a solution to an increasingly relevant industrial problem.

Team performance drivers	*Structural*	*Cultural*
Team task / process	Process design, process variables, improvement tools and techniques, skills optimisation, task significance	Systems-thinking, shared mental models
Team characteristics and teamwork process	Knowledge and skills, size, heterogeneity, roles and responsibilities, clarity of goals, norms, communication, autonomy	Accountability, commitment, cohesion, trust, collaboration, motivation, shared mental models, emotional intelligence
Organisational context	Team briefings, goal alignment, stakeholder integration, rewards, training, physical environment, benchmarking and transfer of best practices, information systems, technology, markets, competition	Organisational culture, management style, leadership, emotional intelligence

Table 12.2: Structural and cultural dimension of team performance

❑ From a practical point of view, it would be valuable to investigate the possibility of customising the TPMS design construct for specific categories of teams. This construct(s) would make explicit the specific performance drivers and provide a generic set of measures for each category of team.

12.6. Reflecting on the research experience

This research journey has been a challenging, stimulating and enlightening experience. If this researcher was to pick one significant element of this journey, it would be the continuous learning aspect. Whether it was reading a research article, studying a research method, analysing data, giving a presentation, steering a meeting or visiting an organisation, the researcher had to keep an open mind to capture anything that could be relevant to this research. Through this study, the researcher has gained a deep understanding of the qualitative research process and has become an expert on the field of performance management and team management. The process has also fundamentally improved his analytical, reflective, inquiry and reporting skills, all of which are critical for doing good quality research.

In hindsight, there are a number of things that the researcher would have done differently. Although there were a large number of organisations involved in this study, finding the most appropriate organisations to collaborate in the study was not an easy task. Ideally, the researcher would have selected an organisation that showed the features of an 'ideal' context for TPMS design to carry out another AR study. This would have enabled comparing and contrasting the corresponding findings with the AR study described within this thesis. Also, the complete design and implementation of the TPMS would most probably have taken less time and this would have facilitated the assessment of the impact of TPMS in more detail.

It would also have been appropriate to look at several teams coming from the same type of industry sector (e.g. service, public) in order to further support the generalisability of the research findings.

Finally, during the AR study, it would have been useful to have been able to place more emphasis on influencing the managers in charge of the other functions that formed the order fulfilment process. If management buy-in from these functions had been achieved, the story of the project might have been different. Due to the increased pressure coming from the top, however, the AR team decided to keep the focus on the Production Team.

12.7. A glance into the future

The following quotation from Daniel Goleman (O'Neil, 1996, p.1), the father of 'emotional intelligence', is appropriate for drawing this thesis to a conclusion:

> *'Emotional Intelligence is a different way of being smart. It all depends on the type of relationship that we maintain with ourselves, on the way that we relate to others, on our capability for leadership and on our ability to work on a team. These are the elements that determine the reality of the workplace'*

Teamwork has been in the top of the management agenda for at least a couple of decades now, and from the impressions gathered during this study, it will remain there for a lot longer. While industry is still trying to complete the move towards flatter process-based structures, more flexible and collaborative type of organisational structures have started emerging (e.g. virtual companies, extended enterprises, clusters). This has changed and will continue changing not only the way that companies operate and are structured, but also the way that people present themselves, behave, relate to others and work with others in the workplace. The era of the 'soft' skills is at our doorstep. This means that researchers and industrialists will continue, for at least a few more years, to look for better ways to develop and manage teams and people.

Looking to the future of research, and to the operations management (OM) arena in particular, a debate has emerged within the OM community in recent years. Even if the aim of OM research is to enhance the capabilities of industrial operations, practitioners have often shown their dissatisfaction with the end results of research projects. This means that research is not focused on solving the current industrial needs as much as industry would like. More than two decades ago, organisational scientists had already raised this issue (Susman and Evered, 1978; Mintzberg, 1979; Thomas and Thymon, 1982) but the problem has not yet been solved. While the more traditional theoretically based research, also known as *Mode 1* research, is still valuable and necessary, OM research needs to move towards practitioner based research. This type of research, also known as *Mode 2* research, closes the gap between theory and practice by generating new knowledge based on the current problems (and corresponding solutions) that industry is facing. This will contribute to both communities, the academic and the practitioner, as well as enhancing the economic capabilities of individual regions.

This shift in the way to approach research also requires an evolution of the specific strategies and instruments that researchers use. Traditional quantitative studies are being replaced by more phenomenological or qualitative studies, in which the researcher focuses on gaining a deeper understanding of each particular case. In that sense, AR is becoming a relevant and valuable research strategy because it enhances the understanding of the industrial problem and provides an effective solution while working with the company. From the experience gained during this study, this researcher encourages the OM community to adopt action research as a key research strategy because it provides a more holistic solution to each particular problem. In turn, this will result in a more comprehensive set of new theories being generated.

Those features of the reality of the workplace that Goleman refers to are also very much applicable to the new skills required by researchers. In qualitative studies, and AR in particular, interpersonal skills, intuition and common sense can be considered key research instruments. It is not about doing a survey or counting the responses from an interview as much as recognising your strengths and weaknesses, effectively relating with the respondents, understanding the entire context of the situation and using plenty of common sense.

We all know that there is no 'holy grail' providing a universal solution to all industrial needs. There is, however, a lot of good research out there that needs to be brought closer together. There is still a tendency to label each research work under specific research disciplines. While this is appropriate, from the point of view that it defines the boundaries of a study, it is the responsibility of the researcher to make sure that these boundaries do not act as barriers to gaining useful learning from other research disciplines. OM cannot solve all the problems of a company in isolation from other disciplines. It is, therefore, important for different research disciplines to collaborate closer together in order to learn from each other, increase the overall quality of the research and provide more effective solutions to the industrial community. *If we knew what we already know* we could be closer to the 'holy grail'.

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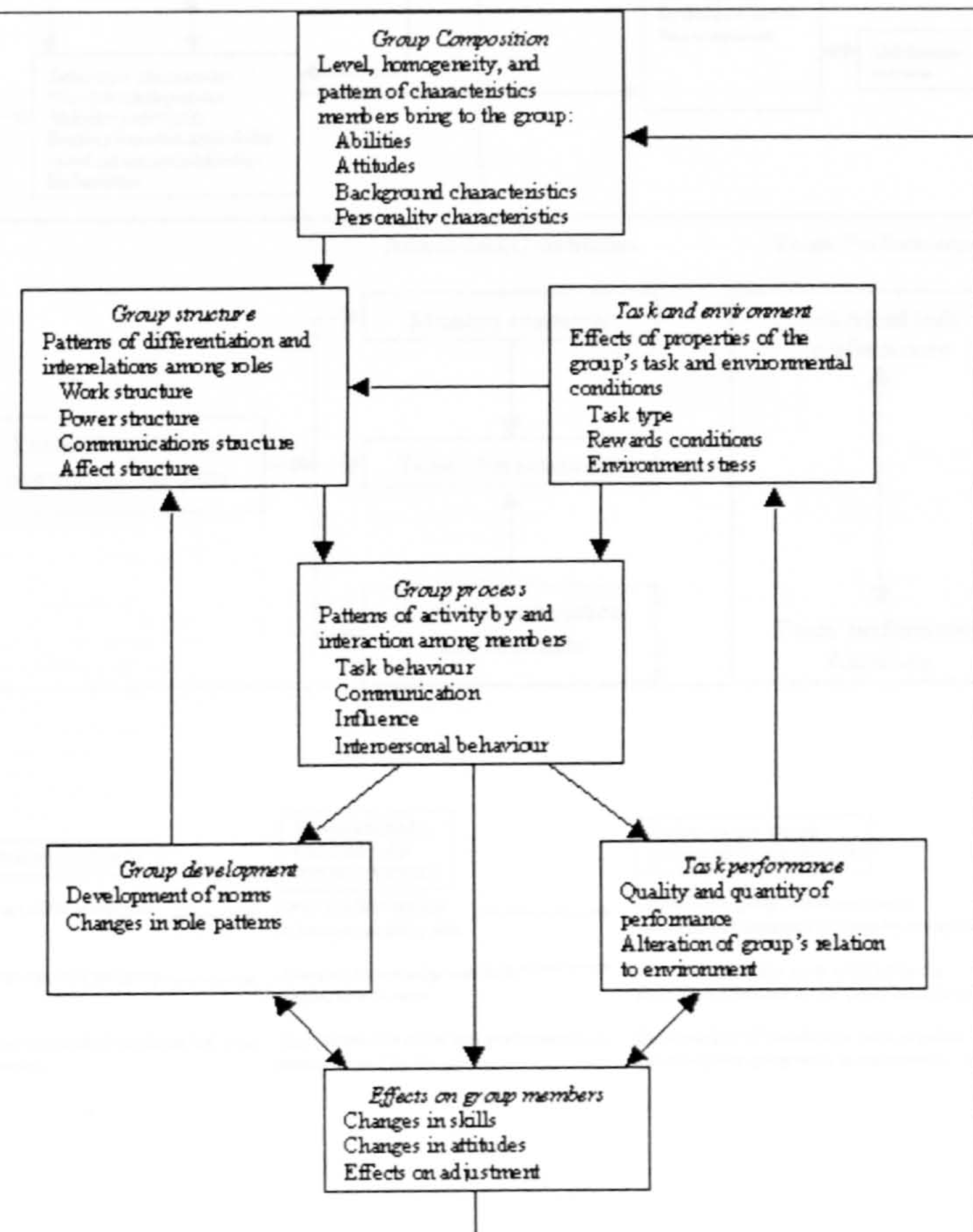
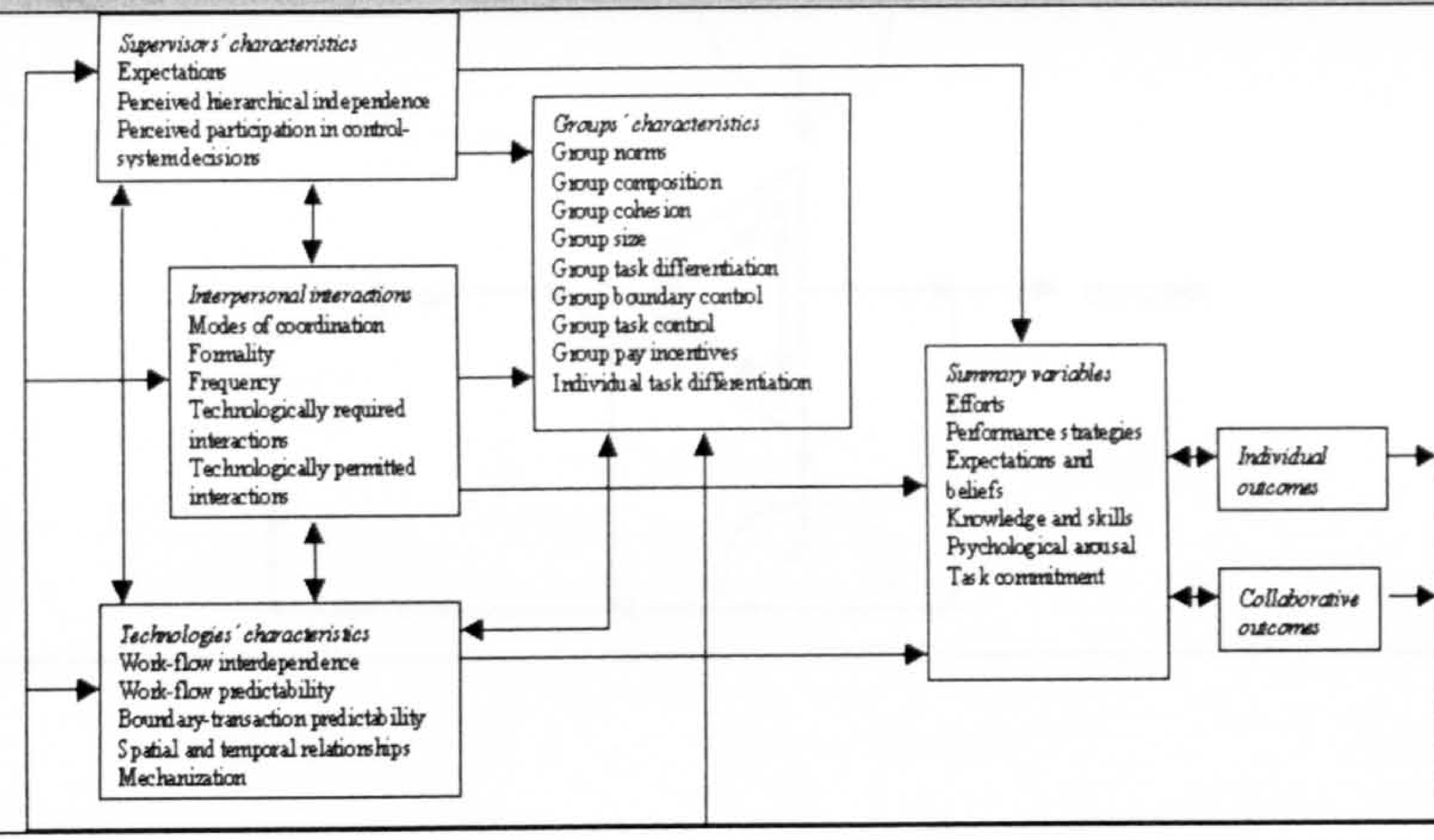
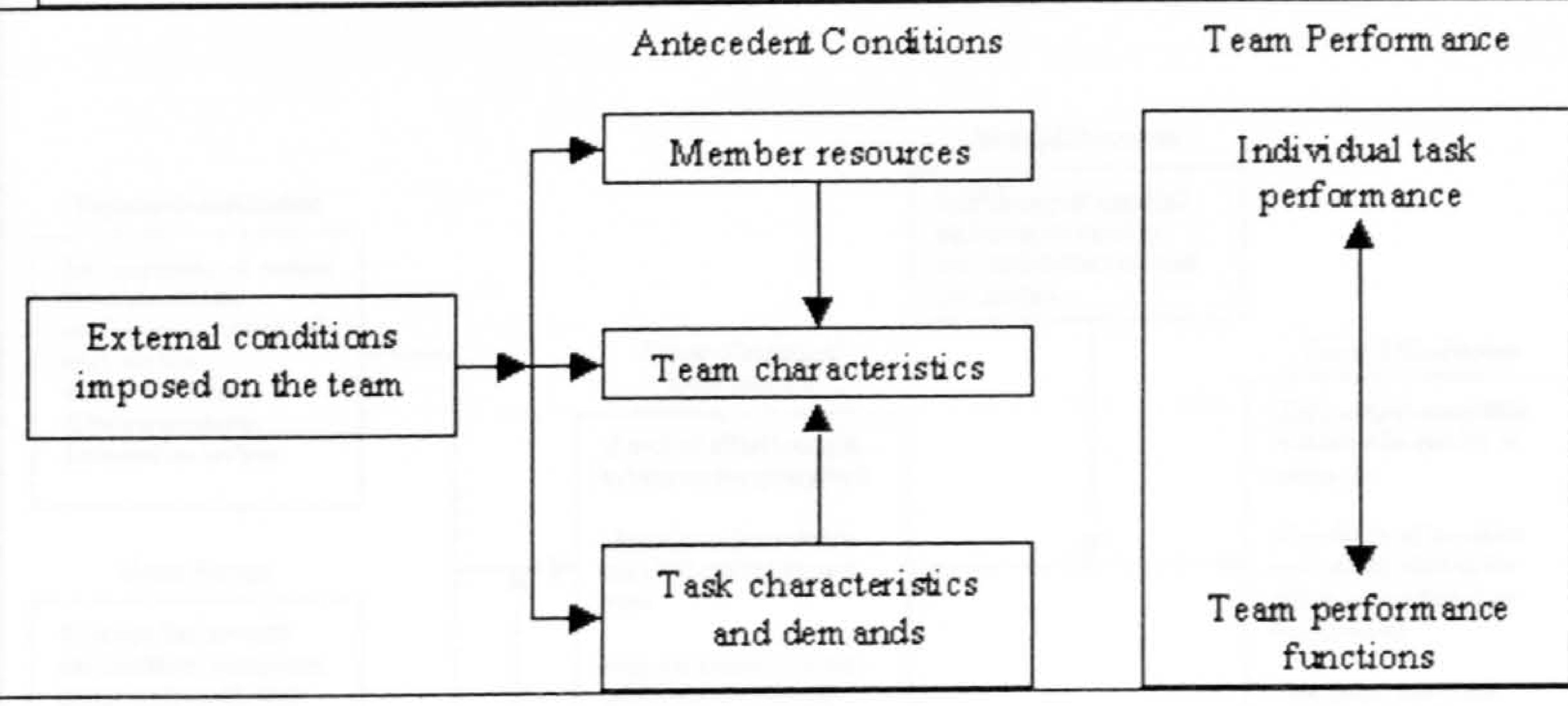
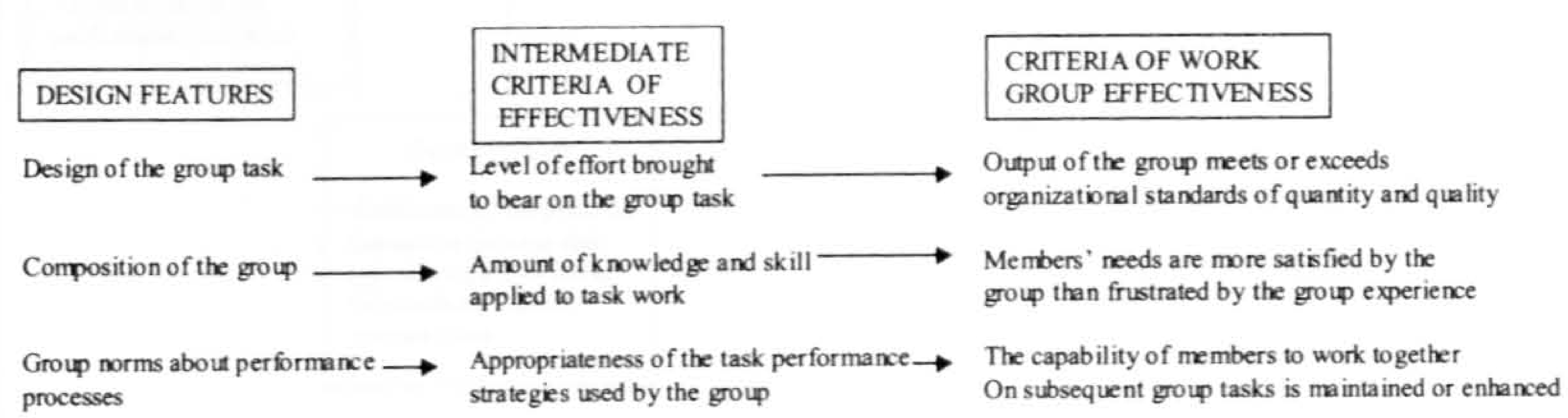
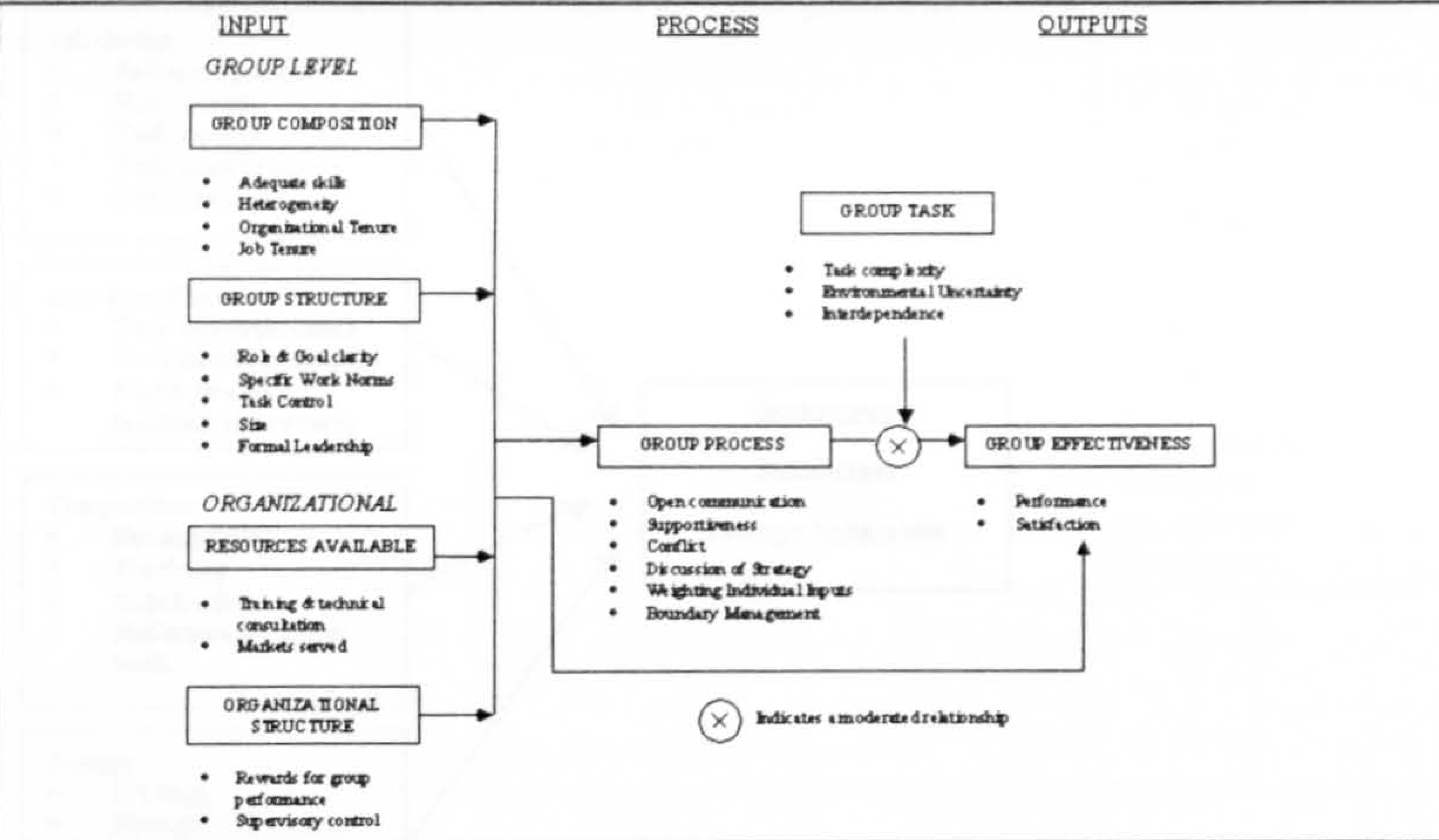
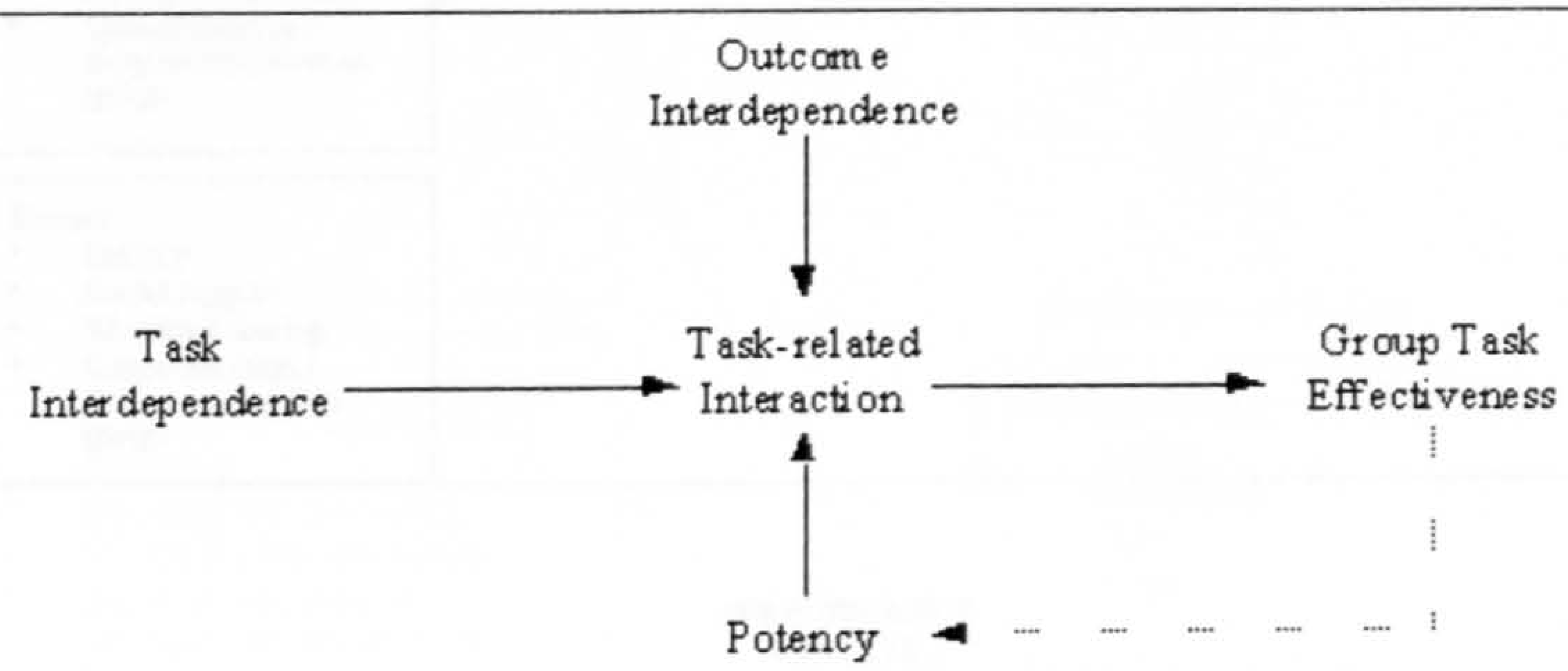
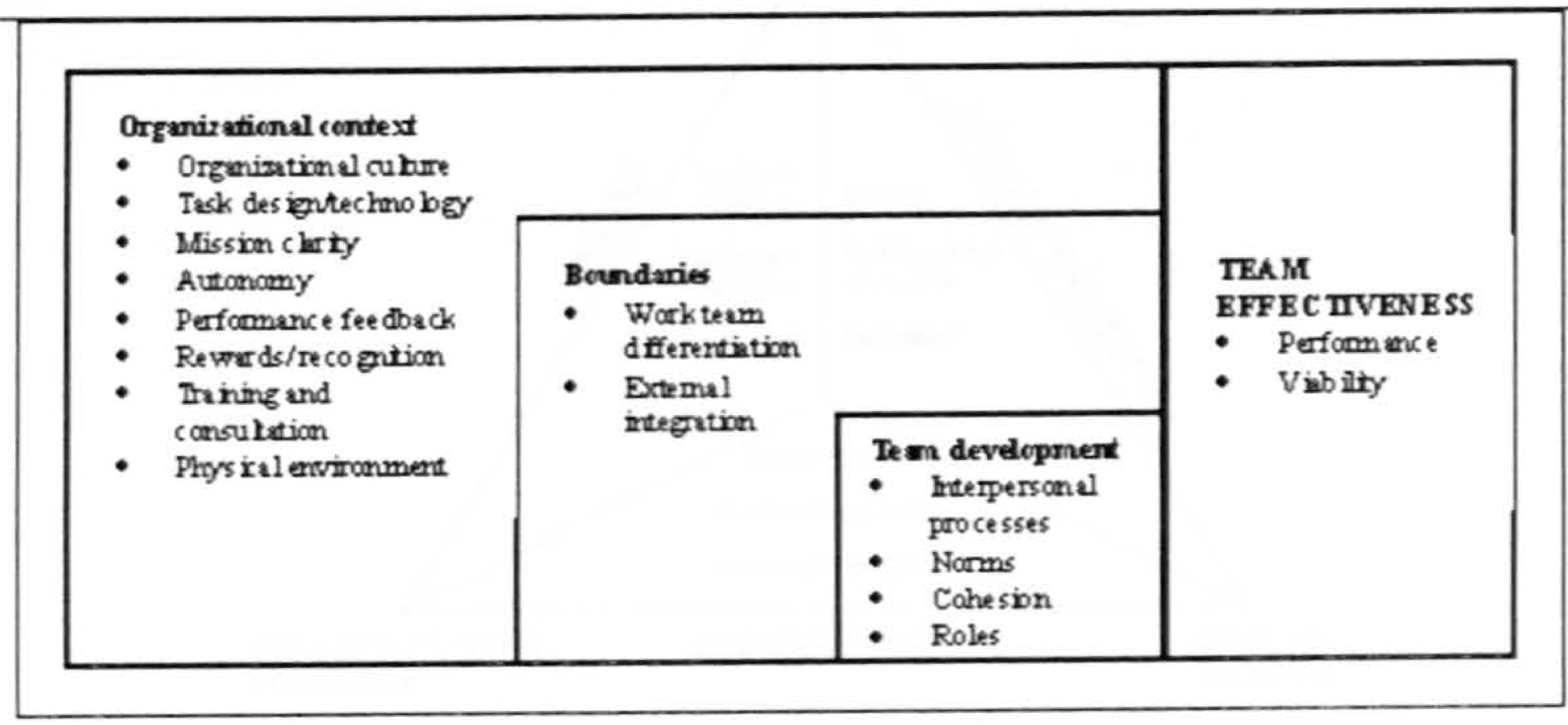
APPENDIXES

