Leadership for Lean Six Sigma

by

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Dedicated to:

Susan and Jerry

Your patience, understanding and support have made this possible.

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Publications list

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Keywords

ASQ	American Society for Quality
BB	Black Belts
BPR	Business Process Re-engineering
CI	Continuous Improvement
CIP	Continuous Improvement Process
COPQ	Cost of Poor Quality
CSFs	Critical Success Factors
CTQ	Critical to Quality Characteristic
DFSS	Design for Six Sigma
DMAIC	Define-Measure-Analyse-Improve-Control
DoE	Design of Experiment
EFA	Exploratory Factor Analysis
EU	European Union
FD	Finance Director
FMEA	Failure Mode and Effect Analysis
GB	Green Belts
HETAC	Higher Education and Training Awards Council (Ireland)
ISO	International Organisation for Standardisation
ISSSP	International Society of Six Sigma Professionals
JIT	Just-in-Time
JMP	Statistic Software
KPIs	Key Performance Indicators
MBNQA	Malcolm Baldrige National Quality Award
MD	Managing Director
MNC	Multi National Corporation

NVIVO	Research Software for Analysis and Insight
QFD	Quality Function Deployment
QI	Quality Initiatives
QP	Quality Programme
QM	Quality Management
QMS	Quality Management System
RQs	Research Questions
SPC	Statistical Process Control
SPSS	Statistical Package for Social Sciences
SSRI	Six Sigma Readiness Index
TOC	Theory of Constraints
TPM	Total Productive Maintenance
TPS	Toyota Production System
TQM	Total Quality Management
VOC	Voice of Customer
VSM	Value Stream Mapping
YB	Yellow Belts

Abstract

Continuous improvement is an important business strategy for many organizations, and in the last few years Lean Six Sigma has become one of the most popular and proven business process improvement methodologies.

Lean and Six Sigma developed as independent business improvement initiatives, before converging in the past decade. The success of Lean Six Sigma deployment depends on a series of process/quality improvement projects undertaken in organisations: although a vast amount of literature has explored the topic of Lean Six Sigma, most of it has centred around the technical aspects, specific case studies or problems, leaving a gap in knowledge about the impact of leadership on successful implementation.

The aim of this research is to assess the impact of organizational leadership on the deployment of Lean Six Sigma in organisations and thereby develop a dependency model to facilitate its successful implementation. A mixed-methods approach, using survey and semi-structured interviews, was adopted.

This research identifies leadership as a critical success factor for Lean Six Sigma deployment in organizations, details what leadership traits are needed for a successful deployment, differentiating by industry sector, and presents a leadership dependency model.

Building on the existing literature, this research extends and helps refine our understanding of Lean Six Sigma and leadership, identifying the traits a leader needs to display to increase the chances of successful deployment.

Chapter 1

Introduction

1.0 Introduction

In this chapter, the researcher provides the context for the research, discussing the need for more investigation on the role of effective organizational leadership in Lean Six Sigma.

The overall research aim, objectives and research questions are then introduced and justified. This chapter concludes with a structure for the rest of the thesis.

1.1 Research Context

Quality improvement, or Continuous improvement, is an important business strategy for many organizations, and over the last decade Lean Six Sigma has become one of the most popular and proven business process improvement methodologies (Antony, Snee and Hoerl, 2017).

The term Lean Six Sigma was first introduced in the literature in 2000 (Timans et al., 2012), and from then has received increased interest and popularity, both in small and medium-sized manufacturing businesses (Kumar et al., 2006) and in large organisations, such as Motorola, General Electric, Honeywell (Laureani & Antony, 2012; Timans et al., 2012).

Snee (2010) defined Lean Six Sigma as ‘a business strategy and methodology that increases process performance resulting in enhanced customer satisfaction and improved bottom line results’, arguing it was not productive to debate whether Lean or Six Sigma was more applicable to solve specific issues, while focusing instead on how to combine them best to address the problem at hand. Lean Six Sigma uses tools from both toolboxes, in order to get the best of the two methodologies, increasing speed while also increasing accuracy.

Despite its success in some organisations, others are struggling to turn Lean Six Sigma into a success, citing a lack of leadership, changing business focus, internal resistance and availability of resources as the main impeding factors (Timans et al., 2012).

Brewer and Eighme (2005) mentioned committed leadership as a necessary ingredient, among others, for the successful deployment of Lean Six Sigma in organizations and define it as “clear direction on overall strategic deployment of Lean Six Sigma, commitment of time, resources (people), etc.. for the deployment, clear communication to everyone showing the need for the initiative, insistence on tangible bottom-line impact” (Brewer and Eighme, 2005).

Snee (2010) pointed out how Lean Six Sigma is an effective leadership development tool: ‘leaders enable an organization to move from one paradigm to another; from one way of working to another way of working. Lean Six Sigma provides the concepts, methods and tools for changing processes’. Leadership expert Kotter (1996, 2008) emphasised how the continuous improvement journey needs to begin with a sense of urgency and Snee (2010) identified leadership as a much

needed requirement for successful Lean Six Sigma deployment being critical for sustained improvement.

The role of effective leadership in Lean Six Sigma deployment deserves further investigation: while not suggesting there is a Lean Six Sigma leadership style, the objective of this research is to investigate the impact of Organizational Leadership overall on Lean Six Sigma deployments in organization, through answering key research questions, illustrated in the next section.

1.2 Research Aims and Questions

In the vast Lean Six Sigma literature, studies examining the impact of leadership are lacking. As explored in more detail in the literature review chapter, a lot of the literature has focused more on the technical side of Lean Six Sigma, leaving the leadership and cultural impact aside.

Leadership is widely considered a critical success factor for Lean Six Sigma deployment in organization: Rockart (1979) illustrated the concept of critical success factors (CSFs) and examined how they can be used to determine the informational needs of managers. According to Rungasamy et al. (2002), CSFs are those factors essential to the success of any programme or technique in the sense that if the objectives associated with the factors are not achieved, the application of the technique may fail catastrophically. CSFs include issues vital to an organization's current activities and future success (Boynlon & Zmud, 1984). The aim of this research is to investigate the impact of leadership on the deployment of Lean Six Sigma in organisations and thereby develop a practical framework to facilitate its

successful implementation.This aim can be achieved answering the following research questions:

***RQ 1**: What leadership traits are more conducive to successful deployment of Lean Six Sigma?*

This question is central to the research: among the many different leadership traits, which ones are more conducive to successful deployment of Lean Six Sigma?

Leadership traits are the personal qualities that shape effective leaders, and we aim to determine which ones are more effective in the context of deploying Lean Six Sigma in organizations.

***RQ 2**: To what extent do different types of organizations rely on Leadership for a successful Lean Six Sigma deployment?*

This question would address an important part of the research, to know which types of industries and organisations are more dependent on Leadership when deploying Lean Six Sigma. Although Lean Six Sigma is rooted in the manufacturing industry, where it was originally developed over the past few decades, the distribution of PPP (Purchase Power Parity) GDP, among various industry sectors in the main worldwide economies, reflected a decline in the industrial sector, with the service sector now representing three-quarters of the US economy and more than half of the European economies, as outlined in the World Economic Outlook Database (IMF, 2018). Since the early 2000s, applications of Lean Six Sigma in the service industry have grown (George, 2003), and in light of the increasing importance of the service sector in the global economy, this research question addresses whether the leadership impact on Lean Six Sigma deployment differs across industries.Addressing these questions

would fill a gap in knowledge of the impact of leadership on successful deployment of Lean Six Sigma.

1.3 Scope of Research

Properly defining the scope of research is an important activity to make sure the key RQs can be addressed with the available resources (time, money, technical capability). The author originally started with the ambitious goal of including the so called 'soft' aspects on the implementation of Lean Six Sigma: organisation leadership and culture, social, environmental and cultural aspects external to the organisations. Both manufacturing and service sectors were considered (excluding public sector and third sector organisations), regardless of company size. Greater understanding of the research methodology and available resources allowed for narrowing down the scope to focus on factors within an organisation (leadership and organisational culture). Further narrowing took place to limit the scope of the research to leadership only, due to the critical links between an organisation's culture and the culture of the society where the organisation operates. Figures 1.1 shows the funnel of narrowing the scope.

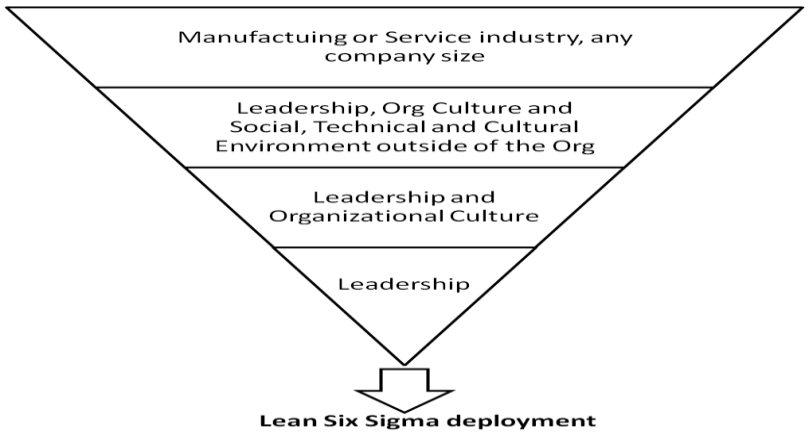

Figure 1.1 Funnel Illustrating the Scope of the Research

1.4 Structure

The structure of the thesis is as follows:

Chapter 1 provides an outline of the research, motivation to conduct this particular research, establishing research aims and questions.

Chapter 2 presents a systematic literature review of Lean Six Sigma and Leadership.

Chapter 3 and **Chapter 4** present the research philosophy, approach, strategy and data collection methods. This also includes a discussion on the design of the survey instrument and semi-structured interviews.

Chapter 5 presents the analysis of the survey instrument, using SPSS and Microsoft Excel. The author starts with descriptive statistics to explicate the findings, and then moves to Exploratory Factor Analysis to establish the relevant underlying factors for a successful Lean Six Sigma deployment in organisations.

Chapter 6 details the findings from the semi-structured interviews conducted with 21 Lean Six Sigma practitioners from a variety of industries and geographic backgrounds. This chapter addresses RQ1.

Chapter 7 presents the leadership dependency model and leadership traits derived from the research, addressing RQ2.

Chapter 8 discusses the key findings from the research, details the contributions to theory and practice, and provides recommendations for future research in this area.

1.5 Summary

This chapter briefly discusses the context motivating this research, followed by a description of the research's aims and questions. The structure of the thesis was also provided, with a brief description of the content of each chapter.

Chapter 2

Systematic Literature Review

2.0 Introduction

This systematic literature review aims to synthesise, organise and structure the stock of knowledge relating to Lean Six Sigma and leadership. The review focuses primarily, but not exclusively, on theoretical developments and empirical studies in the practice of Lean Six Sigma. The objectives of the review are:

- Investigate the leadership factors that influence the deployment of Lean Six Sigma in organisations;
- Compare leadership traits of successful and unsuccessful attempts to deploy Lean Six Sigma;
- Highlight outstanding issues in the field.

The review also makes an important methodological contribution by applying elements of systematic reviews originating from the so called ‘hard sciences’ to the leadership and Lean Six Sigma fields, where there is little systematic research and concepts are often poorly operationalised. As a consequence, the literature is of little help in providing information to organisations regarding deploying Lean Six Sigma. This review seeks to address some of those issues by synthesising and analysing the literature on leadership and Lean Six Sigma in the context of practical applications for organisations.

2.1 Systematic Review of Literature

Systematic reviews in management research are relatively new (Greenhalgh et al., 2004; Tranfield et al., 2003). They have been used in a range of health, social care and education fields in order to synthesise research in an orderly and transparent way (Tranfield et al., 2002). Systematic review is a structured process to investigate the background literature, which aims to avoid potential purely narrative analysis (Pittaway et al., 2004), by providing an audit of decisions and conclusions of the reviewers, increasing transparency and replication (Thorpe et al., 2005).

The adopted systematic review procedures outlined by Tranfield et al. (2003) entail a three stage review process:

1. Review planning determines the scope of the review and the review protocol, including an explicit description of various steps in the review process, key data collection method, the search strategy for identification of relevant studies, and inclusion and exclusion criteria. These explicitly aim to limit systematic error and bias (Petticrew & Roberts, 2006).
2. Review execution includes collection and organisation of data, data processing and classification, and data synthesis. Data collection is done by using a predefined selection algorithm using predefined search strings.
3. Reporting includes synthesising and examining the consequences of the results.

In the review planning stage, the scope of the systematic review was focused on the Lean and Six Sigma methodologies for quality and continuous improvement,

and leadership effects. In the review execution phase, the search strategy aimed to eliminate bias and be as widespread as possible, by using a database search and cross-refereeing between papers. The review was focused on peer-reviewed journal articles, as the published journal articles can be considered valuable knowledge (Podsakoff et al., 2005), and influential journals tends to shape theoretical and empirical work (Furrer et al., 2008), however, we also included relevant text books, conference proceedings and academic theses.

The following key words, in the 'title' and/or 'abstract' in English, were searched:

- Lean and/or Six Sigma
- Leadership and/or Lean
- Leadership and/or Six Sigma

These keywords correspond to the main fields of studies in which we sought to find a relationship.

The list of peer reviewed journal articles were obtained from ABI/INFORM Complete, Omnifile Full-Test, ASSIA (Applied Social Sciences Index and Abstracts), Infoma – Taylor & Francis, JSTOR, ScienceDirect, Springer, Wiley, Athena, Shibboleth, Google Scholar, EBSCO and Emerald Insights, as they cover the entire management and quality related fields.

The initial search returned 610 papers; we then excluded those papers from journals focusing on areas other than management or quality, books, theses and conference proceedings, as we wanted to focus on peer reviewed journal articles.

Further searches in key journals were used to supplement the initial search to identify articles that might have been missed in the initial search. In order not to miss any relevant articles fulfilling the inclusion criteria, we cross-checked with earlier reviews and included those papers within our criteria. We also carried out manual searches of numerous reference lists from the selected papers to identify additional relevant papers that fall under our selection criteria. We ended up with 285 papers based on the inclusion and exclusion criteria.

We then filtered these papers for articles linked to leadership, Lean, Six Sigma, Lean Six Sigma, continuous improvement, and quality, and we excluded the following: papers dealing with Six Sigma models for implementation; papers dealing with statistical domains; and papers dealing exclusively with the tools and techniques of Six Sigma and industrial case studies demonstrating Six Sigma improvement projects, so to focus less on the technical aspects, and tools, of Lean Six Sigma implementation, and more on papers that touched on the relationship between Leadership and Lean Six Sigma. After going through each abstract, we finally identified 179 relevant articles. Figure 2.1 shows our selection procedure:

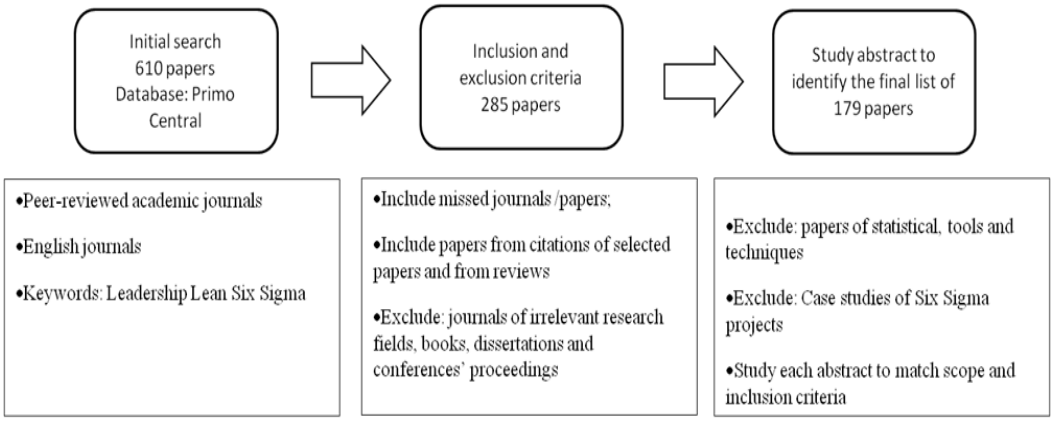

Figure 2.1: Systematic Review - Selection and Review Procedure

Since the objective of our systematic literature review was to review and synthesise the literature, rather than to consolidate the findings empirically, we limited our methodology to descriptive and qualitative analysis: we carried out interpretative synthesis (Dixon-Woods et al., 2006) and qualitative analysis (Bronson & Davis, 2012).

2.2 Results and Analysis of the Systematic Literature Review

This systematic literature review was based on a sample of 179 papers categorised as follows: 146 conceptual papers, 14 empirical studies, 12 literature reviews and seven exploratory studies. In this section, we present data collected with the aim of providing an updated picture of the status of the current literature on leadership and Lean Six Sigma. Since the main objective of our review was to bring out a broad theoretical understanding of the relationship between leadership and Lean Six Sigma, we classified the selected papers on the basis of their research focus, the research methods, year of publication, geography and application sector (manufacturing, service or public sector).

Year of publication

The distribution of papers over time revealed increasing academic interest for the subject, reaching the highest output in the second half of the last decade (Figure 2.2).

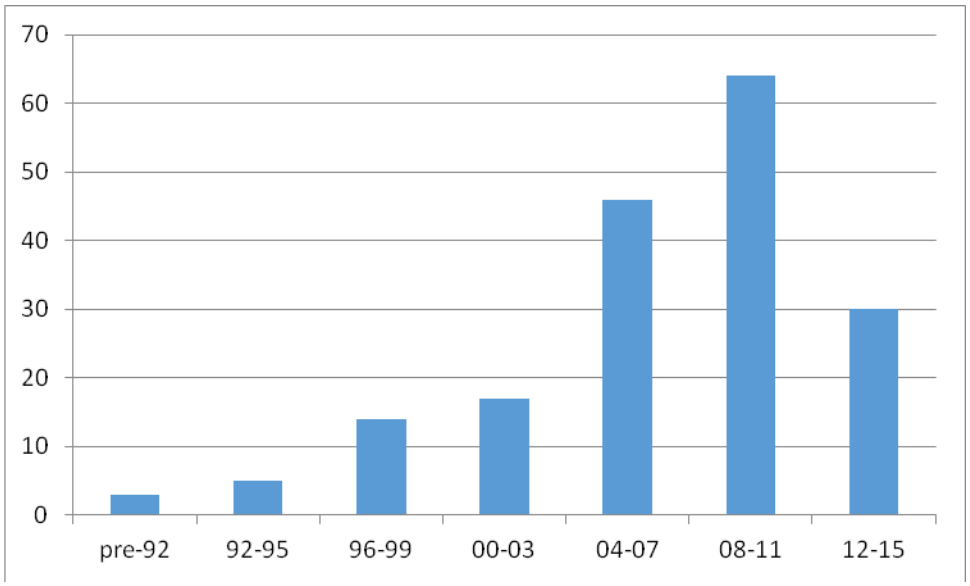

Figure 2.2 The Number of Relevant Articles in the Literature Review by Time Period

Publications on leadership and Lean Six Sigma grew over time, as Lean Six Sigma itself moved from a niche to a mainstream management technique, peaking around 2009–2010.

Journals

Most of the papers were published in the following five journals: *Quality Progress*, *International Journal of Quality & Reliability Management*, *International Journal of Six Sigma and Competitive Advantage*, *Harvard Business Review* and *Total Quality Management & Business Excellence*. Papers were also found in journals dedicated to a variety of fields (e.g., healthcare, engineering, operation management), signalling the dissemination of the topic in contexts and disciplines different from the original manufacturing or quality setting. In total, 97 journals were used for this study and Table 2.1 lists the journals with two or more articles (full list of all journals is available in Appendix I).