APPENDIX A – Models of team performance

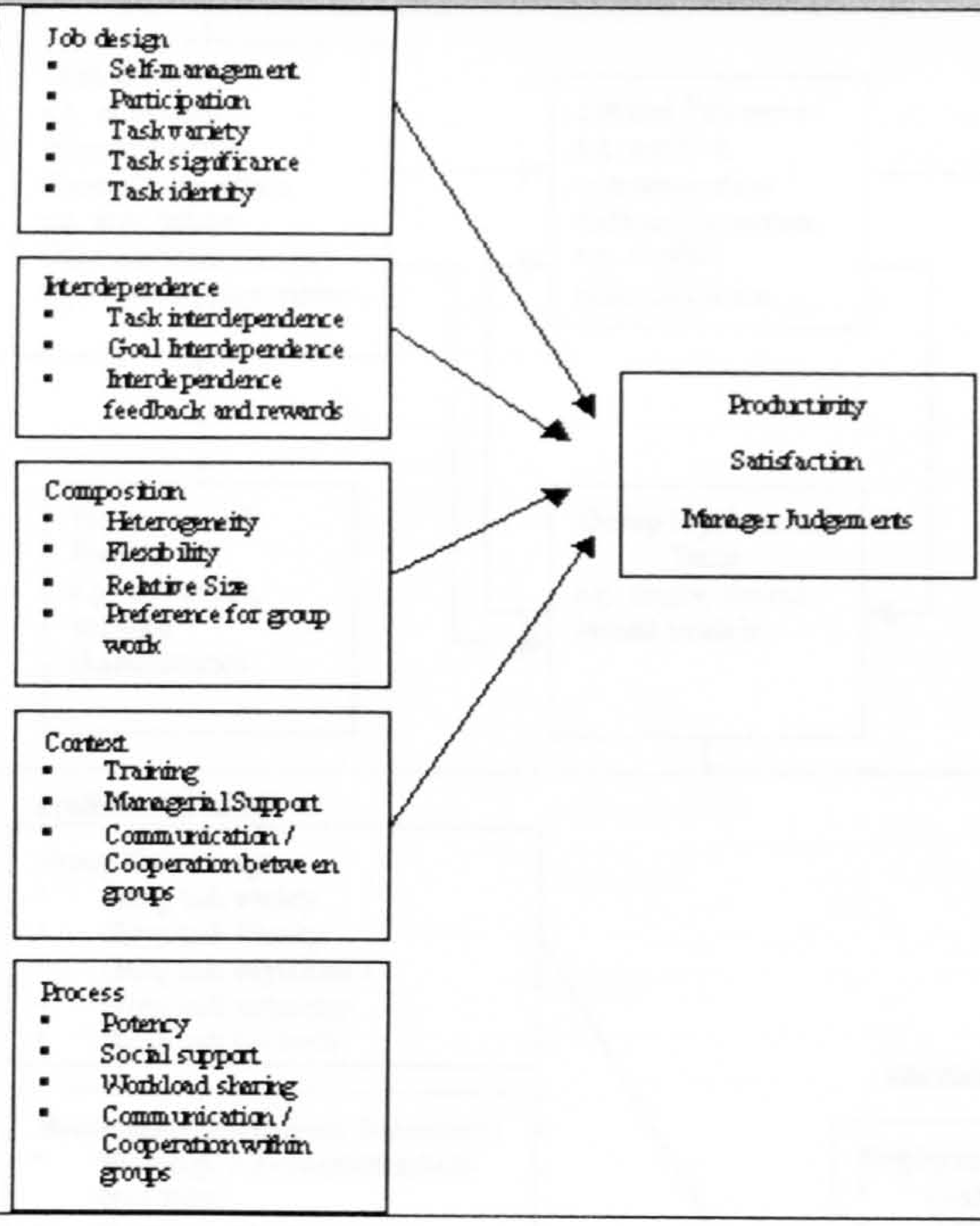
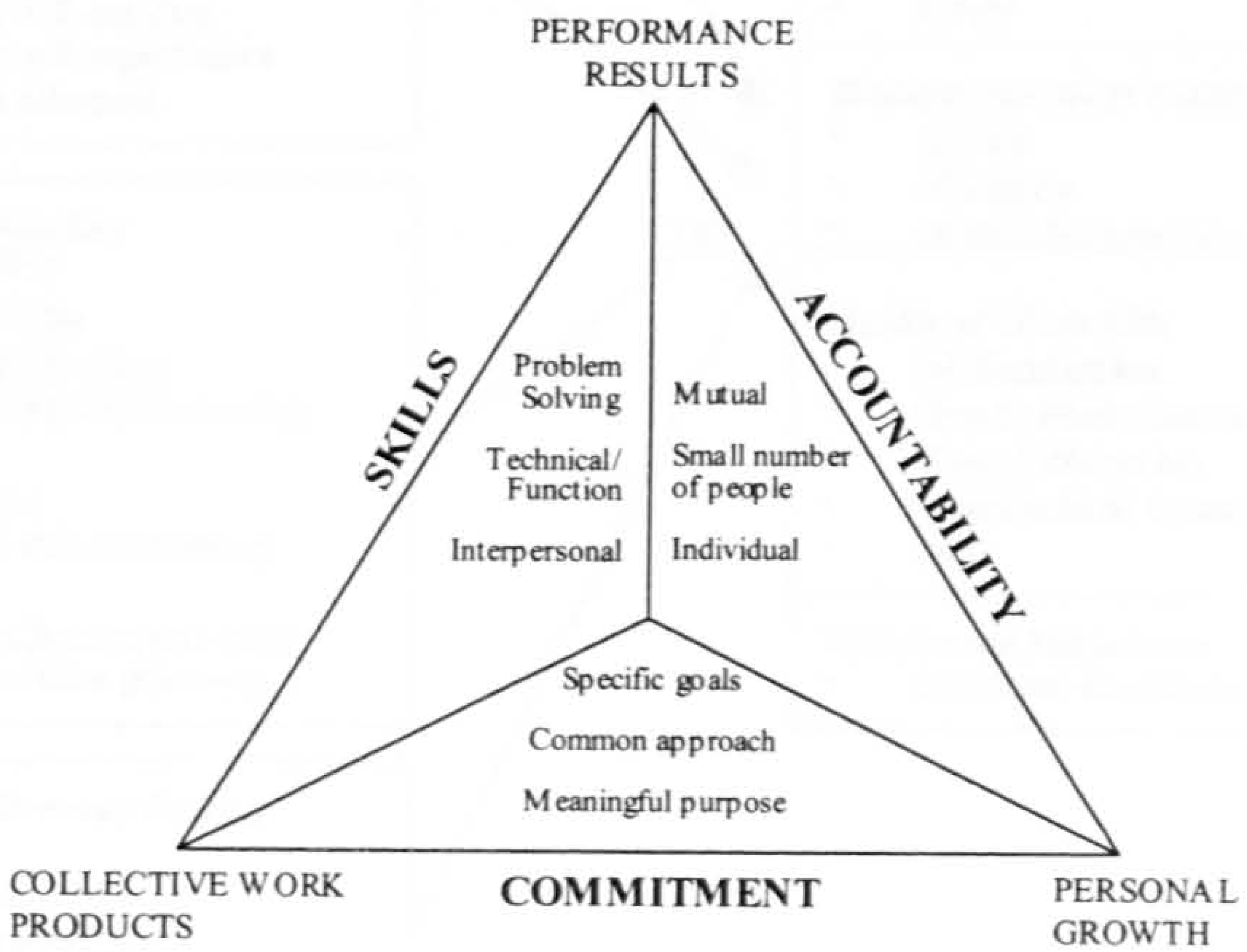
Author and source	Origin	Model of team effectiveness	Drivers of team performance	Dimensions of team effectiveness
Hawthorne studies (Roesthlisberger and Dickson, 1939 from Sundstrom, 1990)	Management studies	N/A	❑ Group norms ❑ Respect and attention provided by managers ❑ Decent wages ❑ Working conditions ❑ Clear goals and responsibilities ❑ Autonomy over working condition and production processes	❑ Output
McGrath (1964)	Social Psychology		❑ Group composition ❑ Group structure ❑ Task and environment ❑ Group processes	❑ Task Performance ❑ Group development ❑ Effects on group members

Author and source	Origin	Model of team effectiveness	Drivers of team performance	Dimensions of team effectiveness
Cummings (1978)	Socio-technical systems theory		❑ Supervisors' characteristics ❑ Interpersonal interactions ❑ Technologies' characteristics ❑ Groups' characteristics ❑ Summary variables	❑ Individual outcomes ❑ Collaborative outcomes
Nieva et al (1978)	Organisational psychology		❑ External conditions imposed on the team ❑ Member resources ❑ Team characteristics ❑ Task characteristics and demands	❑ Individual task performance ❑ Team performance functions
Hackman and Oldham (1980)	Organisational psychology		❑ Design of the group task ❑ Composition of the group ❑ Group norms about processes ❑ Level of effort ❑ Amount of knowledge and skills ❑ Task performance strategies	❑ The degree to which the group's productive output (product, service, or decision) meets the standards of quantity, quality, and timeliness of the people who receive, review, and/or use that output. ❑ The degree to which the process of carrying out the work enhances the capability of members to work together interdependently in the future. ❑ The degree to which the group experience contributes to the growth and personal well-being of team members