Journal	Papers
Quality Progress	20
International Journal of Quality & Reliability Management	11
International Journal of Six Sigma and Competitive Advantage	10
Harvard Business Review	9
Total Quality Management & Business Excellence	7
International Journal of Lean Six Sigma	4
Management Services	4
Leadership and Organization Development Journal	3
Journal of Manufacturing Technology Management	3
International Journal of Operations & Production Management	3
Quality and Reliability Engineering International	3
Management Decision	2
The TQM Journal	2
Technovation	2
International Journal of Production Economics	2
Leadership Quarterly	2
Managing Service Quality	2
Strategic Finance	2
Manufacturing Engineering	2
The Quality Management Journal	2
International Journal of Quality and Reliability Management	2
The TQM Magazine	2
Quality Engineering	2
ASQ Six Sigma Forum Magazine	2
Quality Management Journal	2
International Journal of Productivity and Performance Management	2
Measuring Business Excellence	2

Table 2.1 Journals with Two or More Papers in the Literature Review

The vast majority of papers were conceptual in nature, describing some aspect of the Lean Six Sigma methodology and its possible applications. This was not a surprise, as often industry practitioners cannot publish their results due to a company's non-disclosure rules or concerns about confidentiality and competitiveness. Hence, inevitably, a literature review is always biased towards more theoretical publications. However, it was noticeable that Lean Six Sigma has grown in publications related to healthcare - a clear sign of how it has ventured outside the

more traditional manufacturing sector to tackle problems elsewhere. Considering the countries where research took place, the US was the country with the most papers (approximately 56%), followed by the UK (22%) and Continental Europe (10%) (Figure 2.3).

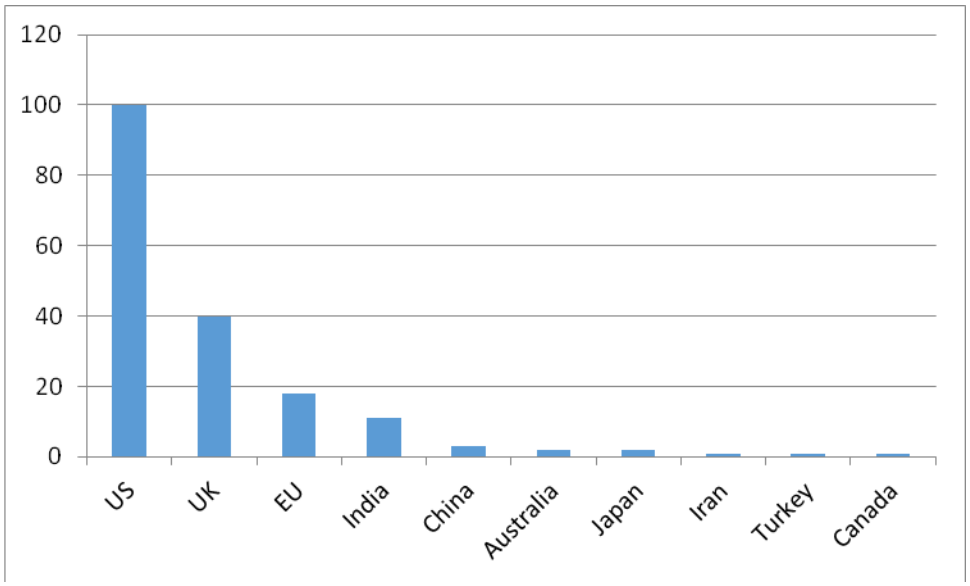

Figure 2.3 The Number of Relevant Articles in the Literature Review by Country

The next part of the systematic literature review process is the synthesis (Dixon-Woods et al., 2006) which involved an in-depth qualitative analysis of each research study selected for review inclusive of all aspects of the research process, related findings, and interpretations made from the primary research (Bronson & Davis, 2012).

2.3 Leadership: Synthesis of Literature Research

The importance of leadership has often been emphasised in the area of quality management. Despite such consideration, little has been espoused regarding the theoretical mechanisms by which leadership and Lean Six Sigma are related. This

paper provides a focus on such issues with the hope of stimulating more systematic research efforts.

Definitions of leadership abound in the literature: in 1991, 54 leadership experts from 38 countries agreed on a common definition of leadership as 'influencing, motivating, and enabling others to contribute toward the effectiveness and success of the organizations of which they are members' (House, Javidan & Dorfman, 2001). Most of the leadership literature can be organised within the following five leadership theories (Kanungo, 1998; Yukl, 2006):

1. *Behavioural perspective* identifies two clusters of leaders' behaviour: people-oriented and task-oriented.
2. *Contingency perspective* says effective leaders adapt their styles to the situation.
3. *Competency perspective* tries to identify the traitss of effective leaders.
4. *Transformational perspective* says that leaders create and communicate a vision.
5. *Implicit leadership perspective* says the importance of leadership is inflated.

It is important to note that no matter which theory one follows, all agree that leaders exist everywhere in the organisation, not just in the executive board (McShane & Von Glinow, 2008). Let's briefly review each fo the five perspectives.

Behavioural perspective

Originally only four leadership styles were identified (Lewin et. al., 1939) in the behavioural perspective:

1. Dictator
2. Autocratic
3. Participative
4. Laissez Faire

In the 1940s and 1950s a number of studies were carried out to determine which leadership behaviours were making leaders more effective. The results clustered the various behaviours around two poles: task-oriented and people-oriented (Northouse, 2004; Yukl, 2006). Those two extremes are clearly useful in theory, but rarely in practice is a leader either completely task-oriented or people-oriented. Moreover, it also assumes that high-levels of both extremes are best in all situations, while in reality the best leaders' behaviour may depend on the situation (Kerr et. al., 1974), as stated by the contingency perspective.

Contingency perspective

Among the contingency theories, the 'path-goal' theory (based on the expectancy theory of motivation (Isaac, Zerbe & Pitt 2001)) has stood the test of time. Path-goal theory introduced the concept of servant leadership, i.e. the belief that leaders serve followers by understanding their needs and facilitate their work performance (Spears & Lawrence, 2002). The path-goal leadership theory advocates four leadership styles:

1. *Directive:* the leader dictates goals and standards.
2. *Supportive:* leader is approachable and friendly, supporting followers.
3. *Participative:* followers are involved in setting goals and standards.
4. *Achievement oriented:* a leader sets challenging goals and strives for continuous improvement.

Other contingency theories include:

- Situational Leadership Theory, developed by Hersey and Blanchard (1988), suggests leaders adapt their styles based on the 'readiness' of their followers, suggesting that effective leadership requires a rational understanding of the situation and an appropriate response, rather than a charismatic leader with a large group of dedicated followers;
- Fiedler's contingency model (Fiedler, 1967), where leadership effectiveness depends on whether the person's natural leadership style is appropriately matched to the situation;
- Leadership substitutes theory (Schriesheim, 1997) identifies conditions that limit leader's effectiveness and advocates that leaders help followers to lead themselves.

Competency perspective

The idea of identifying personality traits more conducive to effective leadership is a cornerstone of the competency theory. Ilies, Gerhardt and Le (2004) individuated the

following personality traits as important for an effective leader: emotional intelligence, integrity, drive, motivation, self-confidence, intelligence and knowledge of the business. The importance of traits more conducive to effective leadership, in the context of Lean Six Sigma deployment, is at the centre of RQ2 of this research, and something we'll investigate in the qualitative research part.

Transformational perspective

Burns (1978) defined transformational leaders as agents of change, creating, communicating and modelling a vision for the team or organisation, inspiring followers to that vision, as such a transformational leader could affects both current performances and the future development of an organization. Opposite to this is transactional leadership: helping organisations to achieve their current objective more efficiently (Goodwin, Wofford & Whittington 2001). For a while, charismatic leadership was synonymous with transformational leadership, but ultimately it became a separate leadership perspective, using referent power over followers to establish itself (Barbuto, 1997).

Implicit leadership perspective

The four types of leadership theories reviewed so far (competency, behavioural, contingency and transformational) all have in common the underlying assumption that a leader can make a difference in an organisation. On the contrary, the last type of leadership theory, the implicit one, considers the importance of leadership as inflated, seeing its origin in the human need for control (Meindl, 1990).

Within the types of leadership theories discussed, we could identify ten leadership styles (Tannenbaum & Schmitt, 1958; Hofstede, 1977; Schriesheim, 1982; Stodgill, 1989; Bass, 1990; Kouzes & Posner, 1987), that we are now going to discuss in details, illustrating their main traits.

Leadership styles

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Level 5

The Level 5 leader sits on top of a hierarchy of capabilities and builds enduring company greatness through a paradoxical combination of personal humility plus professional will (Collins, 2001a). Level 5 leaders routinely credit others, external factors and good luck for their company's success, but when results are poor, they blame themselves. They also act quietly, calmly and determinedly, relying on inspired standards, not charisma, to motivate. Utterly intolerant of mediocrity, they are stoic in their resolve to do whatever it takes to produce great results. They also select great successors for themselves, wanting their organisation to be even more successful in the future (Collins, 2001b).

Affiliative

This is a leadership style where the leader promotes harmony among his or her followers and helps to resolve any conflict. This type of leader will also build teams to make sure that their followers feel connected to each other. Affiliative leaders value people and their feelings, put less emphasis on accomplishing tasks and goals and more on the emotional needs of employees. They keep people happy,

emphasise harmony and build team resonance. Typically, the followers will receive much praise from this style of leader; however, poor performance tends to go unchecked (Goleman, Boyatzis, & McKee, 2002).

Bureaucratic

1. This is a style of leadership that emphasises procedures and historical methods regardless of their usefulness in changing environments. Bureaucratic leaders attempt to solve problems by adding layers of control, and their power comes from controlling the flow of information (Weber, 1905). A bureaucratic leader is subject to a system of behavioural rules and technical rules. Behavioural rules define the scope of a manager's behaviour and constrain his or her conduct, while technical rules control how work is to be performed and how decisions are made (Meier, 1989).

Participative

Also known as the democratic style, the participative leader involves subordinates in goal setting, problem solving, team building and so on, but retains the final decision-making authority (Lewin et al., 1939). The idea that participative leadership is likely to enhance the performance of subordinates was suggested by Barnard (1938) decades ago, and has been expanded and developed subsequently by many researchers (Huang et. al., 2010). Two theoretical models underline the effects of participative leadership behaviour on subordinates' work performance: the motivational model and the exchange-based model. The first suggests that increasing the degree in which subordinates participate in decision making may increase

performance through enhanced motivation (Sashkin, 1976). The exchange-based model, based on social exchange theory (Blau, 1964), suggests that when employees are treated well by their superiors, they are more likely to reciprocate by showing high levels of work performance (Blau, 1964).

Servant

This style stresses the importance of the role a leader plays as the steward of the resources of a business or other organisation, and teaches leaders to serve others while still achieving the goals set by the business (Greenleaf, 1977). Servant leaders begin with the natural feeling of serving first, to ensure that others' 'highest priority needs are served first' (Greenleaf, 1970, p. 4). Various studies (Barbuto & Wheeler, 2006; Dennis & Bocarnea, 2005; Liden, Wayne, Zhao, & Henderson, 2008; Russell & Stone, 2002; Sendjaya, Sarros, & Santora, 2008; Van Dierendonck & Nuitjen, 2011) have developed measures for servant leadership, which have elicited 43 overlapping dimensions. Anderson & Sun (2015) synthesised these in twelve conceptually distinct dimensions, among which the more pertinent for Lean Six Sigma leadership area are persuasive mapping, courage and accountability:

- *Persuasive mapping* describes the extent to which leaders use sound reasoning and mental frameworks to map issues and conceptualise greater possibilities for the future (Barbuto & Wheeler, 2006; Liden et al., 2008).

- *Courage* is the ability to see things differently and take risks with new ways to deal with old problems (Van Dierendonck & Nuitjen, 2011).

- *Accountability* is holding followers accountable to deliver on what they can control (Van Dierendonck & Nuitjen, 2011).

Six Sigma

This style advocates a higher standard of leadership effectiveness through the foundational principles of Six Sigma, and is a model anyone can aspire to regardless of whether the company uses Six Sigma or not (Pande, 2007). The combination of stability (balance) and responsiveness (flexibility) makes a Six Sigma leader. Rather than focusing on traits like charisma, the core of Six Sigma leadership is about practical skills and principles that can be applied to create and sustain success in organisations (Pande, 2007). This leadership style seeks to leverage the application of Six Sigma principles to the leadership domain, but in doing so it doesn't answer the question of what leadership traits are best to successfully deploy Lean Six Sigma in organizations, something this research aims to address in RQ2.

Transactional

This is based on the setting of clear objectives and goals for followers, as well as the use of either punishments or rewards in order to encourage compliance with these goals (Burns, 1978). Bass' (1985) model of leadership conceptualised transactional leadership as consisting of three dimensions: contingent reward and two forms of management by exception (MBE), active and passive. Goodwin et al. (2001) found that contingent reward comprises two factors: explicit psychological contract and implicit psychological contract. The latter is more closely associated with transformational leadership behaviours (Goodwin et al., 2001). A further analysis by Podsakoff, Bommer, Podsakoff and MacKenzie (2006) further distinguished between contingent reward, contingent punishment, non-contingent reward and non-contingent punishment.

Transcendent

Grounded in servant leadership, the transcendent style offers a pathway to increased trust necessary for global sustainability, offering a more inclusive and consensual decision-making process for the economic, social and environmental sectors, moving beyond a singular focus on the bottom line of profits to a multiple focus on the triple bottom lines of profits, people and planet. (Gardiner, 2006). Crossan, Vera and Nanjad (2008) defined transcendent leadership as a form of strategic leadership that spans the levels of self, others and organisation; it captures the quality of going above and beyond the narrow definition of a leader.

Transformational

This style of leadership – in which the leader identifies necessary change – creates a vision to guide the change through inspiration, and executes the change with the commitment of the members of the group. Bass (1985) built on Burns' (1978) description of 'transforming leadership' and developed a model of transformational leadership that encompasses four dimensions:

1. *Charisma* represents 'the degree to which the leader behaves in admirable ways that cause followers to identify with the leader'.

2. *Inspirational motivation* is 'the degree to which the leader articulates a vision that is appealing and inspiring to followers'.

3. *Intellectual stimulation* is 'the degree to which the leader challenges assumptions, takes risks, and solicits followers' ideas'.

4. *Individualised consideration* is ‘the degree to which the leader attends to each follower’s needs, acts as a mentor or coach’. (Judge & Piccolo, 2004, p. 755)

Most of them are often considered part of the necessary leadership traits to deploy a change management initiative like Lean Six Sigma, particularly articulating the vision (inspirational motivation) and challenging the status quo (intellectual stimulation). As a consequence, transformational leadership is often considered the style closer to the ideal organizational leadership needed to successfully deploy Lean Six Sigma in an organization.

Transformational leadership can ultimately be thought as a process in which leaders and followers help each other to advance to a higher level of morale and motivation, creating significant change in the life of people and organizations (Bass & Riggio, 2006).

Visionary

The visionary style – also referred to as charismatic – means that leaders articulate where a group is going, but not how it will get there, setting people free to innovate, experiment and take calculated risks (Goleman et al., 2002). House (1977) and House & Podsakoff (1994) argued that charismatic leaders exude passion and self-confidence, engage in self-sacrificial behaviour, promote a collective identity, model desirable behaviour, establish high expectations for followers and express confidence that followers can achieve them.

Table 2.2 summarises the leadership traits from the literature review for the ten different styles of leadership discussed: each style embodies a different set of traits, with some traits recurring across different styles.

Traits	5-Level	Affiliative	Bureaucratic	Participative	Servant	Six Sigma	Transactional	Transcendent	Transformational	Visionary
Ambitious for the organisation, not themselves	X				X					
Approachable	X	X		X	X			X		
Challenge the status-quo						X			X	X
Charisma									X	
Clarity	X					X	X			
Climate of trust		X		X				X		
Consensus				X	X			X		
Consistency	X					X				
Contingent Reward							X			
Emphathetic		X								X
Enthusiasm	X							X	X	X
Exchange							X			
Facilitating dialog and deliberation				X		X		X		
Flexibility	X					X				
Global perspective						X		X		
Goal orientation	X					X	X			
High-level of control			X				X			
Individual consideration									X	
Inflexible			X							
Inspiration									X	X
Integrity / Honesty	X				X			X		
Intellectual stimulation									X	
Manage by exceptions							X			
Micro-managing			X							
Open-minded						X		X		
Participation		X		X	X			X		X
Personal humility / Modesty	X									
Promotes harmony		X								
Protecting & valuing divergent views				X		X		X		
Quiet determination	X					X				
Reflective						X		X		
Relies on inspired standards, not charisma, to motivate	X				X	X				
Service above self					X			X		
Short-term focus			X				X			
Transparency & disclosure								X		
Understated	X				X					
Unwavering resolve	X									
Value-centred					X			X		X
Warmth	X									
Workmanlike diligence	X									

Table 2.2 Leadership Traits by Leadership Styles

There is not a ‘one size fits all’ leadership style, but it is critical for a leader to adapt his approach to fit the situation: as Goleman (2000) showed, the most effective leaders use a collection of distinct leadership styles, each in the right measure, at just the right time. But do traits matter at all in defining a leader? Research has shown that effective leaders have distinctive traits, such as drive, leadership motivation, honesty and integrity, self-confidence, cognitive ability and knowledge of the business (Kirkpatrick & Locke, 1991) that makes them stand out of the crowd. Since 2000, several new leadership styles have also been proposed (Anderson & Sun, 2015): ideological leadership, pragmatic leadership, authentic leadership, ethical leadership, spiritual leadership, distributed leadership, and integrative public leadership. However, they have not yet been properly defined, with large areas of overlap among themselves and with more traditional styles previously studied in the literature. Anderson and Sun (2015) issued a call to leadership researchers to collectively develop a new model of leadership that encompasses what is unique about these various new styles being proposed.

2.4 Lean Six Sigma: Synthesis of Literature Research

The term ‘Lean Six Sigma’ first appeared in 2000 as a way to describe the integration of Lean and Six Sigma philosophies (Sheridan, 2000). Lean Six Sigma is a business improvement methodology that aims to maximise shareholders’ value by improving quality, speed, customer satisfaction and costs. It achieves this by merging tools and principles from both Lean and Six Sigma (Albliwi et al., 2015; Lee & Wei, 2009; Chen & Lyu, 2009; Chakravorty & Shah, 2012; Vinodh et al., 2012). Lean and Six Sigma have followed independent paths since the 1980s, when the terms were

first hard coded and defined. Lean originated in Japan (within the Toyota Production System), and Six Sigma emerged in the US (within the Motorola Research Centre):

- Lean is a process improvement methodology used to deliver products and services better, faster and at a lower cost. Womack and Jones (1996) defined it as 'a way to specify value, line up value-creating actions in the best sequence, conduct those activities without interruption whenever someone requests them, and perform them more and more effectively. In short, lean thinking is lean because it provides a way to do more and more with less and less—less human effort, less human equipment, less time, and less space—while coming closer and closer to providing customers with exactly what they want'.
- Six Sigma is a data driven process improvement methodology used to achieve stable and predictable process results, reducing process variation and defects. Snee (1999) defined it as 'a business strategy that seeks to identify and eliminate causes of errors or defects or failures in business processes by focusing on outputs that are critical to customers'.

While Lean is all about *Speed* and *Efficiency*, Six Sigma is about *Precision* and *Accuracy*: Lean ensures resources are working on the right activities while Six Sigma ensures things are done right the first time. The term Lean Six Sigma was first introduced in the literature in 2000 (Timans et al., 2012), and from then has received increased interest and popularity, both in small and medium-sized manufacturing businesses (Kumar et al., 2006) and in large organisations, such as Motorola, General

Electric, Honeywell (Laureani & Antony, 2012; Timans et al., 2012). Sreedharan and Raju (2016) found 45 different definitions of Lean Six Sigma in the literature, spread across many industrial sectors and Countries, with most organizations referring to Lean Six Sigma as a synergy of Lean and Six Sigma techniques.