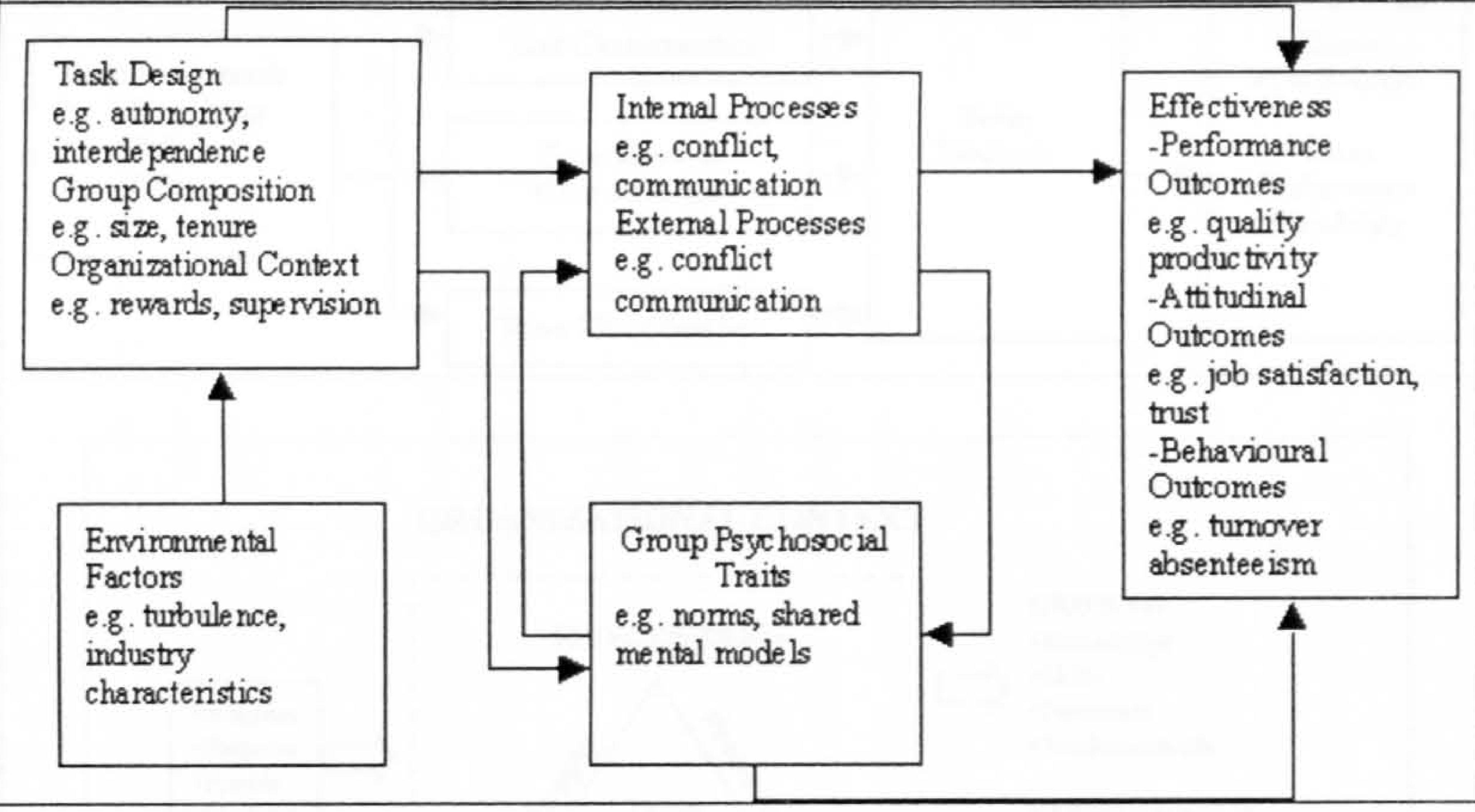
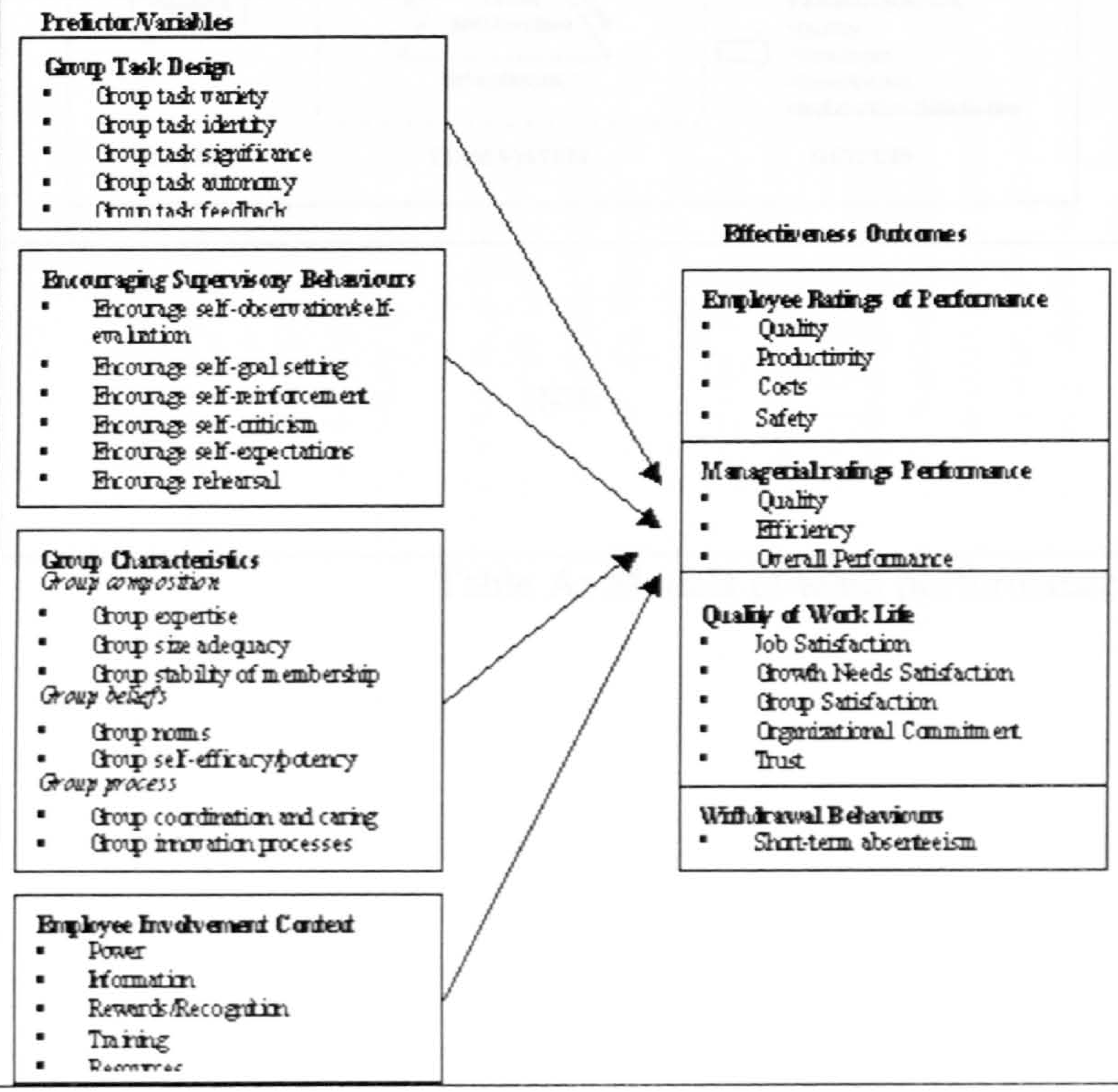
Appendix A: Models of team performance

Author and source	Origin	Model of team effectiveness	Drivers of team performance	Dimensions of team effectiveness
Gladstein (1984)	Organisational psychology		❑ Group Composition ❑ Group Structure ❑ Resources available ❑ Organizational structure ❑ Group Processes ❑ Group Task	❑ Performance output ❑ Member satisfaction ❑ Ability of the group to exist over time
Shea and Guzzo (1987)	Organisational psychology		❑ Task Interdependence ❑ Outcome Interdependence ❑ Potency	❑ production of designated products or services per specification
Sundstrom et al (1990)	Organisational psychology		❑ Organizational context ❑ Boundaries ❑ Team development	❑ Performance (acceptability of output to customers within or outside the organization who receive team products, services, information, decisions, or performance events) ❑ Viability (member satisfaction, participation, willingness to continues working together)

Appendix A: Models of team performance

<table>
<tr><th>Author and source</th><th>Origin</th><th>Model of team effectiveness</th><th>Drivers of team performance</th><th>Dimensions of team effectiveness</th></tr>
<tr><td>Campion et al (1993)</td><td>Organisational psychology</td><td>
</td><td>❑ Job design
❑ Interdependence
❑ Composition
❑ Context
❑ Process</td><td>❑ Productivity
❑ Satisfaction
❑ Manager judgements</td></tr>
<tr><td>Katzenbach and Smith (1993a)</td><td>Management research</td><td>
</td><td>❑ Skills
❑ Accountability
❑ Commitment</td><td>❑ Performance results
❑ Collective Work Products
❑ Personal Growth</td></tr>
</table>

Appendix A: Models of team performance

Author and source	Origin	Model of team effectiveness	Drivers of team performance	Dimensions of team effectiveness
Cohen and Bailey (1997)	Organisational psychology		❑ Task design ❑ Group Composition ❑ Organizational Context ❑ Environmental Factors ❑ Internal / external Processes ❑ Group Psychosocial Traits	❑ Performance outcomes ❑ Attitudinal outcomes ❑ Behavioural outcomes
Cohen et al (1996)	Organisational psychology		❑ Task design ❑ Supervisory behaviours ❑ Group characteristics ❑ Employee involvement context	❑ Employee ratings of performance (quality, productivity, cost, safety) ❑ Managerial ratings of performance (quality, efficiency, overall performance) ❑ Quality of Work Life (Job Satisfaction, Growth needs satisfaction, Group satisfaction, Organizational commitment, Trust) ❑ Withdrawal behaviours (Short-term absenteeism)

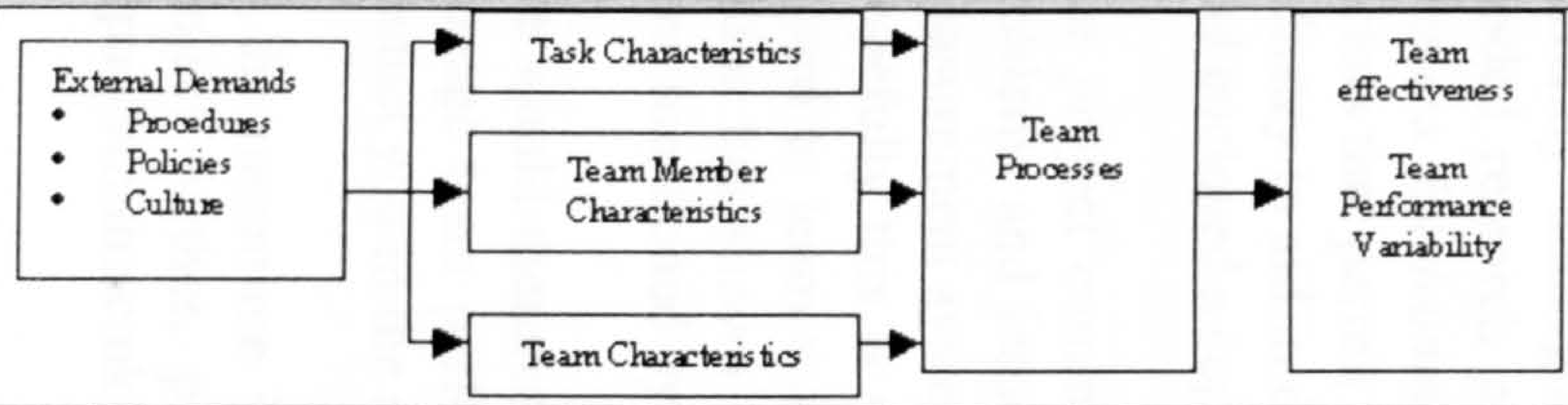
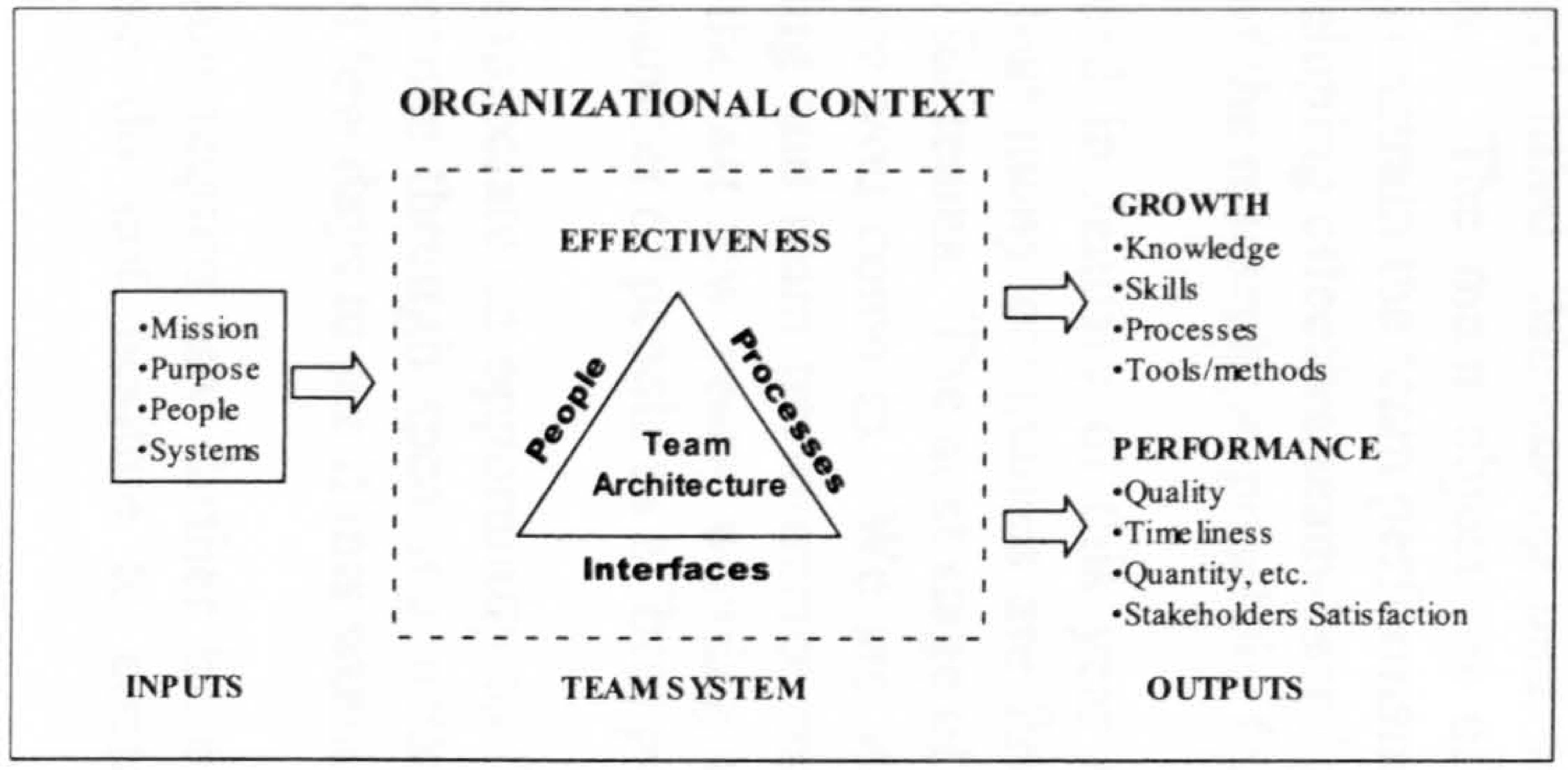
Author and source	Origin	Model of team effectiveness	Drivers of team performance	Dimensions of team effectiveness
Toquam et al (1997)	Organisational psychology		❑ Task Characteristics ❑ Team member performance ❑ Team characteristics ❑ Team processes	❑ Team effectiveness ❑ Team performance variability
Hunt (1999)	Systems approach		❑ People ❑ Processes ❑ Interfaces	❑ Performance ❑ Growth
Hacker et al (2000)	Operations management	N/A	❑ Common goals ❑ Commitment ❑ Cohesion ❑ Understanding of roles ❑ Participation ❑ Performance measurement	❑ Performance against schedule ❑ Internal Customer Satisfaction ❑ Overall Team Health

Table A: Models of team performance

Mr Hugh Mackenzie
General Manager
Litton Interconnection Products
72 Whitecraigs Road
Glenrothes
KY6 2RX

10 May 2000

Dear Mr MacKenzie,

Re: Measuring and managing team performance in business process environments

At the Centre for Strategic Manufacturing, University of Strathclyde, Glasgow, we are currently undergoing an EPSRC (Engineering and Physical Science Research Council) funded research project titled *'Measuring and Managing Team Performance in Business Process Environments'*. The main objectives of this research project are to identify the factors that permit or constrain the team performance measurement and to develop a guide for industry to aid in developing effective team-based performance measurement systems. Please find enclosed a copy of the research proposal for further information.

The project commenced in January of this year and to date we have been examining the problems and issues that many companies are finding in developing effective performance measurement systems for teams. The next stage of our research is to look for some solutions! Hopefully this is where you come in. We are looking for examples of best practice with regard to team working and team performance measurement. Due to the great success that Litton has shown in the last few years, winning several quality awards, your company has been mentioned by a number of people as a "best practice" company with regard to teams.

We would therefore appreciate an opportunity to find out more about how you measure and manage team performance through speaking with yourself and/or your colleagues. I shall contact you in the next few days to see if this would be possible.

In the meantime if you require any further information or you would like to discuss the project further, please do not hesitate to contact me (phone: 0141-548 2588, email: kepa@strath.ac.uk)

Yours sincerely,

Kepa Mendibil
Research assistant

Center for Strategic Manufacturing

APPENDIX B2

Team Performance Measurement - Company Questionnaire

Interviewer ______________________________ **Date** ______________

Interviewee ____

Interviewee Company ______________________________________

The key objectives of the questionnaire are to:

1. assess current practice in team performance measures
2. identify factors that affect the development of TPMS
3. study the processes for designing TPMS
4. study the impact of using TPMS

The questionnaire is divided into six sections, with objectives as follows:

SECTION	MAIN OBJECTIVE
1 - General Overview of the Company	Set the company in context - what the company does and its size
2 – Company structure and culture	Study the structure of the company, focus on process management practices and identify features of the organizational culture
3 – Strategy and performance management systems	Identify the company strategy, deployment mechanisms, and related performance measurement systems
4 – Teamwork practices	Find out what types of team are used, how these relate to the task and the development stage
5 – Support processes	Study the team development and performance management processes (i.e. training, appraisal, rewards, career development)
6 – Team performance measurement systems	Study how team performance measurement is carried out, what is measured and the process for designing the TPMS. Summarise pros and cons of current TPMS and design process

Section 1 - General Overview of the Company

Main Objective - Set the company in context - what the company does and its size

1.1. What is the main activity of your company?

____

____

1.2. How many employees does your company have?

a) On site? ____________

b) Company wide?____________

Section 2 - Company structure and culture

Main objectives - Study the structure of the company, focus on process management practices and identify features of the organizational culture

2.1. Has the company done any re-engineering effort

Yes ☐

No☐

2.2. What type of organisational structure is currently in place?

Process-based ☐ Team-based ☐

Matrix ☐ Functional ☐

2.3. Why re-engineer?

Business decline ☐

Enter new markets ☐

Remain competitive ☐

Others

2.4. Make a statement of the corporate culture.

____

____

____

____

Could you allocate the corporate culture into this framework? If more than one box is selected, indicate the importance of it (1 = highest importance)

Autocratic	☐	Flexible and adaptable to any change	☐
Paternalistic	☐	Strong centralisation of power on critical functions	☐
Bureaucratic	☐	Decentralisation of power on teams and individuals	☐
Autonomy	☐	Control management	☐
Informal	☐	Loose management	☐
Competitive	☐	Powerful normative controls	☐
Cooperative	☐	Disorganised	☐

(Schein, 1985; Mintzberg, 1989; Phesey, 1993)

2.5. What are the strengths and weaknesses of the current structure and culture?

<u>Section 3 – Strategy and performance management systems</u>

Main objective - Identify the company strategy, deployment mechanisms, and related performance measurement systems

3.1. Do you have a mission statement?

Yes ☐

No ☐

Don't know ☐

If yes, what is the mission statement?

3.2. What are the corporate objectives of the company?

Increase market share ☐

Achieve profit targets ☐

Beat the competition ☐

Others ☐ ________________________________

____

3.8. Is it linked to the business strategy?

Yes ☐

No ☐

Don't know ☐

3.9. a) If **yes**, what areas do you measure?

Financial performance	☐ →	Return on investment	☐
	→	Profit	☐
Customer's perspective	☐ →	Delivery on time	☐
	→	Customer satisfaction	☐
Internal processes	☐ →	Process efficiency	☐
Learning perspective	☐ →	Employee capabilities	☐
	→	Intellectual capital	☐
Other	☐	________________	

____

b) If **no**, where do your performance measures come from, and what do you measure?

____

____

____

3.10 Do you use a framework/process for structuring the performance measurement system?

Balanced Scorecard	☐	SMART System	☐
ABC Costing	☐	Hoshin Kanri	☐
Performance Prism	☐	Dixon's Questionnaires	☐
IPMS	☐		
Other	☐	________________	

3.11. Do you have a performance measurement system review process?

Yes ☐

No ☐

Don't know ☐

If 'yes', what the process?

3.12. Which levels do you deploy performance measurement to?

Senior Management ☐

All management ☐

Business unit ☐

Business process ☐

Team Members ☐

All Employees ☐

Others ☐ ______________________________

3.13. How do you deploy performance measures?

____

____

____

____

3.14. Does the company work under any formal quality framework?

EFQM	☐	ISO 9001	☐
Baldridge Model	☐	ISO 14001	☐
Six Sigma	☐	TQM	☐
5S	☐	Investors In People	☐
Others	☐ ______________		

3.15. How does the current strategy and performance management systems affect the organizations?

Increased business awareness at all levels ☐

Drivers improvement culture ☐

Provide management focus ☐

Provides a control mechanism ☐

Others ☐ ______________

Section 4 – Teamwork practices

Main Objective - Find out what types of team are used, how these relate to the task and the development stage

4.1. Do you use teams?

Yes ☐

No ☐

Don't know ☐

4.2. How do you define a team? ______________________________

____

____

4.3. Why did you start using teams? ____

____

4.4. What types of team do you use?

Problem solving ☐

Cross-functional ☐

Self managed ☐

Virtual ☐

Project ☐

Others ☐ ____

4.5. Who do the team report to? ____

____

______

4.6. What is your understanding of team performance?

Task results ☐ Learning and growth ☐

Teamwork processes ☐ Team members satisfaction ☐

Others ☐ ________________

4.7. What are the key drivers of team performance?

Task characteristics ☐ ____

Team characteristics ☐ ____

Organisational support ☐ ____

Teamwork processes ☐ ____

Others ☐ ____

4.8. Are these drivers effectively managed?

Yes ☐ No ☐

If 'yes', how?

4.9. Do you use any specific approach/tool for managing and developing team performance?

Yes ☐ No ☐ Don't know ☐

If 'yes', what approach/tool?

Belbin ☐ Training ☐

DISC ☐ Leadership/coaching ☐

Other ☐ ____________________________________

Section 5 – Support processes

Main objective - Study the team development and performance management processes (i.e. training, appraisal, rewards, career development)

5.1. Do you have any appraisal system?

Yes ☐ No ☐

5.2. What is the purpose of the appraisal?

To monitor individual performance ☐
To reward employees ☐
To develop employees' competencies ☐
To drive continuous improvement ☐
To increase business awareness ☐
Others ☐________________________

5.3. Who does the appraisal?

Peer assessment ☐
Management assessment ☐
Team leader ☐
360 feedback ☐
Others ☐________________________

5.4. What is the appraisal based on?

Team performance ☐
Individual performance ☐
Team task results ☐
Team competencies ☐
Others ☐________________________

5.5. Do you have any reward system?

Yes☐ No ☐

5.6. What is the purpose of the reward system?

To drive a high performance culture ☐
To increase employee satisfaction ☐
To increase business awareness ☐
Others ☐________________________

5.7. Who decides on the reward?

Other team members ☐

Management ☐

Team leader ☐

Others ☐ ______________________

5.8. What are the rewards based on?

Individual performance ☐ (What variables?)

Team performance ☐ (What variables?)

Business performance ☐ (What variables?)

Other ☐ ______________________

5.9. How do you manage individual career progression and development?

Provide continuous training opportunities ☐

Support college / university degrees ☐

Horizontal / vertical progression ☐

Others ☐ ______________________

<u>**Section 5 - Team Performance Measurement Systems**</u>

Main Objective - Study how team performance measurement is carried out, what is measured and the process for designing the TPMS. Summarise pros and cons of current TPMS and design process

6.1. Do you measure the performance of teams?

Yes ☐ answer questions 2 to 11

No ☐ jump to question 8

Don't know ☐

6.2. Do you measure at the team and the individual level?

Yes ☐ No ☐

6.3. What is the impact of measuring team performance?

Drives continuous improvement ☐

Increases business and customer awareness ☐

Other ☐ ______________________

6.4. What do you measure?

Effectiveness ☐

Efficiency ☐

Learning and growth ☐

Team member satisfaction ☐

Task characteristics ☐

Team characteristics ☐

Organisational support ☐

Other ☐ ______________________

6.5. Are performance measures dependent on the type of team?

Yes ☐

No ☐

Don't know ☐

If yes, why? ____

____

____

6.6. How are the performance measures determined?

From company strategy ☐

By the customer ☐

By the team ☐

6.7. How satisfied are you with the current TPMS?

Not satisfied at all 1 — 2 — 3 — 4 — 5 Very satisfied

If any, what are the weaknesses?

Lack of alignment with strategy ☐

Only financially focussed ☐

Only focussed on final outcome, not the team processes ☐

Not team customer focused ☐

Lack of a review process ☐

Others ____

____

6.8. Is there a process for designing the TPMS?

Yes ☐

No ☐

Don't know ☐

If yes, describe this process

If not, why? (no time, cost, lack of tools/knowledge etc.)

6.9. Do you follow a specific model for designing the TPMS?

Zigon ☐

Jones and Schilling ☐

EFQM ☐

Balanced Scorecard ☐

The Cambridge PM model ☐

Other ☐ ____________________

6.10. How efficient is your process? ____________________

____

____

Why do you see your process as being good/bad?

Good (e.g. focus team efforts, increase participation ____________________

____

Bad (e.g. time consuming, too many measures) ____________________

____

6.11. Is there a process or reviewing the TPMS?

Yes ☐ No ☐

If 'yes', how does it work?

____

____

Appendix B3: Case study summary sheet example

BP2: Rank Xerox Glasgow
0. General information
0.1. Company information: -Industry sector: Electronics No. of employees: ~160 -Main activity: Sales and repairs of photocopiers -Other comments: Part of a global electronics organisation. One of the divisions was the first EFQM award winner in 1992.
0.2. Case study details: -No. of company visit: 1 -No. of interviews: 1 -Focal unit of the study: Self-Managed Working Groups (SMWG) -Personnel interviewed: SMWG mentor -Other comments: Questionnaire was used for data collection.
1. Organisational structure / business process management
1.1. Current organisational structure: This company is responsible for the sales and maintenance of photocopiers in Scotland and Ireland. Currently the company has a flat organisational structure with one area service manager and 140 engineers organised in SMWGs split in geographic areas. There are also two SMWG mentors that act as a linkage between the area service manager and the SMWGs. Previously the company was divided into several functions (i.e. service manager, district managers, field supervisors, technical specialist, engineers) that resulted in a very fragmented and hierarchical structure. A much more responsive and flexible working structure was required to efficiently respond to customer demands. The new structure is based on the picture of the end-to-end process that the company is involved, and thus, each SMWG integrates all value-adding functions.
1.2. Organisational culture: The company has a culture of high-performance through self-management. Power is decentralised on teams. The company provides teams with a high level of autonomy for deciding on working structures, holidays, rewards and even salaries. In return the company also expects high levels of commitment and performance from the employees. Management commitment is also high.
1.3. Impact of organisational structure and culture: The change to SMWGs had a very positive impact on the level of customer and employee satisfaction. The current structure provides the required flexibility to be more responsive to customer orders. Team members have a clear understanding of customer requirements. The company now covers a bigger geographical are using the same numbers of employees while providing a better service to customers. Employees also bought into the new structure and as a result employee satisfaction went from 46% to 82%. Employee satisfaction has never gone below 75% since. The high performance culture means that performance measurement is an integral part of the company management systems. Teams are positive towards the use of performance measures.
2. Strategy management and performance measurement systems
2.1. Strategy management process: The company has a clear mission and strategy at the top, which is directly deployed to the teams. Team mentors play a key role in linking the management level with the teams. Strategic objectives combine financial figures with objectives related to innovation, employee development and continuous improvement.
2.2. Performance management systems: The company uses a structured PMS linked to strategy. It is not based in any recognised framework. Due to the nature of the strategy the PMS also includes a balanced set of performance measures. The company works under the umbrella of the EFQM reference model. Investors In People (IIP) is also used as a way of assessing the people management practices. Measures derived from the the EFQM and IIP are observable within the organisation.
2.3. Deployment level: Strategy and performance measures are deployed to the SMWGs.
2.4. Impact of current strategy and performance measurement system: Increase business awareness and commitment to the team objectives. There is a culture of continuous improvement. There is a positive perceptions of the use of performance measures and teams are highly experienced in designing and using performance measures.

3. *Teamworking practices*
3.1. Team characteristics: The SMWGs are formed by 8 to 12 members. *High performing* team. These are cross-functional teams based around the key business process and thus, they all key functions are integrated within the team. The teams have high level of autonomy to plan and manage most of the areas they are responsible for. All teams have a rotational leadership approach so that the whole group manages the team instead of a single team member. SMWGs use structured procedures for carrying out their activities. For example, before team meetings happened the leader has the responsibility to ensure that everyone is prepared for the meetings. There is always an agenda planned for the meeting and team members rotate the roles of a timekeeper and the meeting facilitator.
3.2. Members understanding of team performance: The meaning of team performance goes beyond the achievement of process objectives. Responding to customer demands is the highest priority but keeping team member satisfied, continuous innovation and using the right systems for carrying out their jobs are also considered part of the performance of teams. The high level of autonomy given to the team showed to be a key driver for successful teamwork. However, the SMWG in order to be successful required intensive training and high management commitment. The flat and process based structure brought the customers closer to the team, and as a result, teams have a clear understanding of the customer needs. This is also a key factor positively impacting on team performance. The role of the SMWG mentors has also been essential to improve communication with higher organisational levels and transferring 'best practices'. In summary, the team has a balanced view of team performance and is aware of the key drivers affecting performance.
3.3. Team development processes: Before using the new working systems all employees went through several intensive training courses in order to clearly understand and buy into the new concepts (e.g. business process, SMWG). Team are continuously looking for ways to improve performance. SMWG mentors play a key area for further developing team performance. They look for 'best practices' inside and outside the organisation in order to transfer those practices to the teams.
4. *Support processes*
4.1. Training: The company uses a structured process for providing training to the staff. The SMWG working practices in many cases require an important change of working practices and thus, training plays a key role in the development of SMWGs. The use of a rotational leadership approach also means that all team members need to have the skills required to lead a team. Training needs are continuously monitored and development plans defined based on those needs. Training focuses on developing technical, strategic and attitudinal skills.
4.2. Performance appraisal systems: Team-based appraisal system. SMWGs use a performance review process to evaluate performance, objectives, measures and targets. The team itself carries out performance review. SMWG mentors sometimes support the process.
4.3. Reward and recognition: SMWGs use several reward and recognition schemes. SMWGs have a budget allocated for rewarding those individuals that make an outstanding effort towards increasing team performance. There is also an scheme to recognise outstanding team or individual performance using non-financial rewards (e.g. weekends away, nights out). Team had to justify this reward with a clear contribution to the performance of the business. These two reward schemes are managed by the SMWGs. The third scheme (also using non-financial prizes) rewards those teams that generate and adopt innovative ideas and best practices, which are linked to increasing team performance. .
4.4. Staff development / career paths: The company uses a succession-planning scheme. This is a 6-month appraisal system for developing career paths through personal skills development. Because of the flat structure of this division of the organisation, employees have mostly the opportunity to work in different teams. However, the company also encourages and develops employees to move to other functions (e.g. training) and divisions within the organisation.
4.5. Impact of support processes: The reward and recognition schemes used by the company showed to be successful in that it reinforces the teamwork culture, increases staff commitment and satisfaction. The fact that the company provides rewards for generating and adopting innovative ideas and best practices, reinforces the view amongst team members that performance is not only about financial results. In addition, performance measures related to generation of new ideas and transfer of best practices play an important role within the TPMS.

5. *Design of TPMS (process and content)*
5.1. Top management commitment for designing TPMS: Regional manager and SMWGs are fully committed to having effective TPMS in place.
5.2. General details of the approach for TPMS design: There is a process for designing TPMS. This is a process developed 'in-house'.
5.3. Characteristics of the approach: The SMWGs have the responsibility to defining their own TPMS. If necessary, team mentors take part in the process. These measures need to be consistent with the company's strategy.
5.4. Content of the TPMS: The TPMS includes a balance set of measures that corresponds to the understanding of team performance of the team members and the balanced strategy of the company. Customer satisfaction, Service reliability, Employee satisfaction and Innovation were some of the measures used by the teams
5.5. Effectiveness of TPMS: High
5.6. Impact of TPMS: The broader understanding of the meaning of team performance allows the team to put emphasis not only on those short-term process-orientated measures but on other areas (e.g. innovation, employee development) that will affect the performance of the teams in the future.
3.7. Impact of current strategy management and performance measurement system: The clear link between business strategy and SMWG objectives increases the business awareness of all team members. The self-managed process for developing the team performance measurement system allows the team members to become accountable for those measures and thus, they are all committed to achieve the specified targets. The broader understanding of the meaning of team performance allows the team to put emphasis not only on those short-term process-orientated measures but on other areas (e.g. innovation, employee development) that will affect the performance of the teams in the future.

Table B1: Case study summary sheet for Rank Xerox Glasgow

Appendix C - Overview of the TPMS design construct

The TPMS design process comprises of 9 stages. The following is a description of each of the stages:

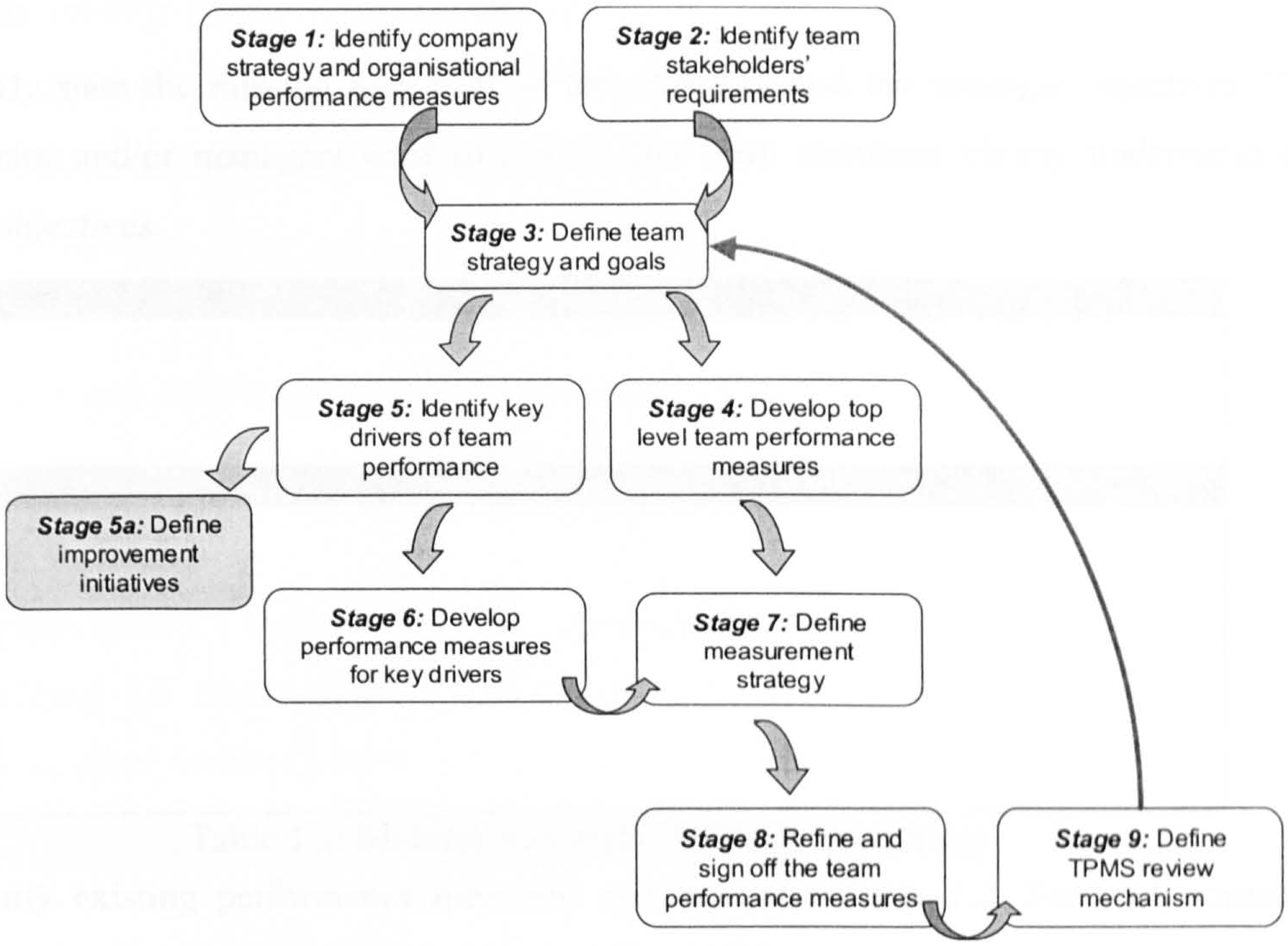


Figure 1: Overview of the TPMS design process

Worksheet 1: Identify company strategy and organisational performance measures

Purpose

The aim of this first step is to obtain a complete and unambiguous statement of the strategy and corresponding objectives of the business. Team performance needs to be integrated within the wider organisational context and thus, a critical point is to align team efforts with company's strategy. Also, the team needs to identify those organisational performance measures already in use, which the team can have an effect on. Deploying these measures to the team level will be essential for achieving total alignment.

Research has found that strategy and performance measures should be aligned. Without such alignment, the direction of the company (strategy) and the methods of getting the goals (actions) and the methods of checking and monitoring progress (performance measurement) are often at odds, with resulting inefficiencies, waste and frustration.

Who is involved?