Snee (2010) defined Lean Six Sigma as 'a business strategy and methodology that increases process performance resulting in enhanced customer satisfaction and improved bottom line results', arguing it was not productive to debate whether Lean or Six Sigma was more applicable to solve specific issues, while focusing instead on how to combine them best to address the problem at hand. Lean Six Sigma uses tools from both toolboxes, in order to get the best of the two methodologies, increasing speed while also increasing accuracy: accordingly, literature findings from either Lean or Six Sigma are applicable to Lean Six Sigma, as the Lean Six Sigma toolbox is essentially the sum of the Lean and Six Sigma respective toolboxes. Cases studies in the literature have identified a number of benefits for organisations to implement Lean Six Sigma (Vinodh et al., 2012; Chen & Lyu, 2009), with Albliwi et al. (2015) listing the following:

- Increased profits and financial savings
- Increased customer satisfaction
- Reduced cost
- Reduced cycle time
- Improved key performance metrics
- Reduced inventory
- Improved quality
- Increased production capacity

Timans et al. (2012) individuated the following critical success factors (CSFs) for Lean Six Sigma:

- Linking to customer
- Vision and plan statement
- Communication
- Management involvement and participation
- Personal Lean Six Sigma experience of Top Management
- Development of the project leader's soft skills and supply chain focus.

The concept of Lean Six Sigma as an integrated strategy is still in development in the literature, and many of the documented benefits and critical success factors mirror the ones from Lean literature and Six Sigma literature respectively. Since its early inception in 2000, a number of academics have developed integrated approaches (Thomas et al., 2008; Snee & Hoerl, 2007; Pepper & Spedding, 2010), while others have focused on a framework for successful integration of Lean and Six Sigma (Alsmadi & Kahn, 2010; Bendell, 2006; Salah et al., 2010; Hardeman & Goethals, 2011), to reap the benefits from both and apply the learning from each methodology. While Pepper (2007) individuated the need for a closer integration of Lean and Six Sigma, in order to drive a unified methodology forward, Snee (2010) focused on how Lean Six Sigma is a holistic improvement methodology addressing the flow of information and materials through processes as well as the enhancement of value-adding process-steps to create the product for the

customer (Timans et al., 2012). In Snee's view, this will naturally lead to making improvement a business process similar to any other important business process.

Overall, there is a noticeable increase in the popularity of Lean Six Sigma in the industrial world, particularly in larger organisations in Western Countries (USA, UK, the Netherlands) and some small and medium-sized manufacturing enterprises (SMEs) in developing countries such as India (Albliwi et al., 2015), even though the theoretical foundations are still developing (Pepper & Spedding, 2010).

2.5 Critical Success Factors (CSFs): Synthesis of Literature Research

The identification of CSFs goes back to the concept of success factors (Caralli, 2004) as a basis for determining the information needs for managers (Daniel, 1961). Rockart (1979) illustrated the concept of CSFs and examined how they can be used to determine the informational needs of managers. According to Rungasamy et al. (2002), CSFs are those factors essential to the success of any programme or technique in the sense that if the objectives associated with the factors are not achieved, the application of the technique may fail catastrophically. Oakland (2000) defined CSFs as: '*...a term used to mean the most important sub goals of a business or organization.....what must be accomplished for the mission to be achieved*'. CSFs include issues vital to an organisation's current activities and future success (Boynlon & Zmud, 1984).

In the vast Lean Six Sigma literature, we identified 31 sources discussing CSFs for its implementation (22 articles and nine books) from which the resulting list

of 19 CSFs is summarised in Table 2.2 (the notes underneath the table identified the authors and whether it came from Lean Or Six Sigma literature).

The majority of CSFs papers (27 out of 31) came from the Six Sigma literature: Antony & Banuelas (2002) analysed the key ingredients for the effective implementation of a Six Sigma programme in UK companies, with Coronado and Antony (2002) further refining them as:

- Management commitment and involvement.
- Understanding the Six Sigma methodology, tools, and techniques.
- Linking Six Sigma to business strategy.
- Linking Six Sigma to customers.
- Project selection, reviews, and tracking.
- Organisational infrastructure.
- Cultural change.
- Project management skills.
- Linking Six Sigma to suppliers.
- Training.

The importance of organisational infrastructure and culture was highlighted by Zu et al. (2010), while Pande et al. (2000) included leadership commitment as one of their CSFs. Johnson and Swisher (2003) identified the following CSFs:

- Sustained and visible management commitment.
- Continuing the education and training of managers and participants.
- Setting clear expectations and selecting project leaders carefully for leadership skills.
- Picking and selecting strategically important projects.

Kwak and Anbari (2006) summarised CSFs into four main areas: management involvement and organisational commitment; project selection, management, and control skills; encouraging and accepting cultural change; and continuous education and training. Similarly, Achanga et al. (2006) identified four CSFs for Lean: leadership and management, finance, skills and expertise, and organisational culture, while Kumar (2007) identified 13 CSFs for Six Sigma implementation in SMEs. The importance of organisational culture as a CSF for Six Sigma was identified by Erwin (2000), while Dale (2000) highlighted the importance of linking Six Sigma to the overall business strategy.

The need for a process management system, particularly for tracking and reviewing projects, was highlighted by Martens (2001), while Ingle and Roe (2001) went deeper into the subject, identifying the prioritisation of projects as a CSF for Six Sigma. Antony (2006) added other CSFs to the literature, including selecting team members, understanding tools, linking Six Sigma to customers and having accountability to the existing list of CSFs. Goldstein (2001) identified the following 13 CSFs for Six Sigma:

1. Deployment plan.

2. Active participation of senior executives.

3. Project reviews.

4. Technical support (Master Black Belts).

5. Full-time vs. part-time resources.

6. Training.

7. Communications.

8. Project selection.

9. Project tracking.

10. Incentive programme.

11. Safe environment.

12. Develop a supplier plan.

13. Customer “WOWS”.

Halliday (2001) focused on the training of employees as a CSF for Six Sigma, while Henderson and Evans (2000) identified the following CSFs for Six Sigma: management support, organisational infrastructure, training, tools, and linking Six Sigma to human resources-based actions (promotions, bonuses, etc.). In an appeal to statisticians, Hahn et al. (1999) identified leadership, training, and project involvement as CSFs for Six Sigma. Antony et al. (2007) identified 13 CSFs for Six Sigma:

- Management commitment and involvement.
- Company-wide commitment.
- Cultural change.
- Linking Six Sigma to business strategy.
- Integrating Six Sigma to the financial infrastructure.
- Organisational infrastructure.
- Training and education.
- Incentive programmes.
- Customer focus.
- Understanding the DMAIC methodology.
- Project management skills.
- Project prioritisation and selection.
- Project tracking and review.

CSF (R...)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Cultural Change				X	X				X		X	X		X	X		X		X						X	X		X		X	
Leadership Style										X	X										X									X	
Management Commitment	X		X	X					X		X	X	X	X	X	X	X	X	X						X		X	X	X	X	X
LSS Training		X		X			X		X		X		X	X	X	X			X		X		X	X	X		X	X	X		X
Organisation Infrastructure						X			X		X	X	X	X		X										X		X			
Communication	X											X																	X		
Linking LSS to Business Strategy			X	X		X						X	X	X	X		X											X			
Linking LSS to Customer												X		X	X		X											X			
Linking LSS to HR Rewards	X										X	X		X										X				X	X		
Extending LSS to Supply Chain			X									X		X														X	X		
LSS Projects Prioritisation				X				X	X		X	X	X	X	X	X				X	X				X			X	X		X
LSS Projects Tracking and Review													X	X			X		X	X	X	X							X		
Project Management Skills				X								X	X	X	X			X		X								X			
Tools and Techniques				X					X		X			X	X								X					X			
LSS Financial Accountability													X	X	X																
Data Based Approach									X														X								
Communication and Awareness																	X	X	X									X			
Selection of Staff for LSS																				X	X										X
Resources to LSS Team																							X	X			X			X	

Table 2.3: Summary of the CSFs from the Literature

Notes:

R1: Henderson & Evans (2000) – Six Sigma Literature

R2: Halliday (2001) – Six Sigma Literature

R3: Pande et al. (2000) – Six Sigma Literature

R4: Eckes (2000) – Six Sigma Literature

R5: Erwin (2000) – Lean Literature

R6: Dale (2000) – Lean Literature

R7: Hendricks & Kelbaugh (1998) – Six Sigma Literature

R8: Ingle & Roe (2001) – Six Sigma Literature

R9: Harry & Schroeder (2000) – Six Sigma Literature

R10: Pande (2007) – Six Sigma Literature

R11: Snee & Hoerl (2002) – Six Sigma Literature

R12: Coronado & Antony (2002) – Six Sigma Literature

R13: Antony et al. (2007) – Six Sigma Literature

R14: Antony & Banuelas (2002) – Six Sigma Literature

R15: Antony (2006) – Six Sigma Literature

R16: Breyfogle et al. (2001) – Six Sigma Literature

R17: Burton & Sams (2005) – Six Sigma Literature

R18: Hayes (2002) – Six Sigma Literature

R19: Sivakumar & Muthusamy (2011) – Six Sigma Literature

R20: Revere et al. (2006) – Six Sigma Literature

R21: Hahn et al. (1999) – Six Sigma Literature

R22: Martens (2001) – Six Sigma Literature

R23: Keller (2001) – Six Sigma Literature

R24: Brue (2002) – Six Sigma Literature

R25: Kwak & Anbari (2006) – Six Sigma Literature

R26: Zu et al. (2010) – Lean Literature

R27: Kumar (2007) – Six Sigma Literature

R28: Brun (2011) – Six Sigma Literature

R29: Goldstein (2001) – Six Sigma Literature

R30: Achanga et al. (2006) **-** Lean Literature

R31: Johnson & Swisher (2003) – Six Sigma Literature

As we can see in Table 2.3, the four CSFs more mentioned in the literature were Management Commitment (19 papers mentioned it), LSS Training (18 papers mentioned it), LSS Projects Prioritization (15 papers mentioned it) and Cultural Change (13 papers mentioned it), highlighting the importance of both the technical aspect (training and projects prioritization) and the cultural aspect (management

commitment and cultural change). Both aspects cannot succeed in isolation, but reinforce and support each other to sustain the Lean Six Sigma deployment in an organization.

2.6 Leadership and Lean Six Sigma

Leadership research has primarily been concerned with two major questions: what personality factors determine whether a particular individual will become a leader, and what personality traits or attributes determine whether a leader will become effective (Fiedler, 1964). Particularly the second question has seen research developing since the 1950s, with the proposing of different sets of attributes, forming the different leadership styles that we have covered extensively in section 2.3.

While the specific leadership traits more conducive to a successful deployment of Lean Six Sigma haven't been specifically individuated, Witt and Baker (2018) examined the impact of personal traits on Six Sigma projects: although the influence of the personalities of team members on the success of team projects has been discussed before, their work go deeper in relation to the impact on Six Sigma projects specifically, highlighting the importance of soft skills training, developing of a greater internal locus of control and diversity of backgrounds within a project team.

The success of Lean, Six Sigma and Lean Six Sigma has been attributed, among other critical factors outlined in section 2.5, to the Top Management of organizations (Swain et al., 2018): Schroeder et al. (2008) suggested that leadership involvement through the use of improvement specialists and the strategic selection of projects, together with a combined structured methodology, can lead to improved

performances. Similarly, Deming and other quality practitioners indicated visionary leadership as a key requirement for a successful quality management program (Anderson et al, 1995). Others have suggested transformation or transactional leadership as the more conducive to a successful implementation of a continuous improvement program (Dean & Bowen, 1994): although originally, the transformation and transactional leadership style were considered to be on the opposite side of the spectrum, Burns (1978) put forward the idea that a leader can be either or neither transformation, transactional or both. Overall, tough, there isn't a consensus on what Leadership style is more positively correlated with Lean Six Sigma deployment success: Swain et al. (2018) showed the behavioural integrity of a leader, defined by Simons (2002) as "the perceived pattern of alignment between an actor's words and deed" is positively related to Six Sigma success in organizations, with the extent to which followers report trust in leadership and respond to leaders' actions affecting the change efforts of the organization (Simon, 2008), but it doesn't cover other leadership traits.

Constancy of purpose was identified by Deming (1986)as one of the most significant criteria for the success of a quality improvement initiative: in the case of Lean Six Sigma, constancy means a continuous improvement effort towards achieving process improvement by maintaining employee engagement throughout the process.

Employee motivation is mentioned by Waldman et al. (1998) as at risk of decline over time, in the absence of a devoted leadership effort towards continuous improvement: in the case of Lean Six Sigma, persistent support from top leadership

is considered a critical success factor to keep employees motivated and engaged in the program.

In most cases, Leadership theory in the Lean Six Sigma literature has focused on leaders and their immediate followers in the respective project teams, taking what can be considered a micro level approach: in this research, we are taking instead a more macro level view, studying organizational leadership emanating from the top of an organization, influencing the overall company, rather than just a specific project team.

Most of the past research in Lean Six Sigma has focused on examining operational practices, techniques, and the associated success factors: although Leadership style has been identified as a critical success factor, as discussed in session 2.5, no Leadership style from the literature was specifically identified as being more conducive to Lean Six Sigma implementation success (Nogueira et al. 2018).

This research takes a step forward by determining the Leadership traits more conducive to a successful Lean Six Sigma deployment (RQ1), and how different organizations leverage Leadership style for deployment (RQ2).

2.7 Gaps in the current literature and agenda for future research

The following gaps have been identified in the current literature:

- *Lack of definition of organizational Leadership traits required to successfully deploy Lean Six Sigma*

Lean Six Sigma implementation can be considered as any other major change initiative: as a change, it is not an one-off project, but rather a continuous process with impact on both processes and people in an organization. One of the major challenges of Lean Six Sigma implementation is guiding the change journey: this guidance is the responsibility of the top management and leadership within an organization. Snee (2010) pointed out how Lean Six Sigma is an effective leadership development tool: 'leaders enable an organization to move from one paradigm to another; from one way of working to another way of working.

Lean Six Sigma provides the concepts, methods and tools for changing processes'. Leadership expert Kotter (1996, 2008) emphasised how the continuous improvement journey needs to begin with a sense of urgency and Snee (2010) identified leadership as a much needed requirement for successful Lean Six Sigma deployment being critical for sustained improvement.

Although the importance of management commitment is well established in the literature, there is no consensus on what leadership traits are more conducive to success. Only a few studies address the role of Leadership in Lean Six Sigma implementation: Gelei et al. (2015) studied the attributes of leaders in Lean Management, Tortorella et al. (2018) analyzed specific contextual factors such as the age of the leader, while Nogueira et al. (2018) studied the relationship between Leadership style and the success of a Lean management implementation. No author identified one existing Leadership style from the literature as being more conducive to Lean Six Sigma implementation success.

This research intends to bring research forward, investigating the leadership traits an organizational Leader should display to support Lean Six Sigma deployment

in the organization: this will be the subject of investigation for RQ1. Answers to this question will also have practical implications, helping organizations, and their leaders, embarking on a Lean Six Sigma deployment's journey.

- *Leadership styles across different industries sectors*

Although originated in the manufacturing industry, Lean Six Sigma has gained significant attention in the service sector since the early 2000s (George, 2003), with service organizations, such as financial companies, health-care providers, retail and hospitality organizations, applying Lean Six Sigma to their own reality.

The service industry has its own special characteristics (Kotler, 1997; Regan 1963; Zeithmal, Parasur and Berry 1985), that differentiate it from the manufacturing industry: however, these are often not taken into account when deploying Lean Six Sigma with its standard approach across industries.

In this research, we want to investigate whether different type of organizations, operating in different industries, rely differently on Leadership for an effective deployment of Lean Six Sigma.

This will be the subject of investigation for RQ2. Answers to this question will allow organization to tailor their Leadership approach to Lean Six Sigma deployment, to take into account the context they operate in.

2.8 Summary

This chapter presented a systematic literature review of Leadership, Lean Six Sigma, its Critical Success Factors, and Leadership and Lean Six Sigma. It also

outlined the gap in knowledge identified in the literature and how this research questions aim to fill them.

The next two chapters will cover the research process and methodology.

Chapter 3

Research Process and Research Paradigms

3.0 Introduction

This chapter aims to define the philosophical position of this research: the quality of management research can be impacted by not thinking through the philosophical issues associated with it (Easterby-Smith et al., 2002) and all approaches to social sciences are based on interrelated sets of assumptions regarding ontology, human nature, and epistemology (Burrell & Morgan, 1979). Hence it is important to make the correct choice of research paradigm based on the rationalisation of the research needs.

3.1 The Research Process

Research is a process, with a series of steps taking place, either simultaneously or in sequence, to transform the initial input, the research topic, into the final output of the conclusions (Ghauri & Grønhaug, 2002):

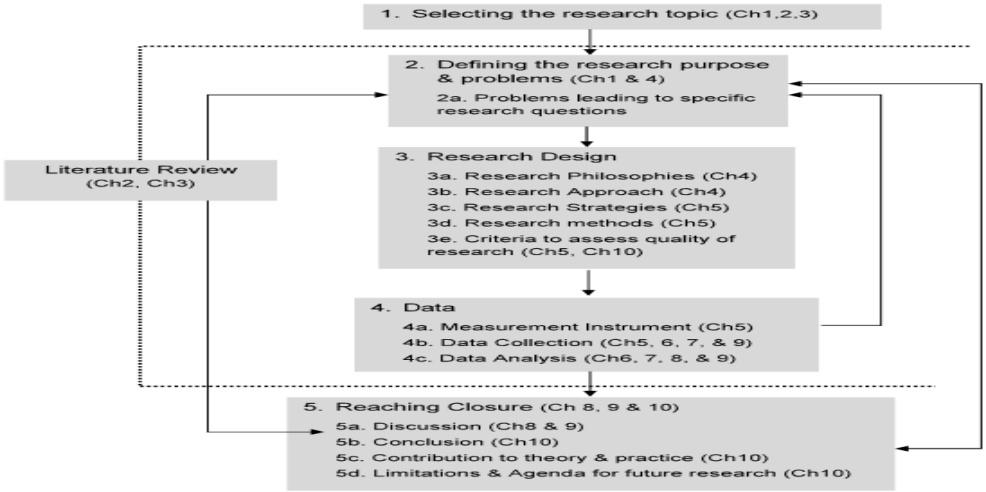

Figure 3.1 The Research Process [Adapted from Ghauri & Grønhaug, 2002]

In this sense, the research process can be considered as similar to problem solving, facilitating the construction of a new theory or testing an existing one.

3.2 Research Purpose and Questions

The starting point of any research is to understand the nature of the research problem, leading to the choice of appropriate research methodology (Rowlands, 2005). It is important to have a clear statement of purpose for the research (Yin, 2003):

- to discover (descriptive research) – focusing on ‘what, who, where’ types of questions;
- to develop (explanatory research) – focusing on ‘how, why’ types of questions;
- to understand (exploratory research) – focusing on ‘what’ type of questions.

While descriptive research focuses on describing traits of the persons, events or situations being studied, explanatory research tries to explain a certain event, through the study of the causal relationships among variables, and exploratory research focuses on adding new insights assessing the event from a different point of view (Shields & Rangarjan, 2003). Depending on the type of research being conducted, the researcher can define the questions as per the general guidelines (Marshall & Rossman, 1999) illustrated in Table 3.1:

Purpose of the Study	General Research Questions
Descriptive	
To document and describe the phenomenon of interest	What are the salient actions, events, beliefs, attitudes and social structures and processes occurring in this phenomenon?
Exploratory	
To investigate little understood phenomena	What is happening in this social programme?
To identify or discover important categories of meaning	What are the salient themes, patterns, or categories of meaning for participants?
To generate a hypothesis for further research	How are these patterns linked with one other?
Explanatory	
To explain the patterns related to the phenomenon in question	What events, beliefs, attitudes, or policies shape this phenomenon?
To identify plausible relationships shaping the phenomenon	How do these forces interact to result in the phenomenon?

Table 3.1 Research Questions and Purpose [Adapted from Marshall & Rossman, 1999]

The purpose of this study was to assess the impact of leadership on the deployment of Lean Six Sigma in organisations. While Lean Six Sigma has established itself as one of the most effective business process improvement strategies, it is failing to achieve promised results in some organisations (Chakravorty, 2009), and the question remains on what factors are more conducive to success.