-All team members (including the team leader)

-Mentor or managers to ensure that the company strategy and performance measures are clearly communicated to do the team

-Process facilitator (internal or external)

What to do

1.1. Clearly state the mission statement of the company and the strategic objectives. The team mentor and/or managers need to ensure that team members clearly understand the strategic objectives.

Mission statement
Strategic objectives
1. 2. 3. 4. 5. 6.

Table 1.1: Mission statement and business strategy

1.2. Identify existing performance measures and complete Table 1.2. For each measure, define the organisational level that the measure applies to (e.g. business, business unit, department, business process, activity) and whether the team has a direct impact on that measure or not.

Measures	Organisational level	Can the team directly affect the measure?
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

Table 1.2: Organisational performance measures

Support tools

If the business does not have clearly defined strategic objectives carry out a brainstorming session including the team members and several managers (ideally the managing director would also be involved) to create a draft business strategy. Without this it will be very difficult to align team efforts and performance measure in the right direction.

Worksheet 2: Identify stakeholders' requirements and contribution to the team

Purpose

The primary objective for the team is to satisfy stakeholders' requirements and thus, this stage aims in clearly identifying team stakeholders and their requirements.

Who is involved?

-All team members (including the team leader)

-Mentor or managers to ensure that stakeholder requirement are clearly understood by all team members

-Stakeholders (e.g. customers, suppliers, management, external bodies)

-Process facilitators (internal or external)

What to do

2.1. Complete table 2.1 by identifying the stakeholders of the team and their requirements. When defining the requirements it will be important to get direct feedback from the stakeholders, either involving them in the process or by contacting them.

Stakeholder	Requirements	Contribution to the team
1.	1.1. 1.2. 1.3.	1.1. 1.2. 1.3.
2.	2.1. 2.2. 2.3.	2.1. 2.2. 2.3.
3.	3.1. 3.2. 3.3.	3.1. 3.2. 3.3.
4.	4.1. 4.2. 4.3. 4.4.	4.1. 4.2. 4.3. 4.4.

Table 2.1: Team stakeholders and their requirements

Support tools

In order to identify team stakeholders it will be useful to carry out a brainstorming session that focuses on answering the following two questions:

1. Who is affected by and affects the team results?
2. What does the team need to do satisfy the stakeholder, and vice versa?

The answers to these questions could be graphically represented using a *team stakeholder diagram* (figure 2.1). This provides a clear and visual representation of the team stakeholders, their requirements and the required contribution from them.

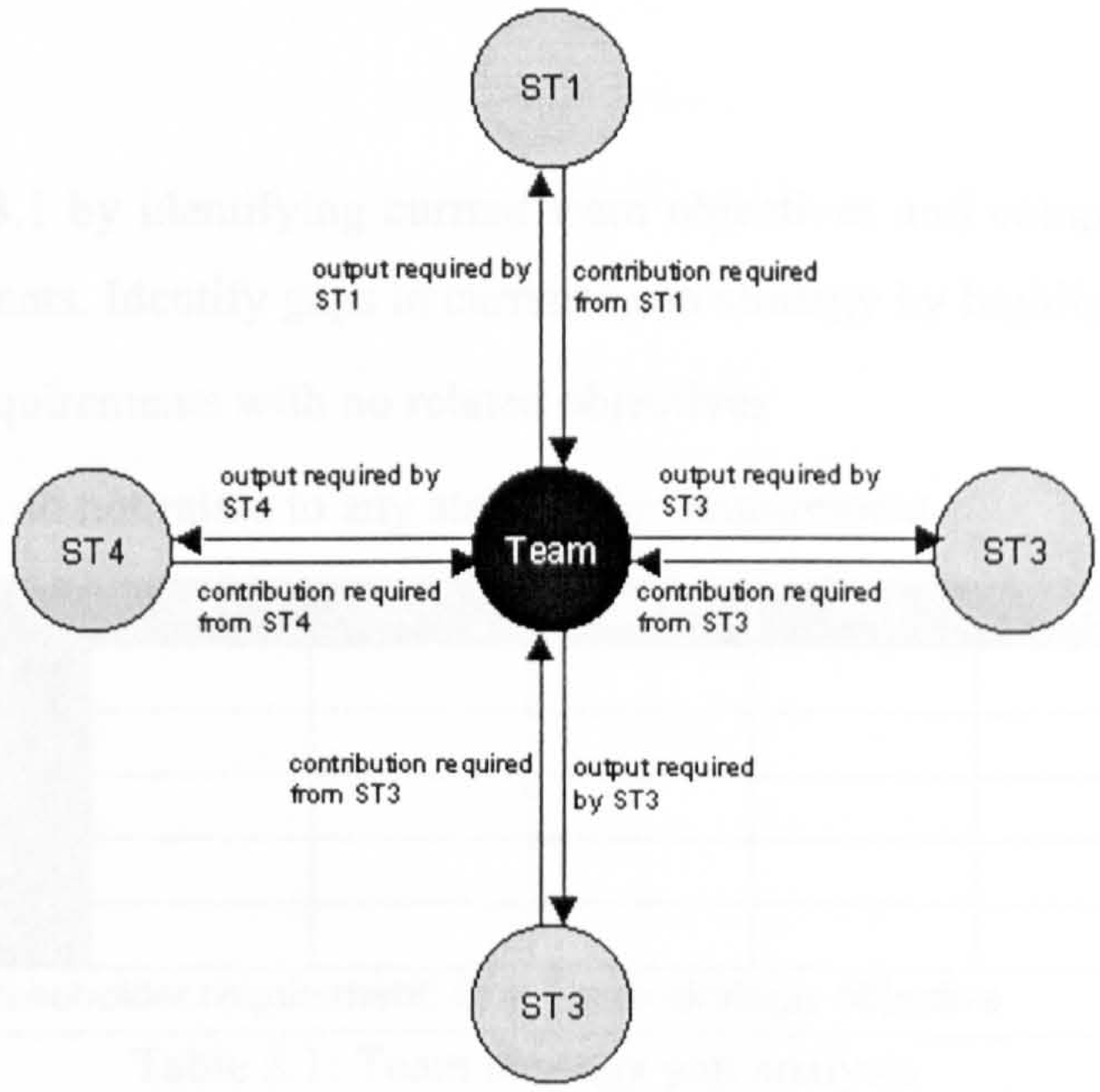


Figure 2.1: Team stakeholder diagram

Worksheet 3: Define team strategy and goals

Purpose

The aim of this stage is to define the team strategy and corresponding goals aligned to the business strategy and team stakeholders' requirements. By doing so, team efforts will be directed in the adequate direction.

In order to ensure that the team has a balanced mix of goals, at this stage it is important to consider the four dimensions that determine team performance (i.e. effectiveness, efficiency, learning and growth, team member satisfaction) and to ensure that there are team objectives related to each of the dimensions. It is important to remember that satisfying stakeholder requirements is mainly related to the *effectiveness* dimension of team performance and this might not be enough to develop a balanced team strategy.

At this stage the team will also assess the appropriateness of the existing strategy and goals by comparing these with the stakeholders' requirements. It is important to do so as a way of identifying current gaps, and defining improvement areas. The gap assessment will allow team members to understand the relation between having a complete/incomplete team strategy and past team performance, and by doing so it will further develop team learning.

Who is involved?

-All team members (including the team leader)

-Mentor or managers to ensure the alignment of team goals with stakeholder requirements (not always needed)

-Process facilitator

What to do

3.1. Complete table 3.1 by identifying current team objectives and comparing them against stakeholder requirements. Identify gaps in current team strategy by highlighting:

-stakeholder requirements with no related objectives

-objectives that do not relate to any stakeholder requirement

	SR1	SR2	SR3	SR4	SR5
Obj1					
Obj2					
Obj3					
Obj4					
Obj5					
SR: Stakeholder requirement; Obj: Team strategic objective					

Table 3.1: Team strategy gap analysis

3.2. Define objectives (including target and timescales) for all stakeholder requirements and record these in table 3.2. Remember that the same objective might relate to more than one stakeholder requirement.

Stakeholder requirement	Team strategic objectives	Target	Timescale
Stakeholder Requirement 1	1. 2.		
Stakeholder Requirement 2	3. 4.		
Stakeholder Requirement 3	5. 6.		
Stakeholder Requirement 4	7. 8.		
Stakeholder Requirement 5	9. 10.		

Table 3.2: Team strategic objectives against stakeholder requirements

3.3. Create a balanced team strategy by developing team objectives related to each of the four dimensions that determine team performance.

Dimension of team performance	Team objectives
Team effectiveness	1. 2.
Team efficiency	3. 4.
Learning and growth	5. 6.
Team member satisfaction	7. 8.

Table 3.3: Team strategy

Support tools

Strategy map is a widely recognised tool for graphically representing the deployment of business strategy and performance measure. Strategy maps provide a valuable platform to view and communicate the relationship between objectives and measures at different organisational levels. Team could make use of strategy maps to better understand the deployment of business strategy and so easier identify the strategic areas that the team can influence.

A useful way for representing the process that the team is responsible for is to create process maps (figure 3.1). Process mapping enables to integrate and represent all the activities carried out by individual team members. It provides a valuable tool for thinking in terms of team, rather than individual, outputs and thus, it encourages team building. By graphically representing the work of the whole team it becomes simpler for the team members to start thinking about team objectives. It is also a useful tool for identifying potential gaps and improvement areas in the existing process.

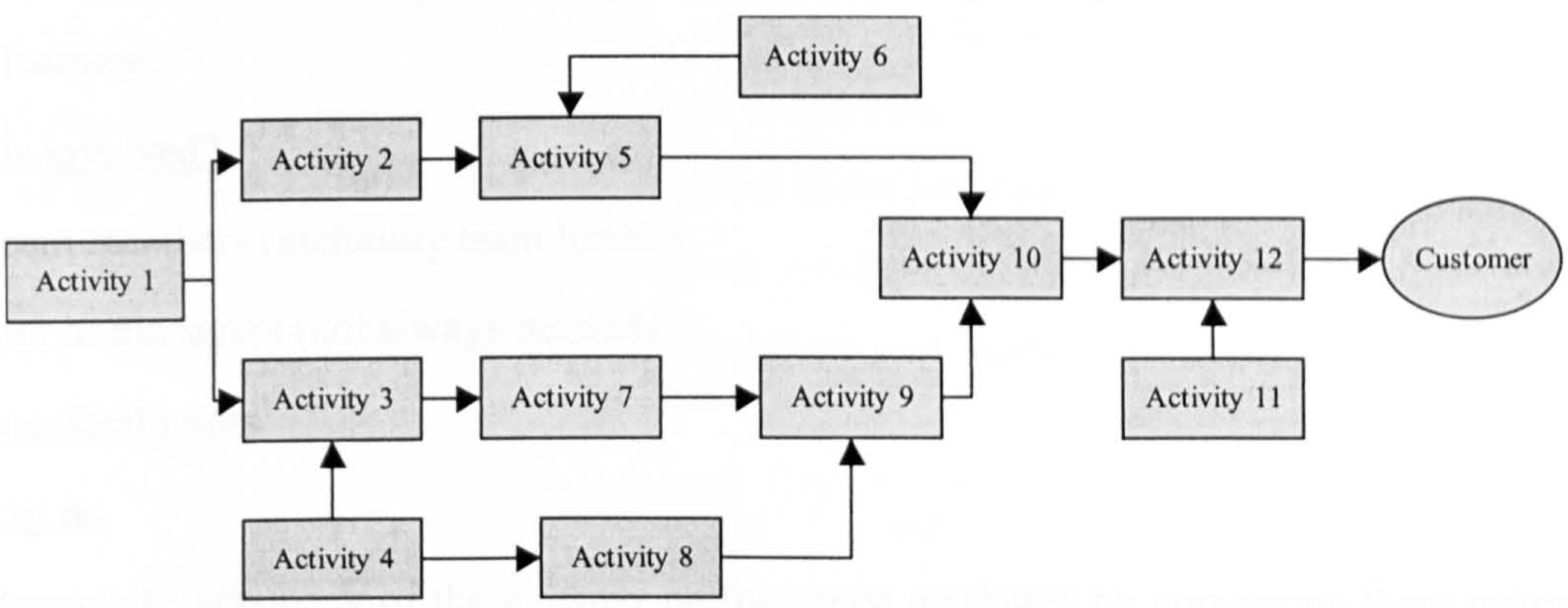


Figure 3.1: Process map

There are a number of ways for mapping business process, from IDEF0 diagrams to specific process simulation software. A simple and practical way of mapping process is the 'post-it' technique. This methods involves the following steps:

-Get the team together

-Each team member writes down each of her/his daily activities on a different *post-it.*

-Team members stick the *post-it* in the wall integrating and combining all the activities in the right sequence. The process the team is charge of is already mapped.

-The team can then put this process into paper or into a computer file

This simple method has been used in many process improvement projects and has shown to be a very useful way of mapping process, identifying key measurement points, encouraging team thinking and bringing team members together.

Worksheet 4: Develop top-level team performance measures

Purpose

This stage focuses on the development of performance measures for each of the goals defined during the previous stage. When developing measures it is important to take into account those desirable characteristics of measures identified in Chapter 5 (table 5.20). The team should prioritise its goals and corresponding measures so that it does not end up with an unmanageable number of measures. Having too many measures will become a huge burden for the team and has the risk of diverting the focus and effort of the team to those areas that are not priority.

At this stage the team will also assess the appropriateness of the existing performance measure by comparing these with the team's strategic goals. It is important to do so as a way of identifying current gaps, and defining improvement areas. The gap assessment will also allow team members understanding the relation between having an inappropriate set of performance measures and past team performance, and by doing so it will further develop team learning.

Who is involved?

-All team members (including team leader)

-Mentor or managers (not always needed)

-Process facilitators

What to do

4.1. Assess the adequacy of the existing performance measures by comparing them against the team's strategic objectives. Identify gaps in the existing set of performance measures by highlighting:

-team objectives with no related measures

-measures that do not relate to any team objective

	Obj1	Obj2	Obj3	Obj4	Obj5
Measure1					
Measure2					
Measure3					
Measure4					
Obj: Team strategic objective					

Table 4.1: Team strategy gap analysis

4.2. Develop performance measures against each of the objectives defined during the previous stage. Ensure that all objectives have at least one related measure.

Team performance dimension	Team objective	Performance measure
Team effectiveness	1. 2.	1. 2. 3.
Team efficiency	3. 4.	4. 5. 6.
Learning and growth	5. 6.	7. 8. 9.
Team members satisfaction	7. 8.	10. 11. 12.

Table 4.2: To level team performance measures

4.3. Prioritise the list of measures above defined and choose those that are more relevant for the team (the critical few). Remember that it is important to have measures related to each of the dimension of team performance and thus, at least four measures (one per dimensions) will be needed at this stage. Limit the maximum number of measure to ten.

4.4. Define cause-effect relationships between top-level performance measures by identifying if each measure affects any other of the chosen measures. Quantifying the exact value of the relationships is a difficult task but the team should use its own experience to quantify whether there is a *strong, medium* or *weak* cause-effect relationship between two measures. Graphically represent these relationships (see figure 4.1) to improve the overall understanding of the team.

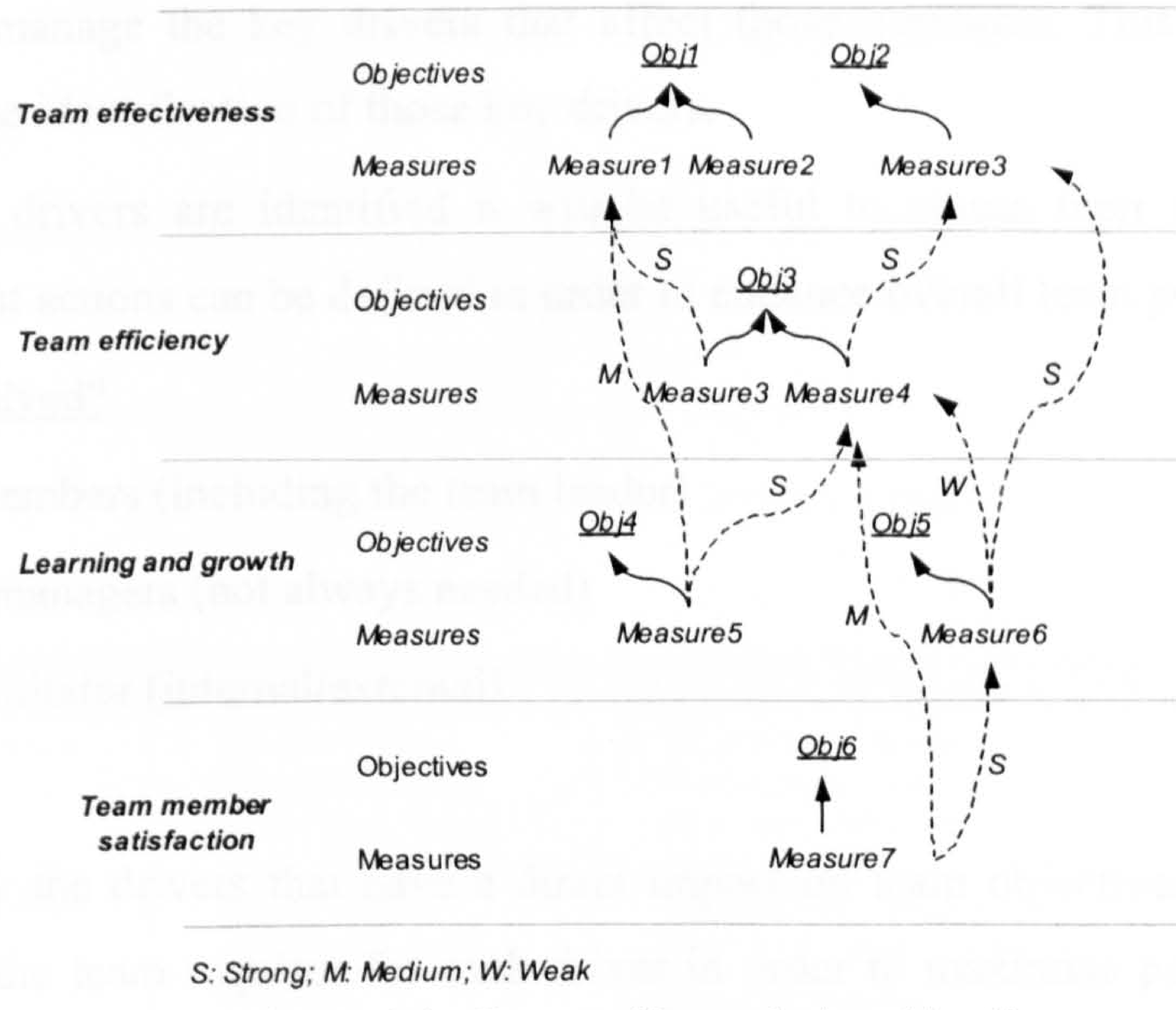


Figure 4.1: Cause-effect relationship diagram

Support tools

Although the final quality check of performance measures will be done during Stage 8 it is important that the team is aware of the most critical features of effective performance measures (see table 8.1, stage 8). This will avoid the development of ineffective measures.

Strategy maps can also be used at this stage for graphically representing the performance measures and illustrating the linkage between the team measures and the wider organisational performance measures. This provides a useful platform to demonstrate that the measures are consistent with the business strategy and to ensure that team members do not lose sight of the linkage between business strategy and team performance.

There are a number of catalogues of measures available that provide a valuable source of performance measures to the team, including the *Catalogue of Performance Measures (Centre for Business Performance, 2000), the European Foundation for Quality Management (EFQM, 1998), QuickMeasures (Zigon Performance Group, 2002), Jones and Schilling catalogue (Jones and Schilling, 2000).* These catalogues are specially valuable for suggesting a number of measures when the team members have not a clear idea of what measures to apply.