The research was conducted in two stages:

- Stage 1: exploratory research was undertaken, through a quantitative survey, to identify the salient themes around the deployment of Lean Six Sigma. This was conducted first to identify the factors affecting the deployment of Lean Six Sigma in organisations. This part of the research focused mostly on '*what*' type of questions.
- Stage 2: explanatory research was then undertaken, through semi-structure interviews, to identify how the themes, outlined in Stage 1, interact and shape the deployment of Lean Six Sigma, identifying relationships between leadership styles and success of Lean Six Sigma deployment. This part of the research focused mostly on '*how'* and '*why*' types of questions.

The output from these two stages was then used to build a leadership model for Lean Six Sigma. The RQs, already discussed in Chapter 1, were framed based on the literature review (discussed in Chapter 2) on leadership and Lean Six Sigma:

RQ 1: What leadership traits are more conducive for successful deployment of Lean Six Sigma?

RQ 2: To what extent do different types of organizations rely on Leadership for a successful Lean Six Sigma deployment?

The answers to these questions were mapped with the findings from the literature review to construct a leadership model for Lean Six Sigma. The next

section discusses the different research philosophies and approaches applicable to management studies.

3.3 Research Paradigms

A paradigm is a distinct concept or thought pattern, whose term has been used quite loosely in academic research. Some of the definitions used are (Kumar, 2010):

- a basic set of beliefs about the world (Denzin & Lincoln, 2000);
- a set of methods that all exhibit the same pattern or element in common (Meredith et al., 1989);
- progress of scientific practice based on people's philosophies and assumptions about the world and the nature of knowledge (Collis & Hussey, 2003);
- a set of linked assumptions, rules, and perceptions about the world which is shared by a community of scientists investigating the world (Deshpande, 1983: 101; Gummesson, 2000).

The research paradigm constitutes the philosophical scaffolding of the research (Crotty, 1998):

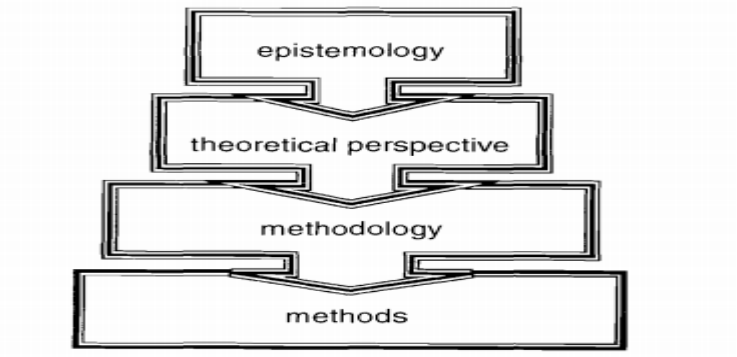

Figure 3.2 Research Paradigm

To illustrate the research paradigm, the author was faced with four questions:

- What *methods* does the author propose using?
- What *methodology* governs the choice of methods?
- What *theoretical perspective* lies behind the methodology in question?
- What *epistemology* informs the theoretical perspective?

Each item was defined as follows (Crotty, 1998):

- *Methods*: the techniques or procedures used to gather and analyse data related to some RQ or hypothesis;
- *Methodology*: the strategy, plan of action, process or design behind the choice and use of particular methods and linking the choice and use of methods to the desired outcomes;
- *Theoretical perspective*: the philosophical stance informing the methodology and thus providing a context for the process and grounding its logic and criteria;
- *Epistemology*: the theory of knowledge embedded in the theoretical perspective and thereby in the methodology.

Clarity about these four elements helps ensure the soundness of the research and makes its outcome more convincing, justifying the methodologies and methods employed, through the theoretical assumptions that underpin the research.

3.3.1 Research Methods

Two separate techniques were employed in the research:

- *Quantitative data* (Chapter 5): a survey was administered electronically, with the intent to determine the CSFs for Lean Six Sigma deployment. A link to the survey, with an accompanying letter, was emailed to Lean Six Sigma experts across multiple geographical regions and industrial sectors. The last question of the survey was whether the respondent was willing to take part in a follow-up interview.
- *Qualitative data* (Chapter 6): 21 people participated a semi-structured telephone interview, with the intent of elaborating on the impact of leadership on Lean Six Sigma deployment.

3.3.2 Research Methodology

The research methodology adopted will be discussed in more detail in Chapter 4, where the choice of a mixed-methods approach using survey and interviews for this research are elaborated. Here the author discusses the choice between inductive and deductive approach.

How to relate theory and reality is a central problem in research. There are two alternative ways of working through which theory can be tested: in an inductive approach, based on empirical evidence we come to a conclusion or propose a theory. On the other hand, the deductive approach uses an existing theory to test a hypothesis under different contexts / scenarios (Ghauri & Grønhaug, 2002; Saunders et al., 2003; Easterby-Smith et al., 2002; Denzin & Lincoln, 2000).

The purpose of any research is to either build a theory to test or to test an existing theory. In theory construction, the research process begins with observations / data collection, as shown in Figure 3.3, and uses inductive / qualitative reasoning to derive a theory from these observations. The focus here is to question whether the observation is a particular case of a more general factor or the observation fits into a pattern or a story (de Vaus, 2005:6). On the contrary, theory is a starting point in the theory testing approach to guide which observations to make, from the general to the particular (de Vaus, 2005:6). Deductive reasoning is used to derive a set of hypotheses, which are tested against data collected through a particular method to prove or disprove the hypotheses, thus accepting or rejecting / modifying the existing theory (de Vaus, 2005:6).

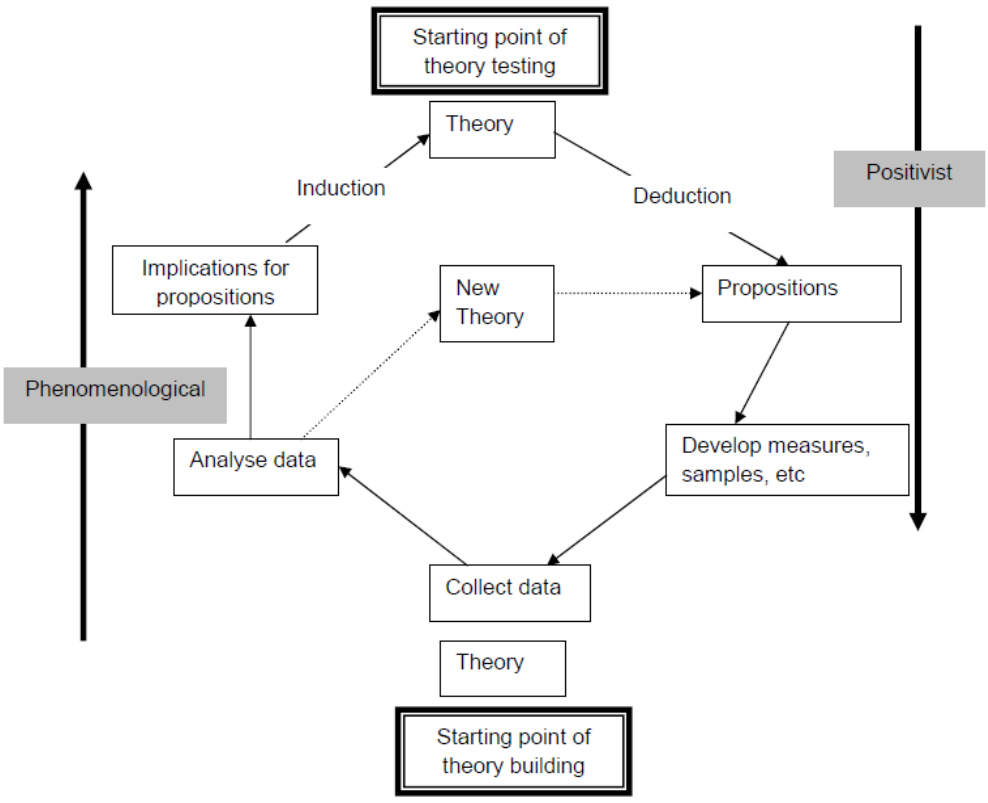

Figure 3.3 The Logic of the Research Process (Kumar, 2010; de Vaus, 2005: 8)

No single approach is better than the other, but the question is which one is more suitable for the research in question. As illustrated in Figure 3.3, the deductive approach, that starts with a hypothesis to be tested through data, is best suited for research within the positivist paradigm, while the inductive approach, that starts with observations to derive a theory from, is more suited for research based within the phenomenological paradigm (de Vaus, 2005: 6).

A mixed approach was followed in this research, with the alternate use of inductive and deductive approaches at different stages of the research. Combining the two approaches is widely practiced (Yin, 2003; Easterby-Smith et al., 2002) as it allows for mitigating the limitations of each approach, and can overcome the potential bias and sterility of a single method approach, through the use of triangulation (i.e. the use of different research approaches, methods and techniques) (Collis & Hussey, 2003).

In reality research rarely falls neatly into only one philosophical domain. In this particular research, the author adopted a triangulation of phenomenological and positivist paradigm, where both hard and soft data were collected to realise the research aim. In the first phase of the study, where a survey was conducted, the epistemological stance was positivist, while in the second phase, the semi-structured interviews, the stance was that of the phenomenological paradigm. The author in the positivist paradigm assumed the role of an objective analyst, making detached interpretations and conducting tests about data collected in an apparently value-free (axiology) manner (Saunders et al., 2003). In the second phase, instead, the author adopted a phenomenological perspective, taking into account the more sensitive

aspects of research which includes value-laden (axiology) and rich data (interviews, etc.) (Easterby-Smith et al., 2002).

A triangulation approach of inductive and deductive research was undertaken from the methodological perspective. In the first phase of the study, a survey instrument was designed based on the existing literature/theory. The purpose of this phase was to identify CSFs for Lean Six Sigma and this phase falls under the category of deductive research. The second phase consisted of interviews with some of the survey respondents to understand the impact of leadership on Lean Six Sigma deployment: this phase falls under the category of inductive research.

3.3.3 Theoretical Perspective

This part of the research paradigm refers to the philosophical stance that lies behind our chosen methodology. For the purpose of this research, the author focused on two main research paradigms: positivist and phenomenological. These two paradigms may be considered as the two extremes of a continuum. As one moves along the continuum, the characteristics and assumptions of one dimension are gradually relaxed and replaced by those of the other paradigms (Collis & Hussey, 2003).

According to the *positivist paradigm*, the social world is independent and exists externally regardless of whether the researcher is aware of it and its properties are measured through objective methods (Easterby-Smith et al., 2002; Meredith et al., 1989; Collis & Hussey, 2003), where the researcher's personality, political views and religious beliefs do not interfere with the research results. The understanding that researchers should always be objective in their work comes from this positivistic

paradigm. Thus, logical reasoning is applied to investigate the research problem under this paradigm, with a focus on precision, objectivity, and rigour to replace hunches, experience, and intuition (Kumar, 2010).

According to the *phenomenological paradigm*, social scientists deal with action and behaviour which are generated from within the human mind (Collis & Hussey, 2003; Eisenhardt, 1989; Yin, 2003), and the understanding of human behaviour is only possible from the researcher's own frame of reference (Collis & Hussey, 2003). For the proponents of this paradigm, there is not just one objective reality, but as many realities as there are individual interpretations (Lopez, 2005). Table 3.2 summarises the main assumptions for the positivist and phenomenological paradigms (Kumar, 2010).

Assumption	**Question**	**Positivist**	**Phenomenological**
Ontological	What is the nature of reality (truth)?	Reality is external and objective. Reality is singular, apart from the researcher.	Reality is socially constructed and subjective. Reality is multiple as seen by observers in a study.
Epistemological	What is the relationship of the observer to the observed?	Observer is independent from that being observed.	Observer is part of what is observed.
Axiological	What is the role of values?	Value-free and unbiased.	Value-laden and biased.

Methodological	What is the process of research?	Deductive process Static design Context-free Generalizations leading to prediction, explanation and understanding	Inductive process Emerging design Context-bound Patterns, theories developed for understanding

Table 3.2 Assumptions of the Positivists and Phenomenological Paradigms

3.3.4 Epistemology

While the theoretical perspective introduced in the previous paragraph described a way of looking at the world and making sense of it (*how we know what we know*), epistemology deals with 'the nature of knowledge, its possibility, scope and general basis' (Hamlyn, 1995). There are three main epistemological stances (Crotty, 1998):

- Objectivism: holds that reality exists apart from the operation of any consciousness (e.g., a tree in the forest is a tree, regardless of whether anyone is aware of its existence);
- Constructionism: holds that no objective truth exists waiting for us to discover it. Truth comes into existence in and out of our engagement with the realities in our world;
- Subjectivism: meaning does not come out of an interplay between subject and object, but is imposed on the object by the subject (differently from

constructionism, the object does not contribute to the generation of the meaning).

As described above, the author has followed a mix of objectivist and constructionist epistemological stances: in the first phase, where a survey was conducted, the epistemological stance was positivist, while in the second phase, where interviews were conducted, the epistemological stance was constructionist, where the people interviewed actively contributed to building the reality they described.

3.4 Implications of Research Philosophy and Approach on this study

The practical reality of research is that it rarely falls into only one philosophical domain, as discussed in the preceding paragraphs of this chapter: this particular research is no different, in the sense it doesn't fall on either side of the philosophical continuum.

From the ontological perspective, the exploratory research undertaken in the two phases (using survey and semi-structured interviews) clearly follows objective ontology. In the second phase of research, while undertaking the interviews, the researcher was an independent observer and was seeking explanations for the Lean Six Sigma leadership practices in the interviewed companies. The researcher was in no way trying to influence the result of the study and remained as an independent observer throughout the research process.

From the epistemological perspective, a triangulation of objectivist and constructionist epistemological stance was used: from a positivist stance in the first phase, where a survey was conducted, to a constructionist stance in the second phase, where the people interviewed actively contributed to building the reality they described. In the first stance, the researcher assumed the role of an objective analyst, making detached interpretations and conducting statistical tests about the data collected in an apparently value-free manner. In the second phase, knowledge and reality are socially created and given meaning from the respondents in the interviews, that shaped their view of the world.

3.5 Summary

This chapter discussed the research from a process perspective by breaking it down into a list of steps/activities. It also illustrated the nature of the RQs which facilitated in identifying the nature of the research (descriptive, explanatory, exploratory), the philosophical stance (positivist vs. phenomenology) of the researcher, and the methodology (inductive vs. deductive) used for the research. The next chapter discusses the research strategies and data collection methods.

Chapter 4

Research Design and Methodology

4.0 Introduction

The objective of this chapter is to introduce the concept of research design, its relationship with the research philosophy and paradigms described in the previous chapter, followed by detailing the particular choice of design and methods for this research. This was influenced by the selection of RQs and philosophical paradigms from the previous chapter.

4.1 What is Research Design?

Although the importance of research design in planning the research is unanimously accepted, many different definitions of research design can be found in the literature, and in many cases the term research design is used interchangeably with research method. However, there is a certain degree of difference between the two and a comprehensive definition of research design was given by Philliber et al. (1980):

'Research design is a blueprint of research dealing with at least four problems: what questions to study; what data are relevant; what data to collect; and how to analyze the results'.

This definition connects the research design with the data collection, measurement and analysis phase: while research design refers to the overall logical structure of the

research, research methods refer to the mode of data collection, hence being a subset of the overall design, as shown in Figure 4.1.

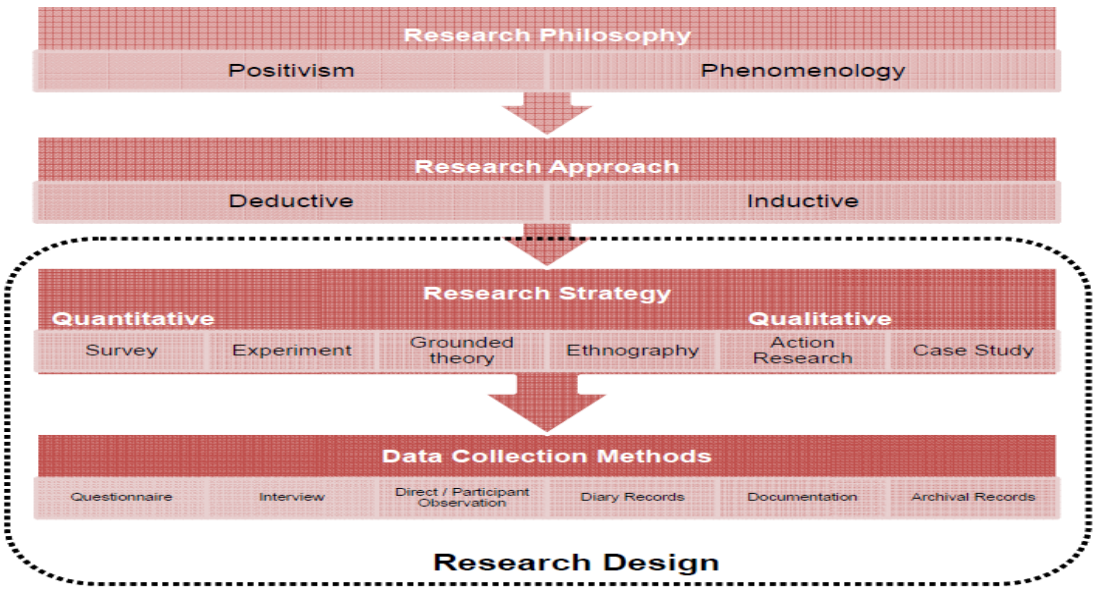

Figure 4.1 Research Design (Kumar, 2010)

The next sections of this chapter will cover the two chosen parts of this research strategy, as outlined in the dotted circle of Figure 4.1: quantitative vs. qualitative research and data collection methods.

4.2 Research Strategies

4.2.1 Quantitative vs. Qualitative Methods

The differences between quantitative and qualitative methods are summarised in Table 4.1 (Kumar, 2010): in quantitative research, the underlying assumption is that research designs should be based on an objective view of the world and follow the positivism paradigm (Easterby-Smith et al., 2002). In contrast, qualitative research is based on the phenomenological paradigm, with a subjectivist ontological position.

Qualitative	Process of Research	Quantitative
Understand & interpret	***Focus of Research***	Describe, explain and predict
Inductive; generation of theory	***Principal Theoretical Orientation***	Deductive; testing of theory
Phenomenological	***Epistemological Orientation***	Positivism
Subjectivity (Constructionism)	***Ontological Orientation***	Objectivism
Minor role; justify problem	***Literature Used***	Major role to justify problem; identify questions and hypothesis
Understanding the interrelationship of different variables	***Purpose of Inquiry***	Explanation and control
High – researcher is participant & catalyst	***Researcher Involvement***	Limited – controlled to prevent bias
Non-probability; purposive	***Sample Design***	Probability
Small	***Sample Size***	Large
Verbal or pictorial description; non-numerical data	***Data Type***	Mainly numerical data
Descriptive analysis by interpretation of data	***Data Analysis***	Statistical techniques
Rely on the participants, the researcher, or the reader	***Data Validation***	Rely on external standards such judges, past research, statistics
Knowledge Constructed	***Output***	Knowledge discovered
Analytical	***Generalization***	Statistical
Patterns of unanticipated as well as expected relationship	***Research question seeks***	A relationship between a small number of variables

Table 4.1: Critical Differences between Qualitative and Quantitative Research Strategies (Kumar, 2010)

4.2.1.1 Mixed-Methods Research

In this research, as explained in the previous chapter, the author has adopted a mixed-methods approach, with the use of a quantitative survey and qualitative interviews: these two methods will be described in the following paragraphs. The careful use of a mixed-approach can help in combining the advantages of both quantitative and qualitative methods, minimising the limits of each. It can also enhance the generalizability of the research findings (Teddlie & Tashakkori, 2009; Creswall & Clark, 2007).

Hammersley (1996) in Bryman and Bell (2007) proposed three approaches to mixed methods research:

1. Triangulation – where the qualitative research is used to support quantitative research findings or vice versa;

2. Facilitation – refers to the use of one research strategy to aid research using the other research strategy;

3. Complementarity – refers to the use of two different research strategies to dovetail the different aspects of an investigation.