Worksheet 5: Identify key drivers of team performance

Purpose

To achieve improved team performance in the top-level measures it is important to effectively manage the key drivers that affect those measures. This stage of the process facilitates the identification of those key drivers.

Once these drivers are identified it will be useful to assess their current status so that improvement actions can be defined in order to enhance overall team performance.

Who is involved?

-All team members (including the team leader)

-Mentor or managers (not always needed)

-Process facilitator (internal/external)

What to do

5.1. Identify the drivers that have a direct impact on team objectives and define what the team what the team requires for each driver in order to maximise performance. objectives against each driver, including the target and the timeliness of the objectives. Complete Worksheet 8. Remember that the same driver will often impact more than one objective. Also it is important to remember that the team will not be

Team objective	Performance driver	Objective for the driver	Target	Timescale
1.	1. 2.	1. 2.		
2.	3. 4.	3. 4.		
3.	5. 6.	5. 6.		
4.	7. 8.	7. 8.		

Table 5.1: Team performance drivers

A useful way of representing the performance drivers is by using *performance driver diagrams* (figure 5.1). These diagrams provide a clear and visual view of the relation between the team objectives and drivers.

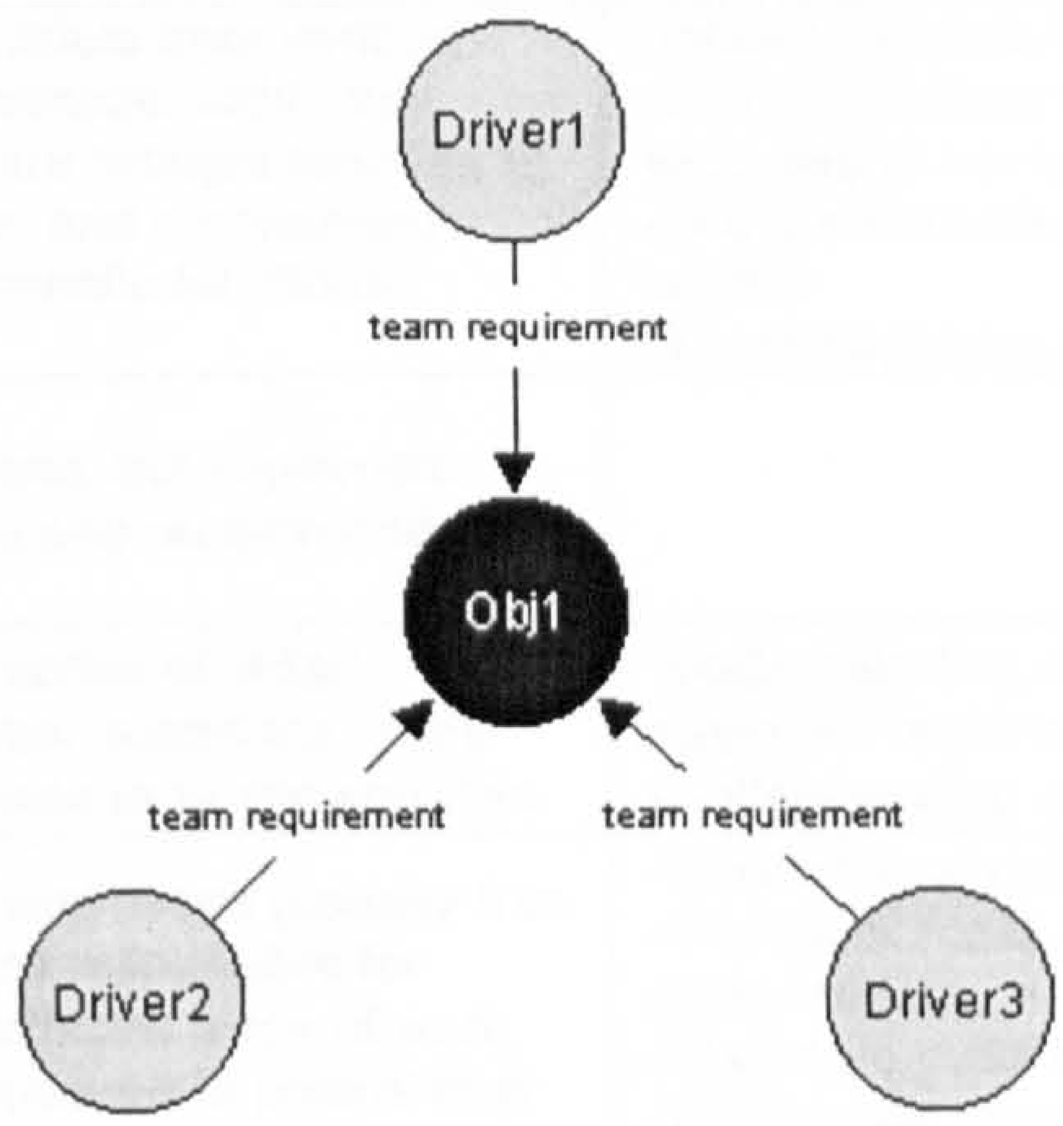


Figure 5.1: Performance driver diagram

Support tools

In order to guide the identification of key performance drivers the team can use the following sources:

-The team performance model described in Chapter 5 provides a description of the generic team performance drivers (table 5.2). This can provides guidance to the teams when defining specific drivers.

Task / process	Team characteristics	Organisational context	Teamwork processes
• Interdependence • Technology requirements • Task Significance • Skills variety • Autonomy • Uncertainty	• Structure and composition: e.g. Team type, size, roles, norms, goal clarity, Skills, Knowledge and Attitudes, Commitment, Accountability	• Organisational support: e.g. Technology, training, rewards, information systems, physical environment, strategic alignment, best practice • External monitor: technology, markets, competitors • Stakeholder contribution	• Internal processes: e.g. Communication, Coordination, Leadership, Learning, Collaboration, Monitoring, Feedback, Decision making, Conflict resolution, Innovation • External processes: e.g. Integration, Coordination, Communication, Cooperation

Table 5.2: Generic drivers of team performance

-Through the synthesis of the literature a classification of types of teams and their and corresponding performance drivers was developed (see table 5.3). Once the team members define what type of team they are part of, this table can be used as a reference guide to identify the corresponding performance drivers.

Remember that this table not prescriptive, it rather acts as a reference guide. This is important because teams often incorporate the features of more than one type of team. In addition, this table only refers to the most generic drivers with little reference to other drivers that might be critical for a particular team.

Type of team	Description	Sample of critical success factors
Simple Problem-Solving Team	Address intra-unit problems over a fixed time frame. Membership is mandated, and the team is reactive and tactical	-Members should have the expertise to focus on the problem and solve it -The team should be highly committed to the task -Employees need to have initiative -Employees need to be willing to accept responsibility
Task Force	Composed of members from various departments or functions within the organisation and are brought together to research, propose, and recommend solutions to one specific functional problem	-Innovation should be encouraged -Team members need the relevant skills and expertise to complete the task -The team needs to have good co-operation and little conflict -Team members need to be flexible
Cross-Functional Team	Similar to task forces, but implement what they propose and recommend	-As Task Forces
Process Team	Responsible to a series of linked activities with a clear output that adds value to the business or to stakeholders	-Understanding of the output of the process and the customer requirements -Understanding each person's role in the process
Self-Directed Work Team	A small group of employees (usually 5 to 20 people) who are responsible for carrying out a significant piece of work. This team is empowered to control their work environment and to strive for self-sufficiency	-Innovation should be encouraged -The team focus should be on the customer and performance -The team culture should be highly participative -Employees should be willing to work under flexible working rules -A highly skilled workforce is required
Virtual Team	A team where members are from different departments, organisations, or locations, or where members work in the team for different durations	-Team members should have the communication skills to work in a virtual environment

Table 5.3: Team types and critical success factors

Although the above sources provide a valuable guide, the key recommendations for the team is to use plenty of common sense when identifying performance drivers. In that sense, the deployment path or mini-process defined as part of the TPMS design framework (see figure 5.2) can be used as a reference to take the team members through a logical thinking process for identifying key performance drivers, assessing the status, defining improvement actions and defining performance measures.

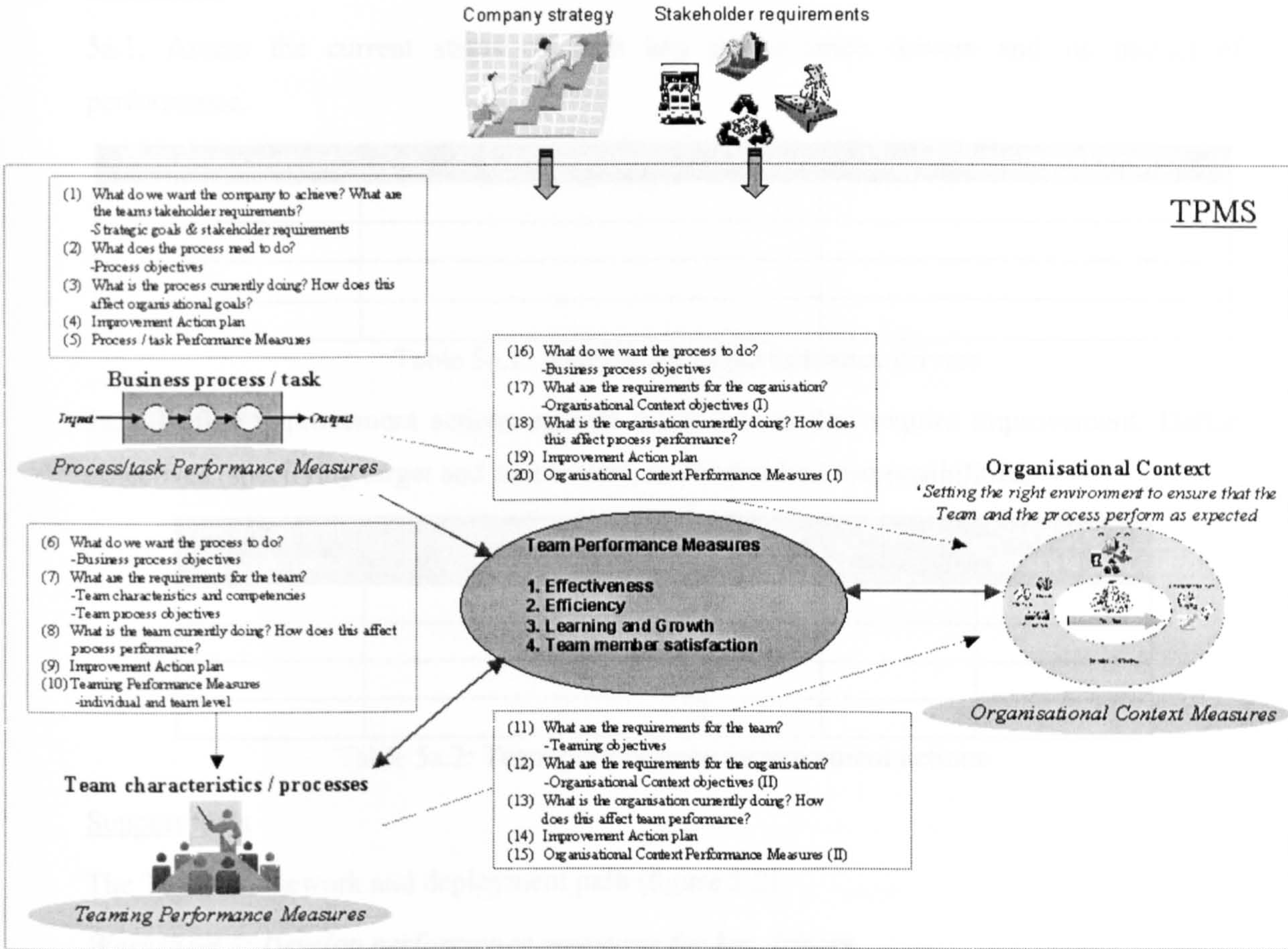


Figure 5.2: TPMS framework and the deployment path

Note that the deployment path not only support the identification of key performance drivers but also the definition of objectives, the evaluation of the drivers, the definition of improvement action and the design of performance measures. Therefore can be also be useful for supporting the next two stages of the TPMS design process.

Worksheet 5a: Define improvement initiatives

Purpose

The aim of this stage is to identify areas and define actions for team performance improvement. The areas for team performance improvement are generally linked to the drivers of team performance identified during the previous stage and thus, the team will need to carefully study the status of these drivers.

Who is involved?

-All team members (including the team leader)

-Mentor or managers (not always needed)

-Process facilitator (internal/external)

What to do

5a.1. Assess the current status of each key performance drivers and its impact of performance.

Performance driver	Current status	Impact on team performance

Table 5a.1: Assessment of performance drivers

5a.2. Define improvement actions against those drivers that require improvement. Define objectives (specifying target and timescales), and individual responsibilities.

Improvement area /driver	Action/Objective	Target	Timescale	Who is responsible?

Table 5a.2: Team performance improvement actions

Support tools

The TPMS framework and deployment path (figure 5.2)

Worksheet 6: Develop performance measures for key drivers

Purpose

The objective of this stage is to design effective measures for those performance drivers that are the most critical. Again, it is important to take into account the characteristics of effective performance measures (table 8.1, stage8). As in stage 4, in order to avoid overload of performance measures it is important for the team to prioritise and choose those measures that are the most critical.

At this stage the team will also assess the appropriateness of the existing measures for performance drivers by comparing these measures with the objectives for the key drivers. It is important to do so as a way of identifying current gaps, and defining improvement areas. The gap assessment will also allow team members understanding the relation between having an inappropriate set of performance measures and past team performance, and by doing so it will further develop team learning.

Finally it is important to define measures that will monitor team development. Team require different measures depending on the development stage. Therefore, measures that monitor changes in team development will need to be included in the TPMS.

Who is involved?

-All team members (team leader included)

-Mentor or managers (not always needed)

-Process facilitator (internal/external)

What to do

6.1. Assess the adequacy of the existing measures for the key performance drivers by comparing the measures with the objectives each drivers. Identify gaps in the existing set of performance measures by highlighting::

-driver objectives with no related measures

-measures that do not relate to driver objective

	DObj1	DObj2	DObj3	DObj4	DObj5
Measure1					
Measure2					
Measure3					
Measure4					
Measure5					
DObj: Driver objective					

Table 6.1: Team strategy gap analysis

6.2. Design performance measures against each of the critical team performance drivers based on the *performance driver diagrams* created during stage 5. Remember that the team might not be able to have an impact on all of the critical drivers (e.g. task uncertainty, rewards) and thus, while defining potential improvement actions against these drivers, the performance measures should remain focused on the areas that the team is accountable for.

Performance driver	Objective for driver	Target	When?	Performance measure
Driver 1	1. 2.			
Driver 2	3. 4.			
Driver 3	5. 6.			
Driver 4	7. 8.			

Table 6.2: Performance drivers measures

6.3. Prioritise the list of measures above defined and choose those that are more relevant for the team (the critical few).

6.4. Define cause-effect relationships between top-level performance measures by identifying if each measure affects any other of the chosen measures. Quantifying the exact value of the relationships is a difficult task but the team should use its own experience to quantify whether there is a *strong, medium* or *weak* cause-effect relationship between two measures. Graphically represent these relationships (see figure 6.1) to improve the overall understanding of the team.

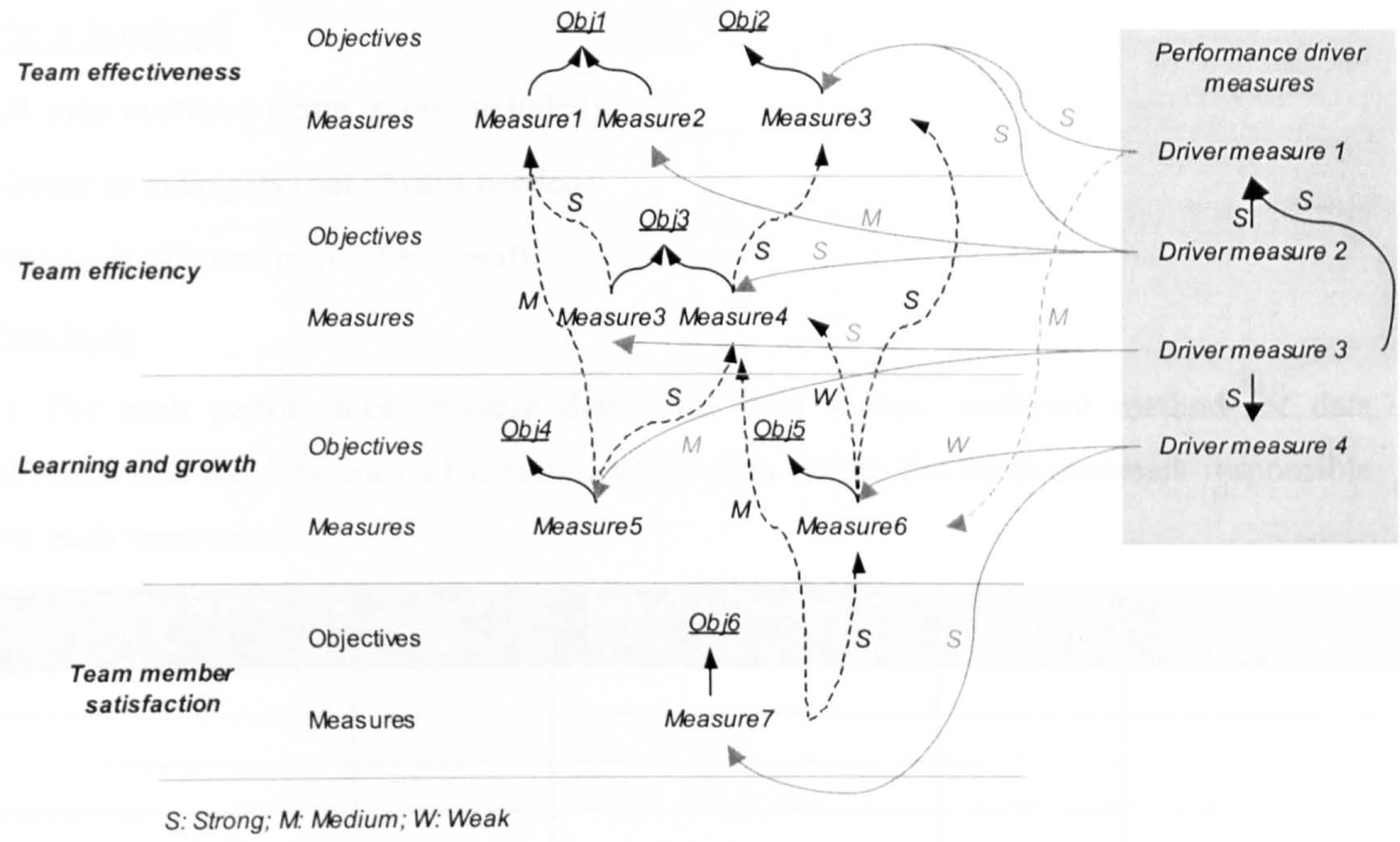


Figure 6.1: Measures relationship diagram

6.5. Define team development performance measures:

1. Determining the features or instances that will indicate a change on team development (e.g. team members provide effective feedback to each other)
2. Defining appropriate measures to monitor those instances (e.g. quality of feedback)

Support tools

As in stage 4

Worksheet 7: Define measurement strategy

Purpose

The aim of this step is to define the measurement strategy and to assign individual responsibilities over each individual measure. Measurement strategy refers to the sources of data, tools and methods for data collection and the frequency of measurement.

This step is very important because the cost-effectiveness of each performance measure will heavily depend of the accessibility of data required for each measure. Often, advanced data acquisition system (which require heavy investment) will be required and in this case it will be important to assess the potential return on investment. Generally numerical measures will need to be combined with descriptive measures (e.g. how team members collaborate with each other) and the latter often require data collection methods requiring high resource consumption (e.g. observational scales, surveys).

Who is involved?

-All team members (team leader included)

-Mentor or managers (not always needed)

-Process facilitator (internal/external)

What to do

7.1. For each performance measure define the data source, preferred method for data collection and the frequency of measurements. Also define the team members responsible over each measure.

Measure	Data source	Data collection method	Frequency	Team member responsible
1.				
2.				
3.				
4.				
5.				
6.				

Table 7.1: Measurement strategy

Support tools

Having a list of different data collection methods for measuring attributes of team performance would be a valuable guide for team members. Although, it is up to the teams to decide what data collection method is suits them best, such a list could be used to provide different suggestions when team members do not have a clear idea of how to collect certain data. Table 7.2 shows a number of measurement methods for the more subjective attributes of team performance.

Measurement variable	Data sources	Measurement method
Team processes –e.g. communication, orientation, leadership, monitoring, feedback, backup, coordination, decision making, information exchange	Expert observers (internal or external), team leaders, team members	Behavioural observation scale, behavioural summary scale, behavioural events, generalizability theory, interviews, questionnaires
Team performance / effectiveness	Team members, observer (e.g. managers, peers, customer)	Team effectiveness survey (Katzenbach and Smith, 1993a), repertory grid technique, Campbell-Hallan Team Development Survey (TDS) (Hallan and Campbell, 1997)
Interdependence	Team members	Task and outcome interdependence survey (Van der Vegt, 1998)
Team knowledge / share mental models	Expert observers (internal or external), team members	Card sort technique, protocol analysis, link weight networks (Pathfinder), attitudinal surveys, observation, interviews, multidimensional scaling
Team autonomy	Expert observers (internal or external), manager, team members	Autonomy measurement instrument (Bailey and Adiga, 1997), Gulowsen scale
Team training effectiveness	Expert observers, managers	Observational scale, expert ratings, content analysis, protocol analysis, decision analysis, policy analysis, automated performance recording, TARGET methodology (Dwyer et al (1997)
Team workload	Team members, managers	NASA task load index (TLX), Subjective Workload Assessment Technique (SWAT) (Bowers et al, 1997)
Teamwork culture	Team members, managers	Team model (Castka et al, 2003)

Table 7.2: Team attributes and measurement methods

Worksheet 8: Refine and agree the team performance measures

Purpose

The aim of this stage is to assess the quality of each performance measure and based on that to refine the list of team performance measures. Ensuring the quality of the chosen performance measures is critical if the TPMS is to be effective. Therefore, the team should check the quality of each of the measures by comparing its features with those characteristics of effective measures.

After doing the quality control check, all the people affected by the performance measures need to provide the final agreement. Once this is done, the performance measures will be ready to be implemented.

Who is involved?

-All team members (team leader included)

-Mentor or managers

-Team stakeholders (when signing off the performance measures)

-Process facilitator (internal/external)

What to do

8.1. Take each performance measure through the measures quality control check (table 8.1). There are several quality control checks for team performance measures including those characteristics described within the comprehensive approach for TPMS design shown in Chapter 5 (table 5.20). However, this typology for TPMS design does not aim to act as a control check for performance measures. Jones and Schilling's (2000) quality control check appears to be more appropriate to carry out this task. Yet, this approach has several limitations (e.g. it only checks whether measures are linked to company strategy and customer requirements, not any other stakeholders) and thus, a modified version of this control check is suggested (see table 8.1).

Performance measure: Category	Issue	Y/N
Strategy	Is the team's strategy evident in the measurement system and is it aligned with the organization's business strategy?	
Stakeholder perspective	Do one or more measures reflect the stakeholders view of the team's performance? How will the customers react to this set of measures?	
Result-based	Does this measure represent a team accomplishment, or the critical cause of a result?	
Team-orientated	Does the measure represent a result accomplished by the team as opposed to an individual?	
Continuous improvement	Does the measure encourage continuous improvement initiatives?	
Influenceable (Control)	Can the team have a significant influence on the measure?	
Corruption resistant	Is the measure resistant to tampering and falsification?	
Accessible	Does the data required by the measure already exist or is it easy to get?	
Measurement strategy	Are sources of data, methods for data collection and frequency of measurement clearly defined?	
Frequent feedback	Can performance on the measure be reported frequently (usually at least monthly)? Quarterly data may be frequent enough for customer surveys.	
Line of sight	Can each team member draw a line of sight between what they do and several of the measures?	
Understandable	Can each team member fully understand the measures?	
Linkage to other teams	Is there a measure or two that the team can share with other team to foster teamwork across team boundaries?	

Table 8.1: Measures quality control check

8.2. Refine the list of team performance measures by ignoring or modifying those measures that do not pass the quality control check. Remember that a TPMS to be manageable for the team it should not include more that ten performance measures. Therefore, if the list includes too many measures it will be necessary to do a final exercise of prioritising measures so that the most critical ones are chosen.

8.3. Sign off the team performance measures by agreeing on the final performance measures. At this stage, it will be important to check if the management and the stakeholders are satisfied with the performance measures. Therefore, it will be important to get feedback from all the parties influenced by the performance measures and to make the final changes to them.

8.4. Define the structure of the feedback reports and the format for presenting the measurement data. Carefully choose the most appropriate format of presentation so that measures are relevant and easy to understand for all team members.

8.5. Create the final *team performance scorecard* (see figure 8.1).

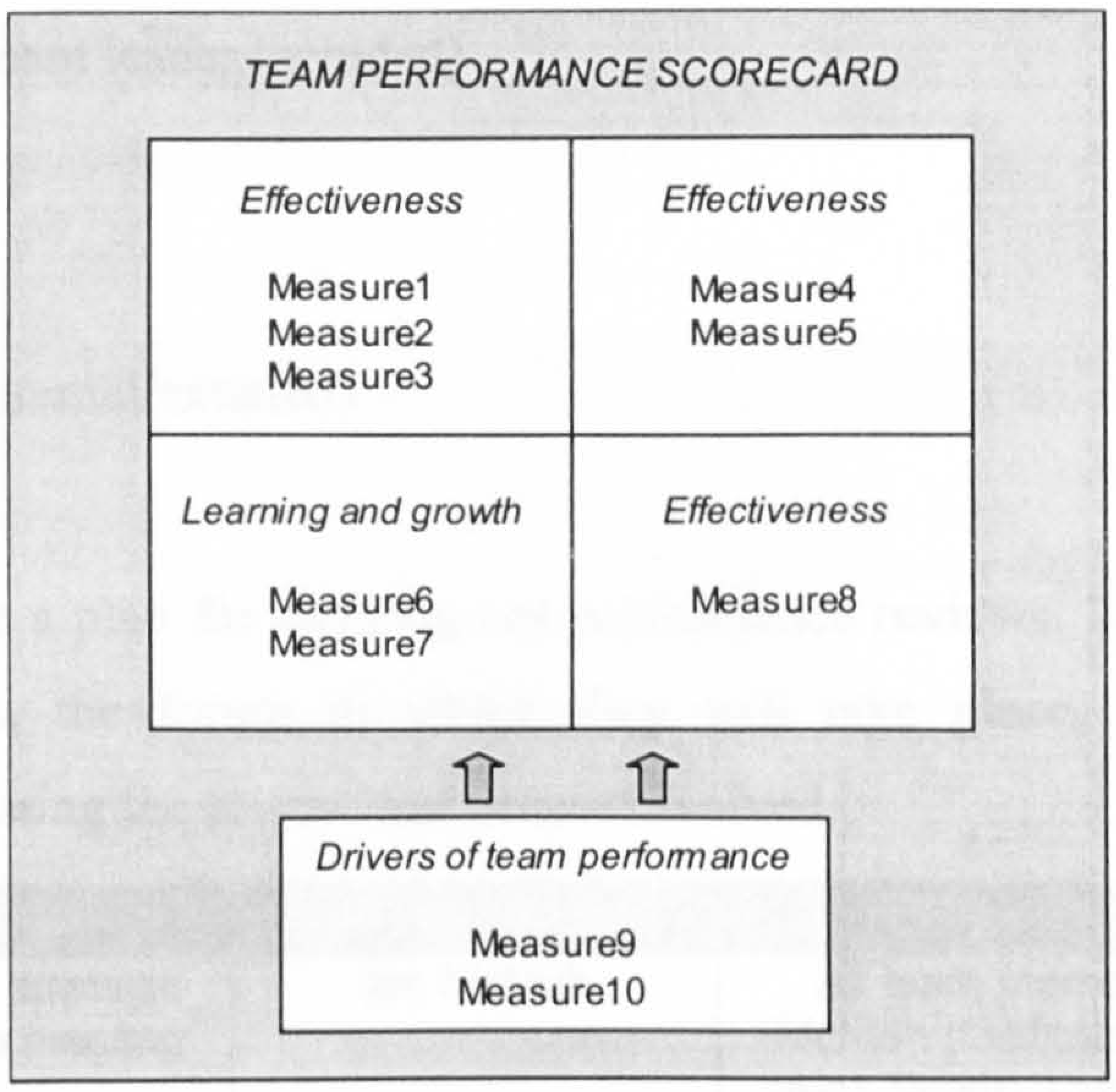


Figure 8.1: Example of team performance scorecard

Support tools

At this stage it could be useful to create a *performance measure summary sheet* (table 8.2) similar to the one proposed by Neely et al (1997) to record the most relevant information related to each of measure within the TPMS.

Measure	
Purpose	
Dimension of team performance	
Related team objective	
Target	
Formula	
Frequency of measurement	
Data source	
Data collection method	
Team member responsible	
Others	

Table 8.2: Measure summary sheet

Worksheet 9: Define the TPMS review mechanism

Purpose

The aim of this last stage is to define an appropriate plan and structure for carrying out the periodic performance reviews. In addition, the team will define a mechanism that will triggers the review of the TPMS. It is important to design such a mechanism because the TPMS to be effective over time has to evolve together with the changes in the business strategy, stakeholder requirements and team maturity.

<u>Who is involved?</u>

-All team members (team leader included)

-Mentor or managers

-Stakeholders

-Process facilitator (internal/external)

<u>What to do</u>

9.1. Define and agree a plan for carrying out performance reviews. Detail the frequency of performance reviews, the forum in which they will take place, person in charge on organising and facilitating the review and people involved

Frquency	Forum	Organiser/facilitator	People involved	Duration
Monthly	Team strategic review meeting	Jim McNish	All team members, Jim McNish (facilitator), mentor (Alex Smith), Lynn McIntyre (customer)	1,5 hrs

Table 9.1: Example of performance review plan

9.2. Define and agree the structure and content of performance reviews. The performance review should at least enable the following activities:

-Review how well the team has performed

-Define adequate improvement actions (including target, timescale and individual responsibilities)

Measure	Action	Timescale	Responsible

Table 9.2: Performance improvement action plan

-Review the progress and impact of past improvement actions (including the actions for performance drivers defined during Stage 5a)

Action	Timescale	Progress	Impact

Table 9.3: Improvement action progress report

9.3. Define and agree a mechanism to review the TPMS. First, it is important to identify the elements that will trigger a review of the TPMS and then to define the specific mechanisms that the TPMS review will be linked to (see table 9.4). Although not being exhaustive, there are 3 elements that will generally act as triggers for reviewing the TPMS:

-Changes in business strategic objectives

-Changes in team stakeholder requirements

-Changes in team development/maturation

Trigger	Linked to	Responsible
Business strategic changes	Strategic planning cycle	Mentor
Changes to team stakeholder requirements	Feedback from stakeholders (e.g. monthly performance review meetings) Stakeholder surveys	Team leader
Changes in team development / maturation	Team development performance measures	Team leader
Other		

Table 9.4: Example of TPMS review mechanism

At this stage it can be appropriate to involve mentors, manager and stakeholders so that they agree to communicate changes in strategic objectives and stakeholder requirements and thus, act as a real-time TPMS review trigger mechanism.

APPENDIX D1

Workshop questionnaire

The aim of this questionnaire is to collect the impressions about the contents of the workshop from all the participants. The questionnaire focuses on assessing the usability, usefulness and novelty of the construct presented and applied during the workshop.

SECTION A: Company and Team overview

1. Participant's company name____________________

2. Main activity of the company____________________

____

3. Participant's team name____________________

4. Main activity of the team____________________

____

5. Team Member Information:

Team member name	*Job title*	*Team role*

SECTION B: Contents of the workbook

Choose the option that describes your opinion best:

	Strongly disagree					Strongly agree
The workbook helps to understand the factors affecting team performance	1	2	3	4	5	6
The group of measures described in the workbook are adequate	1	2	3	4	5	6
The workbook follows a logical path to design team performance measures	1	2	3	4	5	6

What should the workbook include that does not include in the current form?

1.
2.
3.
4.

Please give comments on the contents of the workbook:

SECTION C: Usability and structure of the workbook

Choose the option that describes your opinion best:

	Strongly disagree					Strongly agree
The workbook is clearly laid out and it is easy to work through	1	2	3	4	5	6
Where required, there is enough relevant background information given	1	2	3	4	5	6
It is a simple and easy to use tool	1	2	3	4	5	6

What areas of the workbook should we change to improve the structure and make it easier to understand and use?

1.
2.
3.
4.

Additional comments on the usability and structure of the workbook:

SECTION D: Usefulness of the workbook

How do you think the framework and workbook can benefit the team and consequently, the organisation?	No benefit					Significant benefit
By aligning team performance with company strategy	1	2	3	4	5	6
By enabling to understand team stakeholders' needs	1	2	3	4	5	6
By enabling the team and its individuals to focus on the key factors affecting performance	1	2	3	4	5	6
By determining the specific resources to be provided to the team	1	2	3	4	5	6
By moving towards a team and people centred culture and thus, increasing staff satisfaction	1	2	3	4	5	6
By offering and practical tool to be used with different type of teams and processes	1	2	3	4	5	6
By offering a practical tool to be used in different type of organisations and organisational levels	1	2	3	4	5	6
By saving time and effort	1	2	3	4	5	6
By increasing the empowerment and accountability of teams	1	2	3	4	5	6
By encouraging continuous improvement and learning	1	2	3	4	5	6

Please, give more comments on the benefits of using the framework and workbook:

SECTION D: Novelty of the framework/workbook

Do you know any tools and/or approach for designing team performance measurement systems? Yes☐ No☐

If you do know, what is the name of approach/tool?

1.
2.
3.

Choose the option that describes your opinion best:	Strongly disagree					Strongly agree
There is a need for a tool like this	1	2	3	4	5	6
This frameworks provides a more comprehensive view of team performance	1	2	3	4	5	6
This framework offers new views related to team performance	1	2	3	4	5	6

What are the most significant differences of this approach compared with other similar tools?

Do you think this approach can be used in the future by your organisation?

Any other comments?

Thank you very much for completing the questionnaire.

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APPENDIX D2

Expert feedback

The aim of this questionnaire is to collect the impressions of people working in the area of team performance management about the contents of this seminar

Name________________________________

Company name____

Main activity of the company____

Job title___________________________

Please answer the following questions. In the first two questions choose the appropriate answers by writing the correspondent number in the boxes provided. Please list the answers in order of importance (1 = most important). Use the 'Others' section to add any answers that you think might be applicable for that specific questions.

1. In your opinion, what are the key factors affecting team performance?

☐ Skill level / balanced roles
☐ Understanding of the team objectives
☐ Performance measures
☐ Technology
☐ Rewards and compensation
☐ Training
☐ Understanding of company strategy
☐ Working environment
☐ Tools and techniques
☐ Others 1 =
☐ Others 2 =

2. ***Are you aware of any frameworks / tools for managing team performance?***

☐ Yes ☐ No

If 'Yes', please name those frameworks / tools and tell us how effective they are for managing team performance:

	Very effective			Ineffective
a.-	1	2	3	4
b.-	1	2	3	4
c.-	1	2	3	4

3. ***Do you think there is a need for a (new) practical tool to facilitate organisations in managing team performance?***

☐ Yes ☐ No

Why?

4. ***Please circle the words that in your opinion best describe the contents of the research work presented today:***

Very interesting

'More of the same thing'

Practical

Not applicable in companies

Theoretical

Very critical for current organisations

Innovative

Boring

5. ***Further comments:***

Thank you very much for your time!!

APPENDIX D3 – Coded observations from the workshops

Team	Observations / comments	Impact	Code
IW1.1 IW1.2 IW1.3	Team members are not aware of the company's strategic objectives *'I've seen the mission statement and strategy of the company on a sign above the entrance to the toilets!'*	Process interrupted until the team gather information about company strategy	SD
	Plant manager translating strategy into operational goals. Team members are not aware of company strategy	Involvement of manager allows continuing with the TPMS design process	MC, SD
	Quality manager translating strategy into operational goals. Team members are not aware of company strategy	Involvement of manager allows continuing with the TPMS design process	MC, SD
	Lack of experience in using PMS.	Team members sceptical about the use of TPMS. Managers have to explain several times the purpose of using performance measures. They also play a key role in defining the measures.	PMS, MC
	Individuals working as part of specific functions, not cross-functional teams.	Lack of understanding of cross-functional process objectives. Still thinking in functional objectives	PROCVIEW
	Currently these teams do not exist. The workshop is the first time team members get together to discuss team-based strategy and objectives	Lack of understanding of team goals and drivers affecting team performance	TM
IW2	Team members have a good strategic awareness and wide experience in managing with measures that are directly deployed from the strategy	Team members find it easy to go through the initial stages of the workbook	SD, PMS
IW3	The team has recently started working together but functional thinking is still evident	Process mapping is a valuable exercise to identify team goals. Team members do not see the value of measuring the four dimension of team performance. Their focus is on contributing to company strategy.	PROCVIEW, TM
	Team members have a strong functional orientation. They find very useful to do the process-mapping exercise	The team does not have a clear understanding of the process objectives	PROCVIEW
	Team manager facilitates the definition of company's strategic objectives	Enables the continuation of the process	MC, SD
IW4	Informal and paternalistic organisation	Performance measurement is not an important part of the organisational culture	CUL
	Factory coordinator enables the deployment of company strategy to the team level	Enables the continuation of the process	MC, SD
	Teamwork used at lower operational levels but still strong functional structure across the order fulfilment process	Identifying process objectives is a hard task. Process-mapping exercise is very valuable.	PROCVIEW