In this research, the qualitative research strategy (interviews) was used to triangulate and facilitate the quantitative research (survey). The author collected data in the first phase using a survey instrument and followed up with interviews in the second phase to conduct an in-depth investigation into the phenomenon of interest. Figure 4.2 is a visual representation of the research design used by the author, as suggested by Creswell and Clark (2007), and adapted from Kumar (2010).

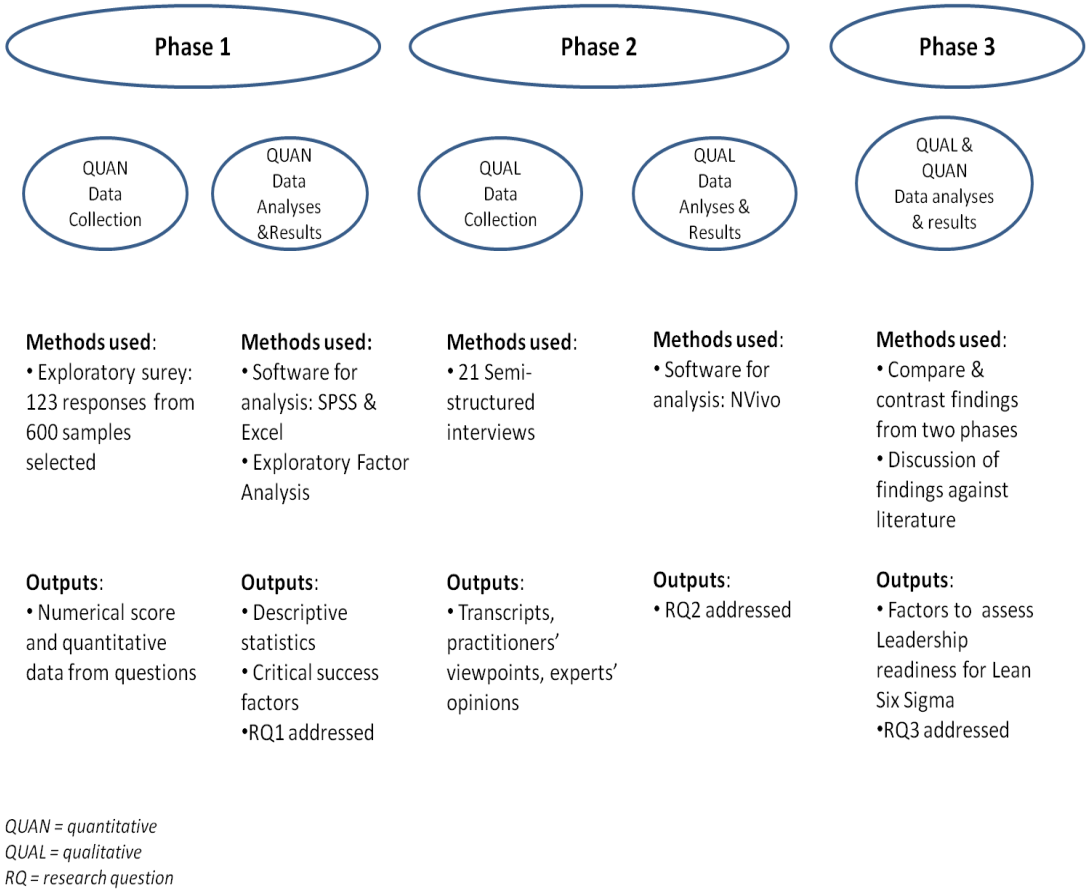

Figure 4.2 Visual Representation of the Research Design

4.2.2 Survey

Survey research has been the most commonly used research in the past three decades (Meredith et al., 1989; Kumar, 2010, Malhotra & Grover, 1998; Flynn et al., 1990; Meredith, 1998; Voss, 1995; Forza, 2002, Rungtusanatham et al., 2003; Boyer & Swink, 2008) and has become the dominant form of data collection in the social sciences, providing for efficient data collection over broad populations, administered in person, by telephone or over the internet (Easterby-Smith et al., 2002). Surveys have been used in research within the areas of Total Quality Management (Ghobadian & Gallear, 1996; Yusof & Aspinwall, 1999), Lean (Achanga et al., 2006; Yusuf & Adeleye, 2002), Six Sigma (Antony & Banuelas, 2002; Antony et al., 2005,

2008) and Quality Management (Black & Porter, 1996; Badri et al., 1995; Flynn et al., 1994). Bryman (1988: 104) defined survey research as: '*Survey research entails the collection of data on a number of units and usually at a single juncture in time, with a view to collecting systematically a body of quantifiable data in respect of a number of variables which are then examined to discern patterns of association*'.

4.2.2.1 Survey Types

There are three types of surveys that have been used to either generate, test or extend a theory (Kerlinger, 1986; Malhotra & Grover, 1998; Forza, 2002):

- Exploratory Survey: the objective is to become more familiar by gaining preliminary insight into the phenomenon of interest and provide the basis for a more in-depth survey. It does not propose any models or hypotheses, but the data collected may be used to identify new dimensions of interest or uncover association among concepts (Malhotra & Grover, 1998; Forza, 2002).
- Descriptive Survey: the objective is to describe the distribution of the phenomenon of interest in a population, thereby establishing facts. Hypotheses are formulated and tested, helping to build and refine theories (Malhotra & Grover, 1998; Forza, 2002).
- Explanatory Survey: the objective is to explain the causal relationship between variables, testing the adequacy of pre-defined hypothesis or models (Malhotra & Grover, 1998; Forza, 2002).

Table 4.2 (Forza, 2002) illustrates the critical differences between the three types of survey research.

Survey Type Element / Dimensions	Exploratory	Descriptive	Explanatory
Unit (s) of analysis	Clearly defined	Clearly defined and appropriate for the research questions/ hypotheses	Clearly defined and appropriate for the research questions/ hypotheses
Respondents	Representative of the unit of analysis	Representative of the unit of analysis	Representative of the unit of analysis
Research Hypothesis	Not necessary	Questions clearly stated	Hypotheses clearly stated and theoretically motivated
Representativeness of Sample Frame	Approximation	Explicit and logical argument to choose among alternatives	Explicit and logical argument to choose among alternatives
Representativeness of the Sample	Not a criterion	Systematic, purposive, random selection	Systematic, purposive, random selection
Sample Size	Sufficient to include the range of interest in the phenomena	Sufficient to include the range of interest in the phenomena	Sufficient to test categories in the theoretical framework with statistical power
Pre-test of Questionnaires	With sub-sample of the sample	With sub-sample of the sample	With sub-sample of the sample
Response Rate	No minimum	Greater than 50% of targeted population and study of bias	Greater than 50% of targeted population and study of bias
Data Triangulation	Multiple methods	Not necessary	Multiple methods

Table 4.2 Critical Differences in the Three Types of Survey Research

In this study, the author used an exploratory survey to assess the CSFs for Lean Six Sigma implementation in the first phase of the research. At this stage the author did not have a theory to test, but the objective was to gain more insights into what factors are critical for Lean Six Sigma implementation, providing the basis for the second part of the research, hence the exploratory type of survey is most suitable. More details and specifics on the survey used can be found in Chapter 5.

4.2.3 Interviews

The interview is a well-established qualitative research method (Crabtree & Miller, 1999). Different interview strategies have emerged from diverse disciplinary perspectives, resulting in wide variation among interviewing approaches: from the highly structured interviews of epidemiology and health services research, to the less structured approach of social sciences.

The purpose of conducting interviews in social sciences is to contribute to a body of knowledge that is conceptual and theoretical and is based on the meanings that life experiences hold for the interviewees (Di Cicco-Bloom & Crabtree, 2006). It is a powerful method to gain insights into issues by understanding the experience of the individuals whose lives reflect those issues (Seidman, 2005).

4.2.3.1 Semi-Structured Interviews

Qualitative interviews have been categorised in different ways, with the most recent research differentiating them as unstructured, semi-structured and structured (Crabtree & Miller, 1999). This differentiation combines strategies that historically emerged from very different disciplines. For example, in ethnography mostly unstructured interviews are being used, while in epidemiology mostly structured interviews are used. Semi-structured interviews are the most widely used interviewing format for qualitative research (Di Cicco-Bloom & Crabtree, 2006). They are usually organised around a set of predetermined open ended questions, with other questions emerging from the dialogue between interviewer and interviewee.

Semi-structured interviews were chosen for the following reasons:

- It provides the opportunity to generate rich data: some degree of comparison is possible, depending on how structured the questions are, and this facilitates content analysis.
- Language used by participants was considered an important factor in gaining insight into their perceptions and values of leadership and Lean Six Sigma.
- Contextual and relational aspects (e.g., industry sector, size of company) were seen as significant to understanding others' perceptions.
- Data generated can be analysed in both the qualitative and quantitative dimensions to develop rich insights on the subject discussed.

4.3 Implications of Research Methods on this study

A triangulation approach of inductive and deductive research was undertaken from the methodological perspective. In the first phase of the study, a survey instrument was designed based on the existing literature/theory on Leadership and Lean Six Sigma SMEs: the purpose of this phase was to determine whether Leadership is a critical success factor for Lean Six Sigma. The second phase, based on inductive research, constituted of semi-structured interviews with respondents frm the initial surveys that agreed to the interview.

Table 4.3 below links the use of different strategies to answer the RQs.

Research Questions	Strategy	Data Collection Methods	Chapter
RQ1. What leadership traits are more conducive for successful deployment of Lean Six Sigma?	Interviews	Interview Protocol	Chapter 6
RQ2. To what extent do different types of organizations rely on Leadership for a successful Lean Six Sigma deployment?	Survey Interviews	Interview Protocol Questionnaire	Chapter 7

Table 4.3 Link between Research Questions and Research Strategy

4.4 Summary

Research design is critical: it not only governs the use of appropriate research strategy and data collection methods, but it also determines the types of conclusion that may be derived from research. This chapter illustrated the research strategy adopted from the author: data collection methods included survey questionnaire and semi-structured interviews.

This chapter provided the theoretical foundation for conducting the data analyses in Chapters 5, 6 and 7.

Chapter 5

Survey Data Analysis

5.0 Introduction

This chapter presents finding from the quantitative study conducted to assess the critical success factors for Lean Six Sigma deployment in organizations.

The study consisted of a structured survey questionnaire administered via email: descriptive statistics and exploratory factor analysis were performed and results are illustrated in this chapter. The findings from this phase of study were used as an input to the next phase of research when conducting semi-structured interviews.

5.1 Survey Methodology and Data Collection

This section explains the methodology adopted for this survey: understanding the research methodology most suited for the objectives of the study is a critical component for researchers. In management research, different methodologies are commonly used, and choosing the most appropriate one depends on the researcher's questions and objectives (Saunders et al., 2003).

Survey instrument

A questionnaire is a structured data collection technique whereby information about a person's perceptions, beliefs, feelings, motivations, anticipation, or future plans can be obtained (Antony et al., 2007). One of the advantages of this technique is that the respondents are asked exactly the same set of questions, thus enabling the statistical analysis of the results.

The survey used in this research comprised 18 questions divided among the following three parts (full list of survey's questions is in Appendix III):

- Background of respondent and organisation.
- Criteria for the successful implementation of Lean Six Sigma in the organisation.
- CSFs for Lean Six Sigma implementation.

The first part of the questionnaire collected information on the role of the respondent, the size, location and industry sector of the organisation, and about the extent of use of Lean Six Sigma in the organisation. The second part of the questionnaire investigated the success metrics used in the organisation to determine whether the Lean Six Sigma efforts were successful, and asked the respondent to self-evaluate the programme's success so far. Finally, in the last section of the questionnaire, each respondent was asked to rank the 19 CSFs outlined in the literature, or suggest new one(s) if they felt any were missing.

Type of questions

When designing a survey, the response format is a major consideration, as it will affect the type and wording of the questions and the type of analysis that can be conducted afterward (Fowler, 2002). For this research a close-ended format of questions was used, to allow for statistical analysis. In the last part of the questionnaire, the 19 CSFs from the literature were scored on a five-point Likert scale (1=Not Very Important; 2=Not Important; 3=Important; 4=Very Important; 5=Critical), and respondents were asked to rank each factor from 1 to 19 (1=most

important, 2=second most important, etc.) in order to identify the importance of these 19 CSFs.

A five-point Likert scale seems to be the most used in management and social research (Cooper & Schindler, 2006; Bryman & Bell, 2007), although Cooper and Schindler (2006) further suggested that no critical difference exists if a scale ranging from three to seven points was used. As per Hasson and Arnetz (2005): '*too many response categories may lead to difficulties in choosing and too few may not provide enough choice or sensitivity, forcing the respondent to choose an answer that does not represent the person's true intent*', the author decided to use the commonly used five-point scale. The Likert scale provides a more precise measurement than yes/no type of questions (Neuman, 2003) and the data collected were then analysed using Microsoft Excel 2007, for the general descriptive statistical data of responses, and SPSS 18.0 software, for the more advanced factor analysis.

Sampling method and procedure

The questionnaire was administered electronically to approximately 350 Lean Six Sigma professionals, from various industries and countries. The list of companies was obtained from the database of the Department of Design, Manufacturing, and Engineering Management of Strathclyde University, plus a network of the professional contacts of the research team. Each participant received an email, inviting them to answer the survey online, using Google Forms platform.

Electronic surveys are very common (Andrews et al., 2003), as they provide a way to conduct studies when it is impractical or financially unfeasible to access certain populations (Couper, 2000; Sheehan & Hoy, 1999; Weible & Wallace, 1998),

and they are very cost effective, as the costs per response decrease as sample size increases (Watt, 1999). Results from electronic surveys can be the same as postal survey content results, with the advantages of speedy distribution and response cycles (Slaughter et al., 1995; Taylor, 2000; Yun & Trumbo, 2000).

The response rate was 35%, with 124 responses received. Survey response rate has been the subject of many studies (Babbie, 1990; Dillman, 1978, 2000; Rea & Parker, 1992; Roth & BeVier, 1998) with a worrying declining trend in response rate, particularly as over-surveying is becoming more prevalent in the internet era. While survey response rate has been declining in studies over time, the recently suggested benchmark is approximately 35%-40% (Baruch & Holtom, 2008). Also, accordingly to the maximum likelihood estimation (MLE), in order for the sample to be effectual in factor analysis the number of respondents should be between 10 and 100 (Ding et al., 1995). The questionnaire was targeted to those organisations, irrespective of industry sector, that have already implemented either Lean or Six Sigma, or Lean Six Sigma.

5.2 Analysis of Survey Results

Demographics

The analysis of the first part of the questionnaire provided a better understanding and context of the key findings of the study.

Number of employees and position of respondents

The majority of respondents were either Master Black Belts (24%), Black Belts (23%), or Function Lead / Manager (15%), with mostly respondents from companies with more than 1,000 employees (68%) participating in the survey, as illustrated in Figures 5.1 and 5.2.

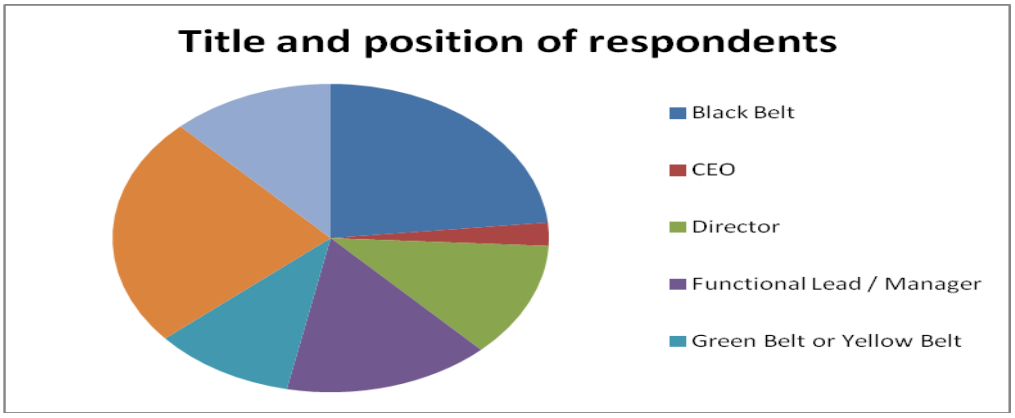

Figure 5.1 Title and Position of Survey Respondents

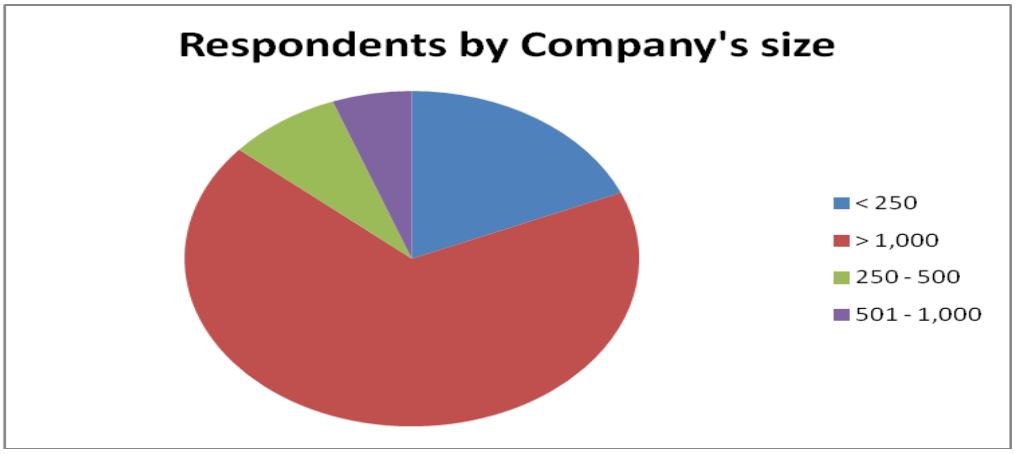

Figure 5.2 Distribution of Survey Respondents by Company Size

Areas of industry

Of the 20 areas of industry selected for this survey, Industrial Goods & Services, Financial Services, Automotive, and Computer & Services accounted for 38% of

total responses. Table 5.1 illustrates the distribution of respondents across the areas of industry:

Industry	Responses
Industrial Goods & Services	13
Financial Services	12
Automotive	11
Computers & Software	11
Energy & Environment	10
Electronics & Semiconductors	8
Health Care	8
Management	8
Pharmaceuticals & Biotechnology	7
Transportation & Logistics	7
Retail & Consumer Services	6
Telecommunications	5
Aerospace & Defence	3
Food & Beverage	3
Government & Trade	3
Chemicals	2
Human Resources	2
Internet & Online	2
Small Business	2
Real Estate & Construction	1
Total	**124**

Table 5.1 Survey Respondents by Industry Sector

Reasons for using Lean Six Sigma

Almost half (44%) of companies have implemented Lean Six Sigma for Cost Savings or Cost Avoidance (e.g., less waste, inventory levels). This was by far the most often mentioned reason for implementation, followed at a distance by Productivity Increases (12%) and Customer Satisfaction (11%). The full list of reasons is listed in Table 5.2.