Team	Observations / comments	Impact	Code
IW5	Clear strategic awareness. This is normal considering that it is a management level team.	Facilitates the completion of the initial stages of the workbook	SD
	Matrix structure. The team is organised around a clearly defined business process	Team members have a clear understanding of the process objectives, which facilitates the definition of the goals	PROCVIEW
	Team members recognises that it is critical for them to improve the existing performance management systems *'It is critical to have effective measurement system to improve the way we manage our business'*	Team members very receptive and committed to the process.	PUR-BEN
IW6	*'You need a day away from your normal activities to be able to go through the workbook. I don't know if management will be happy to do that with all teams in our company'*		MC
	Team members (group of team leaders) do not take a proactive role in designing the TPMS. There is not a senior figure involved in the process and they appear to be sceptical of the value of using TPMS.	The team struggles to define measures against the different dimensions and drivers of team performance.	MC, PUR-BEN
	'The collection of the required data and management of the measurement system might involve high resource utilisation. We don't want measurement to become our primary activity'	Scepticism about using TPMS	PUR-BEN
IW7	The company has a high-performance, flexible and adaptable culture	PMS is at the centre of the management systems, Team members have an extensive experience in using PMS and clearly understand the purpose and benefits of it. Committed towards designing the TPMS.	CUL, PMS, PUR-BEN
	Individual-based appraisal and reward *'The current system encourages an individualistic environment and jeopardises team culture.... It is a contradiction to measure team performance while rewarding individual members'*	Team members support the view of re-designing the existing appraisal and review, and to introduce TPMS as the new basis. The team designs a high quality TPMS.	APPR-REW
	'The process requires a good pre-understanding of organisational data regarding strategy and performance measures'		SD, PMS
	High performing team – *'understanding what organisational level teams are and the unique features of each team will increase the effectiveness of the construct'*		TM
	Team based on business process and involving members from two companies	Clear understanding of team and process objectives. Facilitates the continuation of the TPSM design process	PROCVIEW

Team	Observations / comments	Impact	Code
IW8	Team recognises the importance of designing effective TPMS in order to further develop teamwork practices and redesign current individual-based appraisal and reward system. In their words, the latter discourages teamwork culture.	Fully committed to the process. Team easily grasps all the concepts included in the workbook and designs a good quality TPMS	PUR-BEN
	High-performance culture	PMS at the centre of the company's management systems. Team is aware of the benefits of using performance measures	CUL
IW9	*'We need more effective performance measure to provide focus to the team and manage each specific projects'*	Benefits of TPMS are obvious for the team. They are very receptive to all concepts. Fully committed to the process and they design a good quality TPMS.	PUR-BEN
	Clear strategic awareness. The company has only 6 people and they are all part of the same team.	Facilitates the completion of the initial stages of the workbook and definition of several measurement points	SD
	Team evidences a high level of performance (i.e. *real team*). It is currently focused on team development.	Clear understanding of the drivers that affect the competitiveness of the team. Team sees important to design measures against the four dimensions of team performance.	TM
	Flat process/project based structure	The team has a clear understanding of the goals and performance drivers	PROCVIEW
IT1	Process-based and team-based structures	Clear understanding of the team goals. Simplifies the design of team-based measures	PROCVIEW
	Company strategy deployed down to team level	Simplifies the design of team measures	SD
	The team is advanced in the team development scale, i.e. high performing team.	It has a clear understanding of the drivers that will ensure the competitiveness of the team in the short and long term. Sees the value of defining a set of balanced measures.	TM
	Team-based appraisal and reward system	Designing TPMS is a natural process. Team members see the value and benefits of using TPMS.	APPR-REW
	High-performance culture, power decentralised on teams, participatory management style	PMS at the centre of the company's management system. Teams are responsible for managing their performance and thus TPMS plays a key role	CUL
IT2	The team has a good awareness of the company strategy	Simple to define goals and measures aligned to strategy	SD
	Clearly defined business processes. Team organised around the product development process	Clear understanding of the process goals which facilitates the definition of team measures	PROCVIEW
	High-performance culture, power decentralised on teams, flexible and adaptable to change	Team members have extensive experience in using PMS and understand the purpose and benefits of it. Commitment towards designing TPMS.	CUL, PMS PUR-BEN
	Team and project based rewards	Designing TPMS is natural and necessary process	APPR-REW

Table D3: Coded observations from the workshops

APPENDIX D4 – Summary of the impact from the factors

Cultural features	*Description*	*Impact on TPMS design and implementation*
High performance	Organisation where teams and individuals are continuously challenged with stretched performance targets. Managers managed and managed their business based on the achievement of these targets.	Performance measurement plays a key role in the management teams. Teams have a clear understanding of the purpose of performance measurement and individual have experience in using performance measures. This will facilitate the design and implementation of TPMS.
Flexible and adaptable	The company and its members are used and open to continuous change.	Teams understand the benefits of TPMS. As a result, they are committed to the design and implementation of performance measures.
Decentralised power on teams / participatory management style	Organisations where power and authority is deployed to the point of decision-making. Team proactively participate in the decision-making processes	Teams are responsible for designing and implementing the TPMS. This increases their accountability over the measurement system. Teams define a more balanced TPMS because they put more emphasis on the needs of individual members as well as the development of internal capabilities.
Centralised power on critical functions	Although teamwork might be encouraged, power and decision-making authority remain at a functional level.	Measurement points are dictated from higher organizational levels. These are mainly related to *effectiveness* variables and this can cause an unbalanced view of team performance. Functional objectives and measure are also deployed to the team level and this can create conflicts with the team-based measures.
Individualistic/competitive	High performance culture, where the highest performing individuals, rather than teams, are continuously praised.	Employees work towards the achievements of individual targets, which are not necessarily aligned with team objectives. Team members do not see the benefits of designing and implementing TPMS as long as their performance is appraised based on individual measures.
Command and control	Hierarchical organisation with a distinction between management layers. Management tell teams what to do and performance measurement is used to control performance.	Employees have a negative perception of performance measurement and even fear to the consequences of measurement. As a result, it is difficult to get their commitment over the design and implementation of TPMS.
Loose/informal/disorganised	Management style based on informal procedures and relationships. There is a lack of structure for decision-making, communication and performance improvement activities. Decision-making based on personal judgment and experience	It is not the culture and management style of these organizations to use measures for managing the business. As a result, neither team members nor managers have experience in using performance measures. Team members have a lack of understanding of the purpose and benefits of TPMS and thus, they are sceptical to design and implement measures.

Table D1: Impact of organisational culture

Modes of impact	*Description*	*Impact*
Process-based structure	The company has clearly defined its internal business process and has organised its internal structure around those processes	- Improves the understanding on the need and value of TPMS - Enables the team to identify key measurement points (i.e. process objectives and drivers) - Increases the awareness of the roles of each individual team members, which facilitates the deployment of team measures to the individual level
Matrix structure	The company has defined its internal business processes but there are still functions (e.g. departments, regions) cutting across the processes	Increased probability to create a conflict between team and functional objectives, which will difficult the implementation of measures
Functional structure	The company is organised around its functions or departments. The company is on managing functional performance rather than process performance.	- Lack of understanding of the purpose and benefits of TPMS. - Difficult to define common goals. Team members do not see the process objectives and drivers, and do not understand each other's roles and responsibilities. - Conflicts between team-based and functional measures. - Difficult to design and implement a TPMS.

Table D2: Impact of business process view

Modes of impact	*Description*	*Impact*
Team-based appraisal and reward	Appraisals and rewards are based on team performance	-Improves the understanding of the need for a TPMS -Team members are committed to the design and implementation of the TPMS - Team members are accountable for the measures
Individual-based appraisal and reward	Appraisals and rewards are based on individual performance	- Individuals do not see the need to design and implement TPMS - Lack of predisposition to design and implement TPMS - Individuals focus on individual measures, which are not always aligned with team objectives
Business-wide rewards	The company provides rewards based on business wide performance equally to all employees	The potential impact of team or individual rewards does not exist. Team members focus on those using those measures that have a key impact of business performance.
Based on a key dimension (usually financial figures)	Rewards are given based on the performance against a single dimension	Teams members focus on designing and implementing measures related to that dimension. It can become an obstacle to design and implement other measures.
Based on several dimensions	Rewards are given based on the performance against a number of different dimensions	Teams members focus on designing and implementing measures related to several dimensions dimension. It allows to design and implement a more balanced set of measures.

Table D3: Impact of focus and content of appraisal and reward systems

Modes of impact	*Description*	*Impact*
Mature team / high performance level	The team is a real of high performing team	- Allows the team to identify the dimensions and drivers for measurement - Enhances the understanding of the purpose and benefits of TPMS - Increased experience and knowledge on TPMS design and implementation (including descriptive measures) - Facilitates the design of a balanced TPMS - Increased commitment and accountability of team members, which facilitates implementation
Low maturity / low performing team	The team is still in the early days of teamwork (pseudo team / potential team)	- The team does not have a clear understanding of the dimension and drivers of team performance - The team has little experience in designing and managing measures - The team does not see the need to design measures against the four dimensions of team performance

Table D4: Impact of team maturity

Factor	TPMS design	TPMS implementation
Management drive	- Assists the team in identifying and aligning company strategy and team objectives. - Increases the commitment of team members during the process - Provides the required resources to design the TPMS (e.g. training on PMS, day out for going through the process)	- Ensures that the measures are implemented and actively used by the team - Ensures that action planning follows measurement - Increases the accountability of team members over the measures - Provides the resources for successful implementation
Organisational culture	- Affects the predisposition of team members to commit to the design process (e.g. high performance vs disorganised) - Affects team members understanding of the purpose and benefits of TPMS - Affects the content of the TPMS (i.e. type of measures) (e.g centralised vs decentralised)	- Affects the predisposition of team members to implement and use the performance measures - Affect the experience and knowledge of team members as well as managers in implementing and using performance measures
Purpose and benefits of TPMS	- Affects the predisposition of team members to commit to the design process - Affects the contents of the TPMS (i.e. type of measures) (e.g. control vs development and improvement) - Affect the level of commitment and support from management to design TPMS	- Affects the predisposition of team members to implement and use the performance measures - Affect the way is which measures are managed (e.g. review only vs review and planning) - Affect the level of management drive to implement and actively use the TPMS
Strategy deployment	- Enhances the alignment of the TPMS with the company's strategy - Positive impact on the contents of the TPMS (i.e. type of measures) - Simplifies the whole process for TPMS design	- Improves the commitment of the team members for implementing the measures because they see a clear link of measures with strategy
Organisational PMS	- Facilitates linking organisational PMS with TPMS - Simplifies the whole process for TPMS design - Affects the understanding of the purpose and benefits of PMS - Enhances the knowledge and experience of team members on designing measures - Affects the contents of the TPMS	- Enhances the knowledge and experience of team members on managing measures, which simplifies implementation - Simplifies implementation by integrating TPMS with the existing performance management system and using existing resources (e.g. IT infrastructure)
Systematic use of quality frameworks	- Enhances the knowledge and experience of team members on designing measures - Positive impact on the contents of the TPMS - Enhances the perceptions of teams on the value of measures	- Enhances the knowledge and experience of team members on managing measures, which simplifies implementation
Structured approach for TPMS design	- Provides clear guidelines and support tools to design the TPMS - Increases the commitment of management - Increases accountability of team members over the measures - Minimises the negative impact of constraining factors	- Overcomes the impact of factors negatively affecting implementation (e.g. relevant measures, balanced, reliable)
Business process view	- Improves the understanding on the need and value of TPMS - Enables the team to identify key measurement points (i.e. process objectives and drivers) - Increases the awareness of the roles of each individual team members, which facilitates the deployment of team measures to the individual level	- Avoid conflicts between functional and process objectives and measures, and as a result, facilitates implementation and use of measures

Table D5: Impact of factors on TPMS design and implementation

Factor	TPMS design	TPMS implementation
Focus and content of appraisals and rewards	- Affects the understanding of the purpose and benefits of TPMS - Affect the commitment of team members to designing the TPMS (individual-based vs team-based) - Affects the content of the TPMS	- Avoids or creates conflicts between team and individual interest (team-based vs individual-based) and as a result, simplifies or complicates implementation - Affects the commitment of team members for implementing, using and improving measures - Increases accountability of team members over measures, which facilitates implementation
Team maturity	- Allows the team to identify the dimensions and drivers for measurement - Enhances the understanding of the purpose and benefits of TPMS - Increased experience and knowledge on TPMS design (including descriptive measures) - Facilitates the design of a balanced TPMS - Facilitates the TPMS design process	- Increased commitment and accountability of team members, which facilitates implementation - Increased experience and knowledge on implementing and using TPMS (including intangible / descriptive measures)
IT support	- Increases acceptability of measures regarding accessibility of data	- Facilitates data collection, analysis, display and communication, all of which are critical to implementing the TPMS - Increases transparency of information and as a result, increases accountability of team members over the measures - Increases management commitment and confidence over the TPMS
Process leader and facilitator	-Leads the TPMS design process and provides the required support (e.g. education on TPMS) and guidance to the team members - Provides transparency to the TPMS design process and enhances the general perception of the purpose and benefits of TPMS	- Leads the TPMS implementation process and provides the required support to the team members

Table D5: Impact of factors on TPMS design and implementation (continuation)

IGR ASSESSORS' FORM

THIS FORM WILL BE COPIED AND PASSED (UNATTRIBUTED) TO THE INVESTIGATOR

Grant Reference: GR/R43792/01	Project Title: RAIS: Measuring & Managing Team Performance in Business Process Environments
Please return the form by: 04 October 2002 To: Mr Stuart Eley	Investigator: Dr JC MacBryde Institution/Organisation: University of Strathclyde
	Assessor reference number: EPUQIE

Please enter an assessment for each of the criteria listed by ticking the appropriate box. The confidence level box is provided so that you can indicate your confidence in assessing the review report against the corresponding criterion (H=High, M=Medium, L=Low).

Assessment / Criterion	1 Unsatisfactory (5%)	2 Tending to ← (20%)	3 National standing (35%)	4 Tending to → (30%)	5 Internationally leading (10%)	Confidence level H/M/L
Research Quality				✓		H
Research Planning and Practice			✓			M
Potential Scientific Impact			✓			H

Assessment / Criterion	1 Unsatisfactory (5%)	2 Tending to ← (10%)	3 Good (40%)	4 Tending to → (30%)	5 Outstanding (15%)	Confidence level H/M/L
Output of Research Staff				✓		M
Communication of Research Outputs				✓		M
Potential Benefits to Society			✓			M
Cost-effectiveness				✓		M

ADDITIONAL COMMENTS: Please comment on the grantholder's self-assessment, including any aspects on which there is a divergence of views.

NX0044 Your statements and conclusions will be passed unattributed to the applicant. Thank you for your time and effort in completing this assessment.

IGR ASSESSORS' FORM

THIS FORM WILL BE COPIED AND PASSED (UNATTRIBUTED) TO THE INVESTIGATOR

ISSUES YOU MAY WISH TO CONSIDER	PLEASE GIVE YOUR OPINION ON ANY ASPECT OF THE PROJECT REVIEW
Research Quality: ◦ underlying quality of the research, originality and novelty	The quality of the primary research is high and targetted at an important area for business. It adds to the broad body of research on performance measurement and team working.
Research Planning and Practice: ◦ scientific/technological approach ◦ suitability and effectiveness of the methodology, techniques, management and expertise ◦ extent to which planned and additional objectives achieved ◦ project management	The approach adapted for this RAIS grant added to the earlier research and was well structured.
Potential Scientific Impact ◦ significance of key advances ◦ potential impact on other research	Provides an effective example of the previous research.
Output of Research Staff: ◦ level and quality of training and opportunity for career progression, RAs, students, collaborators ◦ contribution to the provision of trained staff to meet national needs	The individual development opportunity was good and appears to have been used effectively
Communication of Research Outputs: ◦ dissemination to other researchers ◦ extent and influence of relationships with research users [inc. other academics] and industry ◦ contribution to public understanding	Dissemination of findings and working with partners
Potential Benefits to Society ◦ contribution to quality of life ◦ relevance to beneficiaries ◦ potential for exploitation (development of new or improved products, processes and services) ◦ outputs and timescales	Specific tangible benefits to the company were impressive. The letter of endorsement was an excellent reference. Broader benefits are dependent on businesses recognising the advantages of team working and the importance of an appropriate performance management system.
Cost-effectiveness: ◦ cost-effectiveness and value for money of the project ◦ use of resources, particularly staff, equipment and facilities ◦ non-EPSRC contributions ◦ follow-on support	The money appears to have been spent cost effectively with benefits to both the individual and the company in which the research took place.
Future developments: ◦ developments beyond the lifetime of the project likely to benefit any of the above	
Any other aspects: ◦ young researcher, facilities etc.	

NX0044 Your statements and conclusions will be passed unattributed to the applicant. Thank you for your time and effort in completing this assessment.

EPSRC

Engineering and Physical Sciences Research Council

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IGR ASSESSOR'S FORM

9 OCT [illegible]

THIS FORM WILL BE COPIED AND PASSED (UNATTRIBUTED) TO THE INVESTIGATOR

Grant Reference: GR/R43792/01	Project Title: Measuring & Managing Team Performance in Business Process Environments
Please return the form by : To	Investigator: Dr J C MacBryde Institution/Organisation: University of Strathclyde
	Assessor reference number: 7SQ24W

Please enter an assessment for each of the criteria listed by ticking the appropriate box. The confidence level box is provided so that you can indicate your confidence in assessing the review report against the corresponding criterion (H= High, M=Medium, L=Low).

Assessment / Criterion	1 Unsatisfactory (5%)	2 Tending to ← (20%)	3 National Standing (35%)	4 Tending to → (30%)	5 Internationally Leading (10%)	Confidence Level H/M/L
Research Quality				X		H
Research Planning And Practice				X		H
Potential Scientific Impact				X		H

Assessment / Criterion	1 Unsatisfactory (5%)	2 Tending to ← (10%)	3 Good (40%)	4 Tending to → (30%)	5 Outstanding (15%)	Confidence Level H/M/L
Output of Research Staff					X	H
Communication Of Research Outputs				X		H
Potential Benefits To Society				X		H
Cost-effectiveness					X	H

ADDITIONAL COMMENTS: Please comment on the grantholder's self-assessment, including any aspects on which there is a divergence of views.

The assessment of this grant is made in relation to the original grant but in its own right as a RAIS. Overall this grant supported the original grant well and has an useful addition to further the subject area.

IGR ASSESSOR'S FORM

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ISSUES YOU MAY WISH TO CONSIDER	PLEASE GIVE YOUR OPINION ON ANY ASPECT OF THE PROJECT REVIEW
Research Quality: • underlying quality of the research, originality and novelty	This grant was a well thought out and resourceful addition to the original grant through good management of the P.I. Within the original grant some interesting, relevant and beneficial results were obtained through case study research.
Research Planning and Practice: • scientific/technological approach • suitability and effectiveness of the methodology, techniques, management and expertise • extent to which planned and additional objectives achieved • project management	Often research grants fall short of providing tangible results to the Engineering Management Committee . The original grant not only attempted to produce a work book as a tangible output, but through this grant attempted to also test the concept. The results could be considered as not particularly exciting, ie. the 3 generic contributors (6.3) - it is bringing them together in a framework that allows an impact and relevance to both the practitioner and academic committee.
Potential Scientific Impact • significance of key advances • potential impact on other research	The research map was an effective tool to illustrate the methodology
Output of Research Staff: • level and quality of training and opportunity for career progression, RAs, students, collaborators • contribution to the provision of trained staff to meet national needs	The use of RA's and students whilst linking into their PhD was very good.
Communication of Research Outputs: • dissemination to other researchers • extent and influence of relationships with research users [inc. other academics] and industry • contribution to public understanding	The dissemination of journal and conference papers has been good but maybe the research could be submitted to a wider range of journals, eg. some HRM based journals.
Potential Benefits to Society • contribution to quality of life • relevance to beneficiaries • potential for exploitation (development of new or improved products, processes and services) • outputs and timescales	The grant showed a good level of cost effectiveness and the RA was obviously useful and utilised with the company.
Cost-effectiveness: • cost-effectiveness and value for money of the project • use of resources, particularly staff, equipment and facilities • non-EPSRC contributions • follow-on support	The funding of both this and the original grant has obviously allowed an important area to be research and some further work is already seen to be underway which is very commendable.
Future developments: • developments beyond the lifetime of the project likely to benefit any of the above	
Any other aspects: • young researcher, facilities etc.	