Reasons for using Lean Six Sigma	Number of respondents	Percentage of respondents
Cost Savings or Cost avoidance (e.g. less waste,	55	44%
Productivity Increase	15	12%
Customers' satisfaction	14	11%
Profit / Bottom-line	11	9%
Reduce defects / Improve quality	7	6%
Cost of Poor Quality	6	5%
Leadership development / Culture change	6	5%
Operating Income/Sales	3	2%
DPMO / Process Capability	1	1%
Processing times	1	1%
Others	5	4%
Total	124	100%

Table 5.2 Survey Respondents by reason for using Lean Six Sigma

Status of Lean Six Sigma implementation

More than half of companies (54%) used Lean and Six Sigma together in tandem, 20% used Lean on its own, and only 9% used Six Sigma on its own. A third of respondents' companies applied Lean Six Sigma to all their business units, with half applying it to more than one business unit. When asked to indicate which business units in their organisation used Lean Six Sigma in any form, the more frequently mentioned business units were Operation / Production, Customer Service, Supply Chain, Logistics, and Finance. Figure 5.3 illustrates the number of mentions each business unit received:

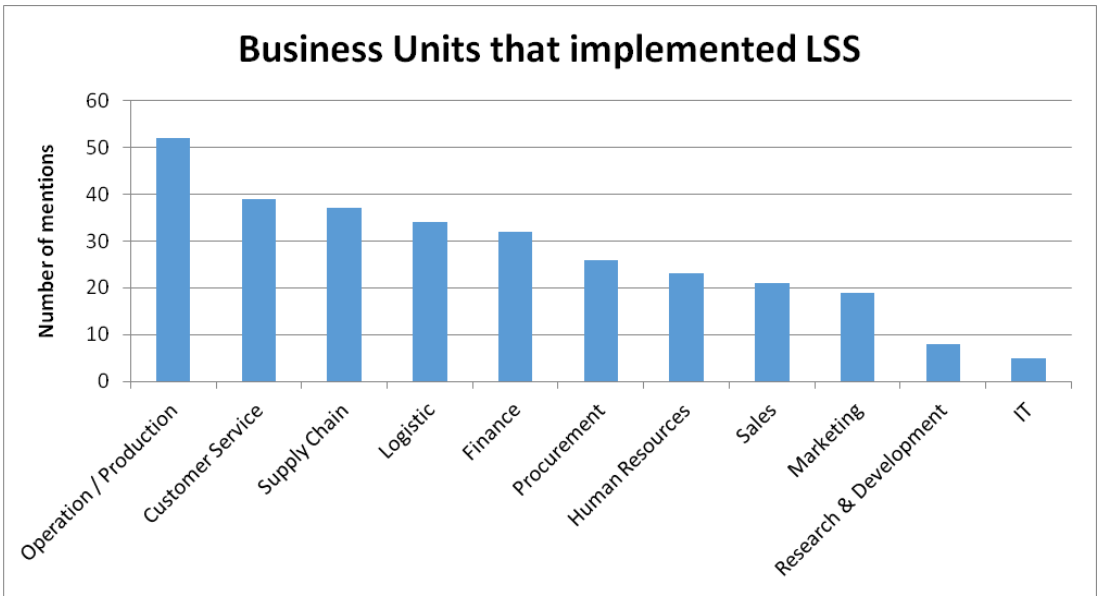

Figure 5.3: Business Units that Implemented Lean Six Sigma

Reliability Test

For a survey, like any other measurement instrument, we need to be concerned about the consistency of measurement. This concern should apply to all observations or measurements that we make, whether they be qualitative or quantitative (Brown, 1997). The results of a study can be no more reliable than the

instrument upon which they were based, hence it is critical to measure the consistency of the survey used in a study.

In order to measure the consistency of the survey, a reliability test is usually conducted. Reliability is a measurement of consistency of surveys, as it offers 'an indication of consistency between two measures of the same thing' (Black, 1999). The three most important factors affecting reliability are the length (or total number of questions), the quality of the questions and the fit to the group being measured (Brown, 1997).

Reliability tests usually fall into three categories (Brown, 1997):

- test-retest reliability, where the researcher administers a measure on two occasions and calculates the correlation between the two sets of scores as a reliability estimate.
- equivalent forms reliability, where the researcher administers two forms of a measure and calculates the correlation between the two sets of scores as a reliability estimate.
- internal consistency reliability, where the researcher estimates the reliability of a single form administered on a single occasion.

Internal consistency estimates were used because it wasn't possible to administer the questionnaire twice or have two different questionnaires. According to Cramer (1998), 'reliability is particularly important in connection with multiple item scales', and he indicated three main types of tests for assessing data reliability: Cohen's kappa coefficient, Ebel's intraclass correlation, and Cronbach's alpha coefficient.

Cronbach's alpha coefficient is the most widely used (Black, 1999) test, as it has the advantage of being applicable when questions are small scale in their own right like the Likert scale questions (Brown, 1997). This was calculated using JMP software: an alpha coefficient of 0.6 or higher is considered to be an acceptable level of internal consistency. The results indicated an overall Cronbach's coefficient of 0.855; hence, we can infer that the data collected are reliable for analysis.

Performance of Lean Six Sigma

Two thirds (66%) of respondents considered the implementation of Lean Six Sigma to be either successful or extremely successful; about 3% considered it to be either unsuccessful or extremely unsuccessful, with the remaining 31% showing no significant impact either way.

Critical Success Factors (CSFs)

Respondents to the survey were asked to score on a Likert scale (see paragraph 5.1 for more details) their perceived importance of each CSF, with 1=Not Very Important; 2=Not Important; 3=Important; 4=Very Important; 5=Critical. A factor with the highest mean score was considered to be the most important factor.

The t-tests indicated no significant difference (at 95% confidence level) in responses among respondents from organisations of different sizes and among respondents whose organisation deployed either Lean or Six Sigma first. Figure 5.4 shows the result of the t-test for the size of the organization, with a p-value (0.93) higher than the confidence level (0.05), and a t-Stat (-0.08) smaller than the t-Critical two-tail value (2.02), indicating we are unable to reject the null hypothesis of equal

variances. Thus, we can conclude that respondents from different sized organisations answered in a similar way.

Similarly, Figure 5.5 shows the result of the t-test for whether the organization deployed Lean or Six Sigma first, with a p-value (0.47) higher than the confidence level (0.05), and a t-Stat (-0.72) smaller than the t-Critical two-tail value (2.02), indicating we are unable to reject the null hypothesis of equal variances. Thus, we can conclude that respondents from organisations that implemented Lean or Six Sigma first answered in a similar way.

Mean	3,72
Variance	0,337515789
Observations	20
Pooled Variance	0,332202105
Hypothesized Mean Difference	0
df	38
t Stat	**-0,087784693**
P(T<=t) one-tail	0,465254397
t Critical one-tail	1,685954461
P(T<=t) two-tail	**0,930508794**
t Critical two-tail	**2,024394147**

Figure 5.4 Survey t-test output for organization size

Mean	3,554840278
Variance	0,91242149
Observations	20
Pooled Variance	0,612913245
Hypothesized Mean Difference	0
df	38
t Stat	**-0,729729385**
P(T<=t) one-tail	0,235015133
t Critical one-tail	1,685954461
P(T<=t) two-tail	**0,470030267**
t Critical two-tail	**2,024394147**

Figure 5.5 Survey t-test output for Lean or Six Sigma first implementation

The results of the survey are shown in Table 5.3, where the CSFs have been ranked according to their assessed importance. 'Management Commitment' was considered to be the most important, followed by 'Cultural Change', 'Linking Lean Six Sigma to Business Strategy', and 'Leadership Style'. Furthermore, respondents did not consider 'Organisational Infrastructure', 'Extending Lean Six Sigma to Supply Chain', and 'Linking Lean Six Sigma to HR Rewards' to be important for the successful implementation of Lean Six Sigma.

CSFs	Average Score
Management Commitment	4.63
Cultural Change	4.35
Linking LSS to Business Strategy	4.26
Leadership Style	4.14
Communication	4.11
Linking LSS to Customers	4.07
Awareness of Lean Six Sigma	4.03
Selection of LSS staff	3.93
Data-driven Approach	3.88
LSS Project Selection/Prioritisation	3.88
LSS Project Tracking and Review	3.80
Resources for LSS staff	3.77
LSS Training	3.71
LSS Tools & Techniques	3.65
Project Management Skills	3.54
LSS Financial Accountability	3.51
Organisational Infrastructure	3.24

Extending LSS to Supply Chain	3.19
Linking LSS to HR Rewards	3.04
Others	1.99

Table 5.3: Average Importance Scores for CSFs

5.3 Exploratory Factor Analysis (EFA)

In order to explore the results of the survey and determine whether meaningful patterns within the data could be established, an EFA (Norris & Lecavalier, 2010) was conducted. Factor analysis is a family of statistical methods whose goal is to identify the underlying relationships between variables: as per Finch & West (1997), EFA is the most appropriate technique when there is no a priori hypothesis abut factors or patterns of a measured variable; it is used to determine the number of latent variables (factors) that are needed to explain the correlations among a set of observed variables. In this case, we applied it to the 19 CSFs to determine the existence of any underlying relationships.

EFA has the following assumptions: variables are normal, have a linear relation, have a minimum amount of correlation and a sample size larger than 100, with a suggested ratio of at least 5 participants per measured variable (Gorsuch, 1983) (for the 19 CSFs in our study, that would imply at least 95 responses). These assumptions have been tested in SPSS for the data set (see appendix for output).

One of the first and important decisions to make in EFA is what factors to retain in the model. A balance is required between the need to reduce factors for simplicity and adequately represent all the correlations that exist (Hayton et al.,

2004). It is a critical step, as making an error in terms of selecting the number of factors can significantly alter the solution and interpretation of the EFA. Under representation (i.e. erroneously eliminating a factor) leads to the loss of relevant information, while over representation can lead to factors that are difficult to interpret and/or replicate (Ledesma & Valero-Mora, 2007).

A method to individuate factors that can be eliminated from the model is to look at the communality, i.e. the variance in observed variables that is accounted for by common factors. The communality of a variable is the proportion of that variable's variance that is produced by the common factors underlying the set of variables. A communality value of 1 or above for a factor is an indication of a spurious solution, reflecting too many factors that can be eliminated (Gorsuch, 1983). Table 5.4 shows the results of the EFA, with the column called 'Initial' showing the communality values determined as the squared multiple correlation of each variable with the other variables, while the values in the 'Extraction' column indicate the proportion of each variable's variance that can be explained by the retained factors. Two factors (Lean Six Sigma Training and Awareness) had communalities equal or greater than 1, meaning they are well represented in the common factor space, and hence can be removed from the model.

Factor	Initial	Extraction
Cultural Change	.288	.265
Leadership Style	.404	.383
Management Commitment	.445	.511
Lean Six Sigma Training	.462	*1*
Organisation Infrastructure	.366	.308
Communication	.474	.423
Linking Lean Six Sigma to Business Strategy	.340	.401
Linking Lean Six Sigma to Customers	.433	.454

Linking Lean Six Sigma to HR rewards	.332	.260
Extending Lean Six Sigma to Supply Chain	472	.396
Lean Six Sigma Projects Selection / Prioritisation	.588	.586
Project Management Skills	.522	.636
Lean Six Sigma Financial Accountability	.441	.324
Lean Six Sigma Projects Tracking and Review	.467	.351
Lean Six Sigma Tools & Techniques	.382	.331
Data-driven Approach	.275	.138
Awareness	.516	*1*
Selection of Lean Six Sigma staff	.485	.573
Resources to Lean Six Sigma Staff	.468	.595

Table 5.4 Communalities of Factors for EFA

In order to determine the fewest remaining number of factors that explains the largest amount of variation, there are a number of procedures designed to determine the optimal number of factors to retain in EFA (Fabrigar & Wegener, 2011). Most of these procedures rely on the use of eigenvalue. The eigenvalue of a factor is the sum of the squared factor loadings for a given factor, representing the amount of variance of the variables accounted for by that factor.

We used Kaiser's (1960) eigenvalue-greater-than-one rule (also known as K1 rule) to determine the factors to be included in the final model. The eigenvalue for each factor tells us something about how much variance in the observed indicators is being explained by that particular factor: the lower the eigenvalue, the less that factor contributes to the explanation of variances in the variables (Norris & Lecavalier, 2010). Usually, factors with eigenvalues greater than 1 are deemed to be significant (Zwick & Velicer, 1986; Tabachnick & Fidell, 1996; Gorlsuch, 1983). The K1 rule is the default setting of many statistical packages and is the most well-known and most utilised method in practice (Gordon & Courtney, 2013).

Calculation of eigenvalues was performed in SPSS and four factors were found to have eigenvalues greater than 1, explaining 55% of the variance (Table 5.5).

Factors	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings
	Total	% Variance	Cum %	Total	% Variance	Cum %	Total
1	4,959	29,173	29,173	4,309	25,350	25,350	3,018
2	1,901	11,183	40,355	1,241	7,297	32,647	2,821
3	1,287	7,572	47,927	.950	5,590	38,237	2,351
4	1,172	6,896	54,823	.697	4,103	42,340	2,330
5	,962	5,657	60,481				
6	,904	5,319	65,799				
7	,867	5,102	70,901				
8	,775	4,560	75,462				
9	,697	4,102	79,564				
10	,622	3,658	83,223				
11	,553	3,250	86,473				
12	,484	2,849	89,322				
13	,465	2,738	92,060				
14	,399	2,346	94,406				
15	,341	2,006	96,412				
16	,318	1,872	98,285				
17	,292	1,715	100,000				

Table 5.5: CSFs Total Variance Explained

The first 4 factors are meaningful as they have eigenvalues higher than 1 and the four factors together account for 55% of total variance.

Finally, we used the pattern matrix to group the 17 CSF variables around the four factors, based on their factor loadings. The factor loadings are the correlation coefficients between the variables and the factors, indicating the percent of variance in each variable explained from each factor. The pattern matrix shows the factor structure, i.e. the intercorrelations among the variables being tested in the EFA. Using the numerical factors illustrated in Table 5.6 we can group our original 17 variables around the 4 significant factors highlighted from the eigenvalues. For example, the variable Project Management Skills has factor loading values of 0.611 for Factor 1, -0.143 for Factor 2 and -0.378 for Factor 4, so it would be grouped on

Factor 1, being the one with the highest value (load). Higher factor loading indicates that a variable is highly correlated with that specific factor, so for each row of Table 5.6 we selected the higher numerical value and associated the variable of that row with the corresponding factor in the column with a higher numerical value.

	Factor Loadings			
	1	**2**	**3**	**4**
Project Management Skills	.611	-.143		-.378
Lean Six Sigma Project Selection / Prioritisation	.596	.106	.219	
Organisational Infrastructure	.464			
Lean Six Sigma Tools & Techniques	.426		.134	
Extending Lean Six Sigma to Supply Chain	.393	.201	.155	
Data-based Approach	.355			
Linking Lean Six Sigma to HR rewards	.311			-.272
Management Commitment		.717	-.147	
Linking Lean Six Sigma to Customers	-.148	.674		
Linking Lean Six Sigma to Business Strategy	-.113	.588		-.136
Leadership Style	.127	.582		
Communication	.187	.387	.170	
Cultural Change	.231	.384		
Resources to Lean Six Sigma Staff			.893	
Selection of Lean Six Sigma Staff	.243		.537	-.118
Lean Six Sigma Financial Accountability				.815
Lean Six Sigma Project Tracking and Review	.251	.126		-.544

Table 5.6: CSFs Pattern Matrix

Matching each variable to the factors with the highest factor loading, we can then suggest the following composition for each factor:

- **Factor 1**: the variables with a higher numerical loading on Factor 1 were Project Management Skills, LSS Project Selection and Prioritisation, Organisational Infrastructure, Tools and Techniques, Extending Lean Six Sigma to the Supply Chain, Data-Based Approach, Linking Lean Six Sigma to HR Rewards, and Project Tracking and Review. All these variables showed their highest association to the same significant Factor:

they all refer to the sphere of managing projects, and we can thus refer to this factor as 'Project Management'.

- **Factor 2**: the variables with a higher numerical loading on Factor 2 were Management Commitment, Linking LSS to Customers, Linking LSS to Business Strategy, Leadership Style, Communication, and Cultural Change. All these are either leadership traits (style, communication, and commitment) or leadership priorities (linking Lean Six Sigma to strategy and customers): we thus refer to this factor as 'Leadership'.

- **Factor 3**: the variables with a higher numerical loading on Factor 3 were the Selection of LSS Staff and Resources to LSS Staff. We refer to this factor as 'Selection of top talented people'.

- **Factor 4**: only one variable, Lean Six Sigma Financial Accountability, had a higher factor loading on Factor 4: we refer to this as 'Financial Accountability'.

EFA allowed us to reduce the initial 19 variables from our survey to 4 main critical factors, grouping them around the themes of Project Management, Leadership, Selection of Top Talented People, and Financial Accountability, confirming our initial hypothesis on leadership being a CSF for Lean Six Sigma deployment.

5.4 Discussion and Implications

The study presented here provided a more complete picture of the CSFs for Lean Six Sigma deployment in organisations. This research adds to the theory of

Lean Six Sigma by highlighting and investigating the role of leadership in driving organisational deployment. The four factors identified as significant all have managerial implications for the practice of Lean Six Sigma, and provide a solid framework for organisations about to start deployment:

- Project Management: for a Lean Six Sigma deployment to be successful, it is important to work on projects aligned with the business strategy, to show immediate value to the organisation at large. Accurate data-driven tracking of projects is necessary to ensure deployment stays on track, as well as rewarding success among employees (Duarte et al., 2012; Kornfeld & Kara, 2013).

- Leadership: as we have seen in the leadership literature review, leaders have many different traits and styles. These results suggest that successful leadership is:

    - Committed to process improvement in general and Lean Six Sigma specifically, as suggested by Dale & Lightburn (1992). Lean Six Sigma transformation is a journey that does not happen overnight: successful leaders are those that can see through the difficult moments and inspire employees to keep going (Jokinen, 2005; Hilton & Sohal, 2012; Suresh et al., 2012).

    - Able to see the link between Lean Six Sigma and the overall business strategy and its customers as well as communicate this to employees in a clear and compelling vision (Sumukadas, 2006; Hilton & Sohal, 2012; Suresh et al., 2012).

- Able to establish an organisational culture that fosters continuous improvement (Taylor and Wright, 2003).

- A visible, inspirational, realistic, targeted and consistent leadership is necessary to carry the organisation forward (Laureani & Antony, 2015).

- Selection of top talented staff: while it is rather typical in organisations that the oldest or the most experienced professionals are in the leaders' positions (Kulmala et al., 2009), this study highlights the importance of having the top talent in the organisation involved in Lean Six Sigma, providing them with the right project management tools and making them financial accountable for the success of their initiatives (Panizzolo et al., 2012).

- Financial Accountability: it is necessary to keep the Lean Six Sigma efforts linked to the financial results of the organisation, making leaders accountable for the financial impacts of their initiatives.

As with any research, this study has a number of limitations which may present interesting future research opportunities. The study focused on the impact of Leadership on Lean Six Sigma deployment, but it did not go into the specifics of separating the types of leadership needed from Senior Management versus the leadership needed from Middle Management. More research is needed to investigate whether there is any significant difference between the two and their influence on Lean Six Sigma implementation.

There is also an opportunity for empirical research to determine which leadership style is more conducive to successful deployment. Bremer et al. (2005)

suggested that Six Sigma leadership utilises both transactional and transformational forms of leadership, while Pande (2007) suggested the need to go over these traditional forms of leadership; an empirical investigation that correlates leadership traits to the success, or lack of, of the Lean Six Sigma programme in organisations, may be needed to close this gap.

Future research should also empirically investigate what type of leadership is more appropriate at different stages of Lean Six Sigma programme maturity: is the leadership style needed to support the start of a deployment the same as that needed to sustain the same deployment later on?

5.5 Summary

This chapter sought to shed further light on Lean Six Sigma deployment, highlighting the most important CSFs and particularly the role of leadership, which is key to Lean Six Sigma success (Hoerl & Snee, 2003).

The results of this quantitative study highlight the importance of having the right leadership in place to ensure successful deployment, coupled with the top talent in the organisation involved in Lean Six Sigma, providing them with the right project management tools, and making them financially accountable for the success of their initiatives.

Next chapter is going to investigate what specific Leadership traits are more conducive to a successful Lean Six Sigma deployment, addressing RQ1.

Chapter 6

Interview Analysis

6.0 Introduction

This chapter presents the qualitative findings that form part of the mixed-methods approach used. Following participation in the online survey that formed the quantitative element of the research, twenty-one respondents participated in the one-to-one telephone interviews that formed the qualitative dimension of the study.

A key advantage in adopting a mixed-methods approach to research is that it facilitates not only discrete quantitative and qualitative data analysis techniques but it allows for integration of both data sets so that their findings can be further explored, contrasted and compared, leading to a more rounded and comprehensive understanding of the phenomenon under study (Bryman & Bell, 2007; Creswell & Clark, 2007; Teddlie & Tashakkori, 2009). Mixed-methods approach may also enhance the generalizability of the research findings (Teddlie & Tashakkori, 2009; Creswell & Clark, 2007) and help to maximise research validity (Scandura & Williams, 2000).

A key finding from the quantitative dimension, illustrated in the previous chapter, was the identification of leadership as a CSF in Lean Six Sigma deployments during the rollout and sustaining phases, and the qualitative dimension set out to further explore this correlation and tease it out in detail by conducting discussions with participants, framed by a concise topic guide focused on five key issues pertaining to preparing for, implementing and sustaining deployments.

Twenty-one of the survey respondents agreed to participate in a follow-up, one-to-one telephone interview to further explore perceptions of the relationship between leadership approaches during the implementation and sustaining phases of Lean Six Sigma programmes and success levels in deployments across a variety of organisational settings. The recorded telephone conversations were transcribed and their content was qualitatively analysed. Further analyses, involving cross comparisons across the quantitative and qualitative data sets yielded rich results that provide insights into participants' experiences and views concerning the relationship between leadership and success levels in Lean Six Sigma deployments.

6.1 Methodology

Qualitative research is based on a phenomenological position (Easterby-Smith et al., 2002). It is a holistic approach which takes account of contexts within which human experiences occur and is thus concerned with learning from particular instances or cases (Reid, 1996). Qualitative research seeks to access the inner world of perception and meaning-making in order to understand, describe, and explain social processes from the perspective of study participants. This approach does not commence with a prior hypothesis to be tested and proven but with a focus of inquiry that takes the researcher on a voyage of discovery as it takes an inductive approach to data analysis, and research outcomes are not broad generalisations but contextual findings. Qualitative researchers tend to speak of 'transferability' (from context to context) rather than generalizability (Lincoln & Guba, 2000).

6.1.1 Constant Comparative Method

The methodology adopted by this study was based on the constant comparative method (Maykut & Morehouse, 1994): while qualitative research is not given to mathematical abstractions, it is nonetheless systematic in its approach to data collection and analysis. The constant comparative method requires the researcher to take one piece of data (e.g., one interview, one statement or one theme) and compare it to all other pieces of data that are either similar or different. The benefit of using this method is that the research begins with raw data and, through constant comparisons, a substantive theory will emerge (Kolb, 2012). Framed by a focus of inquiry, whether data is collected through interviews or questionnaires, open-ended questioning allows study participants to articulate their perceptions and experiences freely and spontaneously.

In analysing data generated in this format, responses are not grouped according to pre-defined categories, rather salient categories of meaning and relationships between categories are derived from the data itself through a process of inductive reasoning. The constant comparative method means the researcher may access and analyse these articulated perspectives so that they may be integrated in a model that seeks to explain the social processes under study. The constant comparative method involves breaking down the data into discrete ‘incidents’ (Glaser & Strauss, 1967) or ‘units’ (Lincoln & Guba, 1985) and coding them into categories.

Categories arising from this method generally take two forms: those that are derived from the participants’ customs and language, and those that the researcher

identifies as significant to the project's focus-of-inquiry. The goal of the former 'is to reconstruct the categories used by subjects to conceptualise their own experiences and world view', the goal of the latter is to assist the researcher in developing theoretical insights into the social processes operative in the subject under study. Thus: 'the process of constant comparison stimulates thought that leads to both descriptive and explanatory categories' (Lincoln & Guba, 1985). Categories undergo content and definition changes as units and incidents are compared and categorised, and as understandings of the properties of categories and the relationships between categories are developed and refined over the course of the analytical process.

NVivo 9 was used as a document management system to give clarity to the coding and analytical processes. The use of a qualitative data analysis software package allows a structured organisation of the data and an audit trial of the analysis, making it easier to highlight different themes emerging in the research (Welsh, 2002). NVivo was particularly chosen over other available packages due to its flexibility and ease of use, complemented by a very comprehensive suite of tutorials, webinars and extensive, detailed online help (Bazeley & Jackson, 2013), all of which make NVivo a commonly utilised software.

6.2 Qualitative Data Analysis

6.2.1 Step by Step Process

The open-ended topic guide for the telephone interviews, which adopted an informal free-flow conversational tone, comprised five broad areas for discussion, namely:

- Communication / Awareness
- Employee Motivation / Teamwork
- Leadership Style
- Management Commitment
- Training

There were seven discrete cycles of analyses. These cycles involved three separate cycles of coding, two cycles of managing codes, one for initial categorisation of open codes and one for data reduction through consolidating codes into a more abstract theoretical framework and two which use writing itself as a tool to prompt deeper thinking of the data (Bazeley, 2009) leading to findings from which conclusions were drawn. Some of the managing coding cycles involved additional coding. The approach to conducting thematic analysis (Braun & Clarke, 2006) is illustrated in Table 6.1 and explained in detail below.

Analytical Process (Braun & Clarke, 2006).	**Braun and Clarke Practical Application in NVivo**	**Strategic Objective**	**Iterative process throughout analysis**
1. Familiarising yourself with the data	**Transcribing data (if necessary), reading and re-reading the data, noting down initial ideas. Import data into the NVivo data management tool.**	**Data Management** *(Open and hierarchal coding through NVivo)* ↓ **Descriptive Accounts** *(Reordering, 'coding on' and*	Assigning data to refined concepts to portray meaning ↕ Refining and distilling more abstract concepts ↕ Assigning data to
2. Generating initial codes:	**Phase 2 – Open Coding- Coding interesting features of the data in a systematic fashion across the entire data set, collecting data relevant to each code.**		
3. Searching for themes:	**Phase 3 - Categorisation of Codes – Collating codes into potential themes, gathering all data relevant to each potential theme.**		
4. Reviewing themes:	**Phase 4 – Coding on - Checking if the themes work in relation to the coded extracts (level 1) and**		

	the entire data set (level 2), generating a thematic 'map' of the analysis.	*annotating through NVivo)* 	themes/concepts to portray meaning 
5. Defining and naming themes:	**Phase 5 - Data Reduction - On-going analysis to refine the specifics of each theme, and the overall story [storylines] the analysis tells, generating clear definitions and names for each theme.**		Assigning meaning 
6. Producing the report	**Phase 6 – Generating Analytical Memos –** **Phase 7 – Testing and - Validating and** **Phase 8 – Synthesising Analytical Memos. The final opportunity for analysis. Selection of vivid, compelling extract examples, final analysis of selected extracts, relating back of the analysis to the research question and literature, producing a scholarly report of the analysis.**	**Explanatory Accounts** *(Extrapolating deeper meaning, drafting summary statements and analytical memos through NVivo)*	Generating themes and concepts

Table 6.1 Qualitative Analysis Approach (Braun & Clarke, 2006)

Phase 1 – Getting Familiar with the data involved transcribing data (five to six hours spent on each transcript repairing initial transcribing errors), reading and re-reading the data, noting down initial ideas and importing data into the NVivo data management tool.

Phase 2 – Generating Initial Codes (open coding) involved broad participant-driven open coding of the interview transcripts recorded from study participants supported with definitions so as to deconstruct the data from its original chronology into initial non-hierarchical codes. These codes had clear labels and definitions to serve as rules for inclusion (Maykut & Morehouse, 1994) or units of meaning (text segments) which will be coded from the interview transcripts (Maykut & Morehouse 1994, pp.126-149).

Phase 3 – Searching for Themes (categorisation of codes) involved re-ordering themes identified and coded in phase 2 into categories of themes by grouping related themes under these categories and organising them into a framework that makes sense to further the analysis of the data. This phase also included distilling, re-labelling and merging common codes generated in phase 2 to ensure that labels and rules for inclusion accurately reflect coded content.

Phase 4 – Reviewing Themes (coding on) involved breaking down the now restructured themes into sub-themes to offer more in-depth understanding of the highly qualitative aspects under scrutiny such as divergent views, negative cases, attitudes, beliefs and behaviours coded to these categories and to offer clearer insights into the meanings embedded there-in.

Phase 5 – Defining and Naming Themes (data reduction) involved consolidating codes from all three cycles into more abstract, philosophical and literature-based codes to create a final framework of themes for reporting purposes.

Phase 6 – Producing the Report involved writing *analytical memos* for the higher level themes to accurately summarise the content of each category and its codes and propose empirical findings for such categories. These memos considered 5 key areas:

1. The content of the cluster of codes on which they were reporting.

2. The patterns where relevant (levels of coding for example, although this could be used to identify exceptional cases as well as shared experiences).

3. Considering background information recorded for participants and considering any patterns that may exist in relation to participants' profiles (who talked about what).

4. Situating the code(s) in the storyboard by considering the relatedness of codes to each other, and their importance of addressing the RQ and sequencing disparate codes and clusters of codes into a story or narrative which is structured and can be expressed in the form of a coherent and cohesive chapter.

5. Considering primary sources in the context of relationships with the literature as well as identifying gaps in the literature.

Phase 7 – Validation involved testing, validating and revising analytical memos so as to self-audit proposed findings by seeking evidence in the data beyond textual quotes to support the stated findings and seeking to expand on deeper meanings embedded in the data. This process involves interrogation of data and forces the consideration of elements beyond the category itself, drawing on relationships across and between categories and cross tabulation with demographics, observations and literature. This phase resulted in evidence-based findings as each finding was validated by being rooted in the data itself and relying on the creation of reports from the data to substantiate findings.

Phase 8 – Synthesising analytical memos into a coherent, cohesive and well supported outcome statement or findings report.

6.2.2 Report Format

Five thematic parts emerged during the process of data analysis and are closely aligned to the interview topic guide, as illustrated in Figure 6.1:

- Part One: Communication
- Part Two: Employee Motivation
- Part Three: Leadership Style
- Part Four: The Programme(s) Deployed
- Part Five: Training

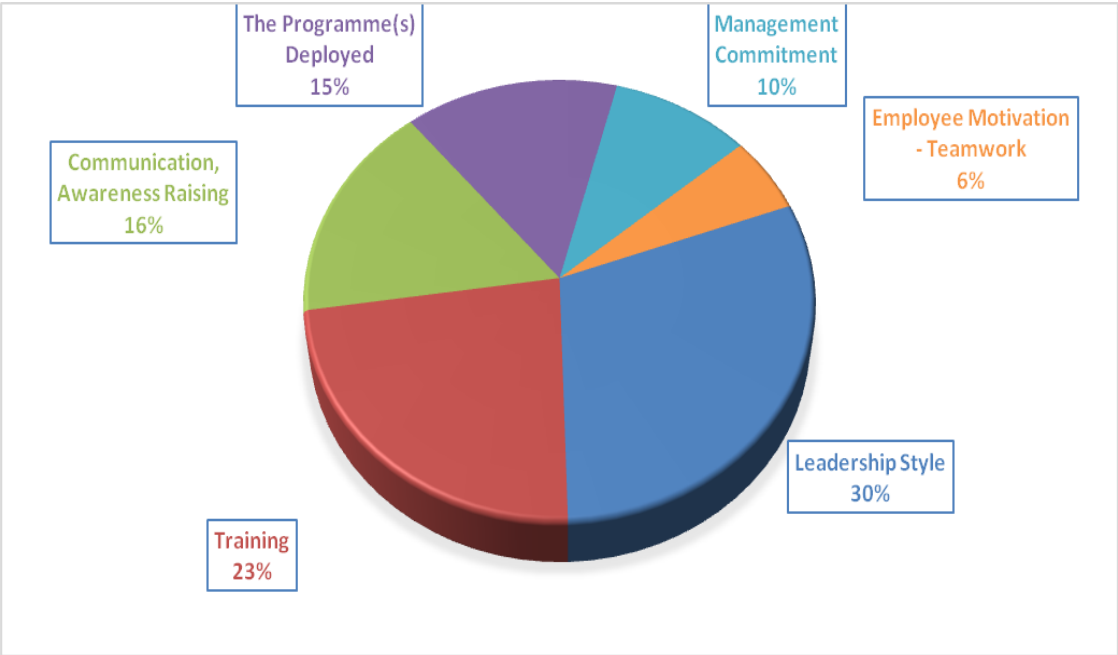

Figure 6.1 Five Topics, by Number of Citations, Discussed by Participants in Telephone Interviews

During analysis of participants' responses coded to these five top-level topics or themes, a number of themes and sub-themes emerged and each of the five sections below opens with a visual overview using a pie chart showing the weighting of these themes in relation to each other (i.e. the number of mentions during the interviews);

the visual overviews are followed by discussion of the themes, and each thematic part closes with a set of matrices showing coding patterns.

While the purpose of a coding framework is to organise data according to what was said, the purpose of a matrix is to consider who said it. Matrices do not consider the hierarchical position of a code as the nature of a matrix is two-dimensional. In this study, matrices were used to cross reference the five major themes against five discrete variables or profiling information and/or demographics. These variables were:

- The size of the participating company
- The location of the participating company
- The sector in which the participating company operates
- The ways in which the participating company measures success of Lean Six Sigma deployments
- The extent to which the participating company deemed the roll out of Lean Six Sigma to have been successful.

It must be noted that, over the course of this qualitative analysis, charts do not show absolute numbers as they are designed to show relativity across and between categories as a prelude to discussion of comments coded to such categories: this qualitative analysis seeks to weight the categories or themes in relation to each other and the charts offer a visual representation of participants' views, perceptions and experiences of Lean Six Sigma deployments.

6.3 Findings on Communication

In analysing participants' comments during telephone discussions on the broad theme of communication, the category *'practices for engaging the workforce, achieving buy-in'* emerged as the dominant theme under this topic, and having further analysed responses coded to this category, four sub-categories or themes were identified as follows:

- Communication Systems and Structures
- Widespread Basic Training, Awareness-Raising
- Events, Conferences, Lunch and Learn
- Create Conditions for Employee Mobility

Table 6.2 illustrates the number of interviews where 'practices for engaging the workforce, achieving buy-in' was mentioned as an important factor and the number of references to each one of the sub-themes:

Themes	Number of interviews mentioning 'practices for engaging the workforce, achieving buy-in'	Number of references to each sub-theme
Communication Systems + Structures	15	32
Create Conditions for Employee Mobility	4	6
Events, Conferences, Lunch and Learn	5	7
Widespread Basic Training, Awareness-raising	14	21

Table 6.2: Number of References to Practices for Engaging Workforce, Achieving Buy-in

A graphical illustration of the number of references is shown in Figure 6.2:

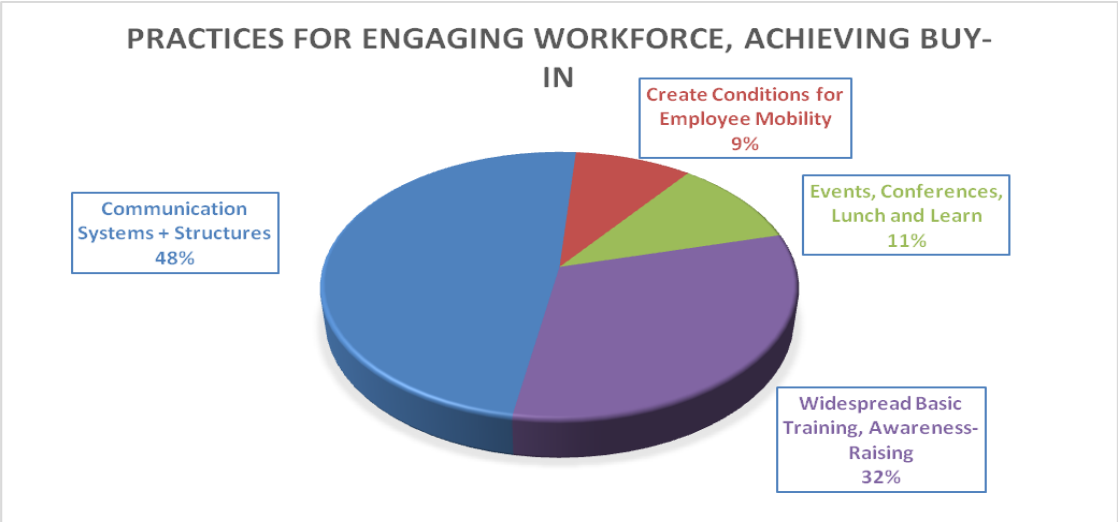

Figure 6.2 Practices for Engaging Workforce, Achieving Buy-in

Participants who considered their deployment of Lean Six Sigma to be successful were equally represented amongst participants with those who considered the roll-out to be 'not significant' or 'negative' comprising 53% and 47% respectively. However, Table 6.3 shows that when it came to the use of practices for engaging the workforce, there was twice as much data coming from those participants that perceived success or extreme success emanating from deploying Lean Six Sigma across all codes in this theme, suggesting a significantly more pro-active approach to communications from participants who successfully deployed the programme. This in line with the Critical Success Factors literature reviewed, in section 2.5, where Communication and Awareness were one of the critical success factors discussed: Burton & Sams (2005), Hayes (2002), Sivakumar & Muthusamy (2011) and Brun (2011) all identified the need for setting clear expectations and constant company-wide communication as a critical success factor.

Table 6.3 illustrates the number of times each themes was mentioned by respondents that categorised their own programme from 'extremely successful' to 'negative'.

T1 - Communications x Success	Extremely successful	Successful	Not Significant	Negative
Practices for Engaging Workforce, Achieving Buy-in	12	30	19	2
Communication Systems + Structures	7	15	9	1
Create Conditions for Employee Mobility	0	2	4	0
Events, Conferences, Lunch and Learn	1	4	2	0
Widespread Basic Training, Awareness-Raising	5	10	5	1

Table 6.3 Matrix of Coding Pattern between Communication and Success of LSS

6.3.1 Communication Systems and Structures

Establishing and utilising effective communication systems and structures emerged as the most talked about suggestion for good practice in engaging the workforce and achieving buy-in to improvement measures. Participants' comments suggested a need for both verbal and visual communication systems as mutually-re-enforcing mechanisms for communicating the message. At perhaps the most fundamental level of communication, the following comment points to the idea of senior management constantly reiterating the importance of improvement initiatives:

> *There is no substitute for visible leadership by the CEO. And what I mean by that is even if the senior executive cannot meet with individual employees regularly, they should be talking about the initiative virtually every time they give a speech or address employees or write a letter to the shareholders in*

the annual report. They should be communicating about this personally on a regular basis.

Participant 14

This constant and proactive communication also address the need to show management commitment and involvement, a recurring theme among the critical success factors literature review: Lean Six Sigma deployment is a journey that does not happen overnight: successful leaders are those that can see through the difficult moments and inspire employees to keep going (Jokinen, 2005; Hilton & Sohal, 2012; Suresh et al., 2012).

Another participant suggested that Lean Six Sigma, in and of itself, could be used as an effective communication tool for leadership in imparting the message:

Sometimes it's quite difficult for a leader to articulate his vision and in fact we often say a fantastic leader is someone who is very good at articulating their vision and presenting the future state, to be able to embrace and communicate and bring the organisation with them. Now Lean Six Sigma is a brilliant way to enable leaders to articulate what good looks like, articulate what the future looks like.

Participant 16

This echoes the words of Snee (2010), that pointed out how Lean Six Sigma is an effective development tool: 'leaders enable an organization to move from one paradigm to another; from one way of working to another way of working. Lean Six Sigma provides the concepts, methods and tools for changing processes'. In this

context, Lean Six Sigma move from being a consequence of the leadership's vision to be the actual vision itself.

Participant 14 suggested, however, that a strategy of top level management constantly repeating the message needs to be bolstered by key functions, such as finance and human resources, chiming in and regularly highlighting financial gains and career development opportunities associated with improvement processes, as well as project leaders constantly reporting on the progress of their initiatives:

> *So it's important to have the CEO mention it, but it's also important to have regular communications from finance as to what the financial results are related to Six Sigma and Lean, from human resources talking about Lean or Six Sigma positions in the organisation, and from one zone supervision about how things are going relative to Lean or Six Sigma. So I think there needs to be vocal communication from the top, and also other more regular consistent communication happening.*
>
> Participant 14

Participants' comments also suggested the importance of communication as not being merely a one-way information flow but rather a two-way mechanism in which the voice of the employee is both heard and listened to:

> *I think people are open to it when they understand why we're doing things. They've always identified problems, they've always voiced their opinions, but they've never necessarily been heard, and to then see that there's a structured methodology for problem-solving where their ideas and their*

intuition can help… people are very open to the methodology when they see that it's going to benefit them.

Participant 10

This idea of encouraging employee participation and valuing their input is exemplified in a suggestion by Participant 2 that workplaces could draw on the approach utilised in Japan whereby fishbone diagrams are placed on site inviting employees' ideas on factors that might be contributing to problems:

So you can put a cause and effect diagram in the workplace and just put the problem at the head of the fish and then have the rest of the fish available for people in the workplace to go and put what they think might be causing the problem, and so it's a much more engaging way to roll it out.

Participant 2

Other communicative mechanisms cited by participants included the use of SharePoint, posters, newsletters, notice boards, storyboarding, and reporting success stories in a variety of formats. However, one participant suggested that, in larger organisations, publicising successes achieved in one part of an organisation to the wider employee base can be challenging:

One of the biggest challenges we have is, around communication, is letting people all around the business know about the small improvements that are going on. I keep a very close eye on them and I can report on them easily, to anyone. What is more challenging for us is there are the fifty or so teams who have daily meetings and come up with their own small improvements, it's

much more challenging for me to keep dynamic logs of all those improvements and to be able to report on those around the organisation. So we're taking some action at the moment to try and make sure that that is more centrally recorded. Staff have been asking for it, they're interested in the small improvements that their colleagues and their teams are making, so our challenge is just to be able to reproduce information on that. And that's improving, but nowhere near where we need it to be.

Participant 11

Participant 13 suggested that failure to comprehensively communicate the reasons for, and progress of, an improvement initiative may place the success of future deployments in jeopardy:

I think failure to communicate with the wider population definitely can impact if you're looking to rollout further, so if you're wanting to go further than whatever that initial team is it makes good sense to try and communicate what they're doing more broadly so that when it becomes part of someone else's daily day job that they already kind of know what's coming and understand why it's happening. Does it impact? It impacts, yes!

Participant 13

While participants strongly emphasised the vitally important role communication plays in engaging the workforce and achieving buy-in to improvement processes, Participant 21 cautioned against communicating too much, too soon, too many, suggesting instead a more 'those-to-be-affected' basis for communicating the message. This 'those-to-be-affected' basis is not meant to be an

exclusionary approach but rather as a caution against unduly raising widespread employee expectations that will not be immediately met. Thus, employees directly impacted by a given initiative need to be well-informed on what to expect and how the improvement process will affect their day-to-day role, and then, as initiatives may develop and expand over time, other employees impacted by the process need to be informed of the implications, but communicating to those not yet affected may, inadvertently, lead to employee apathy in the longer term:

> *There's a very interesting challenge here, and that is setting people's expectations. If you communicate too much, too widely, too early, the danger is that you set people's expectations that they're going to get involved in something, too early, and then nothing happens for a period of time and they wonder what it's all about and it can lose credibility as a result. So I think the comment I'm making here is, yes, communications are absolutely vital but you've got to have a sensible communication strategy that recognises the different degrees of involvement and engagement over a period of time and is appropriately phased and differentiated, if you like, in terms of the messaging and the approach.*
>
> Participant 21

Finally, the following extract exemplifies an organisation that, with unrelenting determination over two to three years, has ticked all the boxes in terms of effective communication systems and strategies for engaging the entire workforce and for successfully embedding a mind-set of continuous improvement and excellence in the culture of the company:

The best that I have seen is where they're all on a programme ... it's very heavily marketed, it's very heavily branded, they've come up with a logo, the logo is on all their documentation, it's on their e-mails, it's even on their badges. They've set up a portal, a SharePoint portal with all the information that anybody ever needs to know on there – there's the projects, you can select projects, you can recommend projects, there's a workflow there on who exactly the sponsors are, it's got timelines, it's got success stories, so it's very, very heavily communicated to these guys on a day to day basis. It's also part of their induction, so anybody who joins the organisation will have an induction on what this programme is and how it works. So really from all the way at the top, all the way down to the bottom, it's engrained within the culture. Now it's easy to say that but that's taken them two or three years to do that, but if you go and see the way they operate now, everybody within the organisation knows exactly what it is. And they celebrate the success which is also another form of communication.

Participant 15

Overall, a communication plan is important in order to involve the employees with the Lean Six Sigma program, by showing them how it works, how it is related to their jobs and how they can benefit from it. By doing this, resistance to change can be reduced (Henderson & Evans, 2000).

6.3.2 Widespread Basic Training, Awareness-Raising

The idea of widespread basic training emerged as a theme in relation to practices for engaging the workforce and achieving buy-in to improvement initiatives. Participants talked about either having conducted or having plans to conduct basic training in Lean for existing employees and also during the induction process of new employees, as exemplified in the following comments:

> *And then they are also trying to determine how we train all frontline, all people in the organisation, so that there's baseline knowledge about Lean in the organisation about ways to go about problem-solving.*
>
> Participant 10

> *Everybody in the company has received basic introductory training to Lean, one-day training for the whole company, and at this stage about ninety-eight per cent of the company I think have done that.*
>
> Participant 11

> *Our suggestion, and they haven't implemented it yet but they're about to, is to incorporate that white belt training as part of new employee training, ongoing, so all the time, so all employees will eventually at least have awareness training coming in.*
>
> Participant 17

Participant 9 made a case for widespread yellow belt training as a mechanism for producing and sustaining cultural change:

The more people that you have at the yellow belt level, for lack of a better word, I think the more likely you are to change your culture. If you just have a few black belts and they become the people who are responsible for doing all the improvements, then if they go away the whole culture gets lost very, very quickly.

Participant 9

And participant 13 witnessed such an approach to yellow belt training in Scotland:

I've seen, in the company that I used to work for, we trained everyone in Scotland as yellow belts so that everyone had that ground knowledge.

Participant 13

Training was also identified as a critical success factor in the literature review, as highlighted from Coronado & Antony (2012), Kwak and Anbari (2006), Goldstein (2001) and Halliday (2001).

However, despite well-intentioned strategies for engaging the workforce through widespread basic training, Participant 13 also suggested that it can be a futile exercise if, once trained, employees are not soon thereafter assigned to projects where their learning is brought into a meaningful context.

What I did see with the training of everyone so that everyone is a yellow belt was that the people that weren't then quickly involved in projects or the

initiative, that knowledge and that enthusiasm was very quickly lost, that kind of 'use it or lose it' I saw really as a very true thing in terms of the training.

Participant 13

Perhaps a solution to the 'use it or lose it' problem could lie in a suggestion made by Participant 21 regarding generating small scale improvement activities designed to raise all employees' awareness of waste and inviting them to suggest innovative ways of minimising it:

So that also begs the question how do you involve a wider group of people? And the answer to that may be to also undertake some small scale local improvement activities and train and encourage everybody to be thinking about reducing waste, looking at ways in which they can improve the ways in which they're working, perhaps even outside of the context of more substantial Lean Six Sigma projects which might be linked to your strategy or end-to-end processes.

Participant 21

Thus the development of small scale improvement activities could possibly, not only counter the 'use it or lose it' phenomenon, but also assist in assimilating an awareness of waste and waste reduction measures into the culture of the organisation, as Participant 6 suggested:

I think culture change is a slow process and I think to try and aim for a culture change on its own is missing the point, culture change happens as results of smaller changes, smaller initiatives, it's the eventual build-up of

them, when they become normalised into the everyday work, that's when the culture changes and, you know, a culture change might be over several years. And that's the way we've approached it here.

Participant 6

The interviews confirmed training as a critical success factor for the implementation of Lean Six Sigma: it is important, after having communicating the rationale for deploying Lean Six Sigma, to provide the opportunity to the employees to raise their comfort level through training (Hendricks & Kelbaugh, 1998).

However, this should be followed closely from practical applications of the concepts learnt during training: the objective is to generate agents of change in the organization, that can spread the Lean Six Sigma philosophy throughout the organization (Coronado & Antony, 2002).

Although the belt system, as outlined from responders, offers a wide knowledge of the Lean Six Sigma methods and tools, it may not necessarily reinforce all the skills needed to sustain the deployment longer term: over time, organizations need to look outside the Lean Six Sigma discipline for other methods and ideas that complement it (Pande et al., 2000), so transitioning from a trained organization to a learning organization, as described from Senge (1990).

6.3.3 Events, Conferences, Lunch and Learn

This category is related to communication systems and structures already discussed and to the second theme of employee motivation and giving recognition in terms of both awards and rewards. However, aside from acting as a means of giving

recognition, some participants talked about events and conferences as a platform for showcasing success stories and thereby raising awareness and generating enthusiasm for improvements across the wider employee base:

> *I think when somebody sees the before and after in a well-run, executed event, Six Sigma black belt, green belt premiere event, they immediately buy into that. I mean most of the time, the persons buy into that and they want to, people want to do a type of event to any problem that they see, basically, because they get into that engagement so far, so strong.*
>
> Participant 1

However, Participant 1 also warned of the potential negative effects, in terms of achieving buy-in and on-going enthusiasm for improvements, if events are not so well-executed:

> *I would say, sometimes the events are not well-executed and the sustainment is not as good. And that's when you have people saying: 'well, we did this, we put a lot of time on this, but we're back to the basics, back to the beginning, how we were, even we're worse than we were'. So yeah, I have seen those examples where people get disappointed on that kind of situation. So it's a mix, and I think it's directly related to how successful the event was for that person that was involved on that event.*
>
> Participant 1

Participant 20 spoke of very positive outcomes of conferences in terms of spreading the word and engaging the workforce, particularly at the level of line function:

> *We used to have Sigma conferences where the specific functions used to come and share their success story and we used to have participation from the line function also, which helped us in getting that much needed commitment from the bottom level. So this kind of communication did help in sharing the practices across the organisation and also it did bring in some kind of recognition for people who had been part of the deployment and it can motivate people further. So this is the kind of communication that's probably even more suitable at helping spread the success stories and good things that have been happening and so that we can get more people on board for the initiative and I think that is the best way of communication.*
>
> Participant 20

Participant 4 spoke about hosting 'lunch and learn' sessions as a means of generating exposure to Lean in a relaxed and informal setting:

> *In the past we've also done stuff that we've called like 'lunch and learn', where we've invited, you know, literally we've rented out a part of like a big cafeteria and we said 'hey, you know, we're going to be talking about the define phase today if you're interested, it's part of the Lean Sigma thing, if you're interested come join us for lunch', and we had just, you know, ten to fifteen simple slides on what it is, just to help with a little bit of exposure.*
>
> Participant 4

Participant 17 talked about an organisation that derives maximum benefit from 'lunch and learn' sessions in terms of engaging the workforce, and this is achieved through optimal use of technologies:

> *The second thing that they do is what they call lunch and learn. And what they do is once a week, sometimes twice a week, but usually it's once, they'll have a one-hour session, sometimes they're in a classroom environment where they invite people to come into a conference room but because we're going into this virtual world now and doing it virtually, we're now inviting folks to come into the virtual session, now we have a limit on that, so we can only do up to twenty-five at a time. So when these lunch and learn sessions happen, we usually fill them up, but they're recorded and then those recordings go to the third place that we communicate to everybody, which is SharePoint. So we've built a SharePoint site that allows anyone in the company to access their continuous improvement page, and in that they can see recorded lunch and learn sessions, they can access tools and templates, they can register for training or even get examples of completed projects. And so it's sort of a collection house of the methodology, the training materials, they can actually access any of that material internally any time they need to. So we've opened it up. And so the green belts are going in and adding content when they update a project, or a black belt, whichever, but the overall population can now get notifications and actually can access that information any time.*
>
> Participant 17

6.3.4 Create Conditions for Employee Mobility

Finally, creating conditions for employee mobility and career development opportunities was also cited as a potential means of engaging the workforce and achieving buy-in to improvement processes, as exemplified in the following comments:

> *I think when you're in the role it's important that you're in the role fulltime, but I do agree as well that there's a lot of benefit in putting somebody into that role maybe for six months or for a year and then translating them back out again into an operational quality role. Moving people through that cycle is a very good career development opportunity, it also keeps them fresh, it keeps them current and it allows you a mechanism to develop other people in the future. So very good if it's built into career development for supervisor, management development, technical roles, and it doesn't have to be purely operational, that could be, you know, HR people, finance, they'd all benefit from something like that.*
>
> Participant 9

> *And then I tried to pick people around the company to show that it won't just work for the production, design or an R&D environment, you know, to show it's not just men and it's not just the production environment. And I think that really helped. People could see that a member of the accounts team, a lady member of the accounts team can get a Six Sigma qualification and she can apply it in accounts, so there was multiplication of it around the factory. So I picked the first person who was the strongest candidate to make sure we had*

an early success, and then we opened up the scope of who could do it, and it works fine.

Participant 7

We developed an embedded Lean coach training programme where subject matter experts from their units would come to an eleven session training course and then, as a result of that, they would have ten per cent of their day, ten per cent of their time dedicated to improvement, and the rest of their time would be their original job. So it's more about job fulfilment and providing them a development opportunity.

Participant 10

This follows on the theme of becoming a learning organization, as one in which the employees continually acquire, share, and use new knowledge to adapt to an ever-changing environment: this ongoing organization renewal is what Senge (1990) defined as "an organization that is continually expanding its capacity to create its future".

6.3.5 Summary

Engaging the workforce and achieving buy-in to continuous initiatives programs was a key success factors respondents indicated in the interviews: communications, training and employee mobility were mentioned as important factors to achieve it.

Proactive and transparent communication, coupled with a feedback mechanism to ensure it's not only a one-way communication flow, was indicated as

central to achieving the objectives of the Lean Six Sigma deployment: when it came to the use of practices for engaging the workforce, there was twice as much data coming from those participants that perceived success or extreme success emanating from their deployment, suggesting a significantly more proactive approach to communications from participants who successfully deployed the program.

These are all characteristics of a learning organization, able to continually reinvent itself and able to expand its capacity to create its future (Senge, 1990): to successfully deploy and sustain Lean Six Sigma, it's then necessary to transition from the status of a trained organization, to that of a learning one.

6.4 Findings on Employee Motivation

In analysing participants' comments during telephone discussions on the theme of employee motivation, the category 'reward systems' emerged as the dominant theme under this topic, and having further analysed responses coded to this category, two sub-categories or themes were identified as follows:

- Non-Financial Rewards
- Financial Rewards

The weighting of these themes in relation to each other are shown in Figure 6.3:

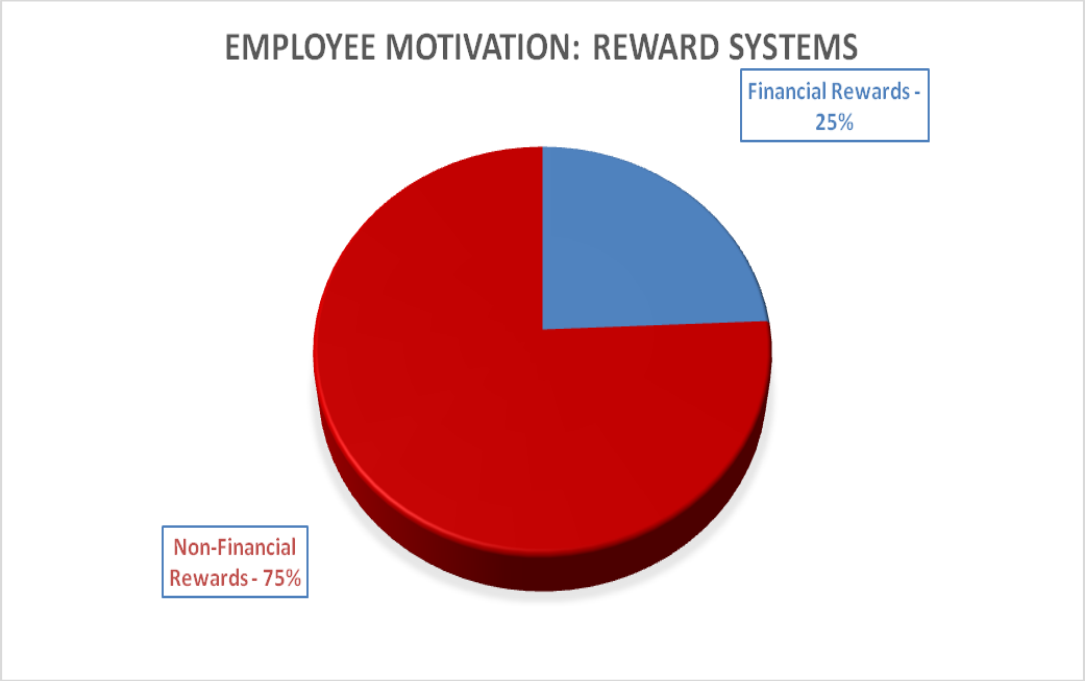

Figure 6.3 Employee Motivation: Reward Systems

On the theme of reward systems as employee motivators, participants suggested that there is no one-size-fits-all rubric on this issue, as encapsulated in the following comment:

> *Personally, I think the work in Lean and Six Sigma must be rewarded, however the specific manner of the reward I think is flexible and it depends on the culture of that organisation. GE has more of a financial culture and so financial rewards make sense to GE. For another company, maybe Google, while they have a different culture and maybe other types of reward would make more sense.*
>
> Participant 14

Interestingly, companies employing over one thousand people were twice as likely to consider financial as well as non-financial rewards as they were over represented by a factor of two, despite companies with greater or fewer than one thousand employees being equally represented in the interviewee group (Table 6.4).

T2 - Employee Motivation x Company Size	< 250	250 - 500	501 - 1,000	>1,000
Reward Systems	10	1	6	20
Financial Rewards	2	0	1	6
Non-Financial Rewards	8	1	5	14

Table 6.4 Matrix of Coding Pattern between Reward System and Company Size

Table 6.4 shows the number of mentions of financial and non-financial rewards by company's size of the respondent: respondents from companies with over one thousand employees mentioned the use of non-financial rewards twice as often (14) as financial rewards. Companies based in the US were over-represented in non-financial rewards and under-represented in financial rewards, making companies based in the UK or Ireland more likely to consider financial incentives as well as non-financial ones (Table 6.5).

T2 - Employee Motivation x Country	USA	UK / Ireland	Asia (not Japan)
1 : Reward Systems	16	16	5
2 : Financial Rewards	2	5	2
3 : Non-Financial Rewards	14	11	3

Table 6.5 Matrix of Coding Pattern between Reward System and Company Location

Table 6.5 shows the number of mentions for financial and non-financial rewards by geography of the respondent's company: one reward effective at achieving a particular performance outcome in one country may not necessarily achieve the same effect in another (Chiang & Birtch, 2012; Becton & Field, 2009), so it is not a surprise to see different rewards strategy across countries.

Adler (1997) asserted that employees with different cultural orientations may be motivated in different ways by an identical reward: non-financial rewards, such as alternative work arrangements, may be more effective in cultures where work-life balance and quality of life are highly valued (Oliver & Cravens, 1999).

Finally, participants who deemed Lean Six Sigma to be successful in their organisation mostly spoke about non-financial rewards, while those that felt the deployment was not particularly successful talked of both financial and non-financial rewards (Table 6.6).

T2 - Employee Motivation x Success or Otherwise	Extremely successful	Successful	Not Significant	Negative
1 : Reward Systems	6	11	17	3
2 : Financial Rewards	0	1	6	2
3 : Non-Financial Rewards	6	10	11	1

Table 6.6 Matrix of Coding Pattern between Reward System and Success of LSS

6.4.1 Financial Rewards

In relation to financial rewards, participants commented on various systems in operation in relation to rewarding employee participation in improvement processes. Such systems ranged from performance-related salaries to cash awards for best performers or for best projects to rewarding project participants with a percentage of the savings resulting from their improvement projects. Other participants highlighted financial incentives such as bonus schemes or salary increments as having proved effective mechanisms for motivating employees and even for enhancing staff retention levels:

A difficult question to answer directly, but yes, I'll give you one very specific example. One client managed to achieve their whole planned financial benefits for the first twelve months of the programme, in eight months. And I asked the manager concerned what was the reason for that and he said, 'it's very, very simple, leaders from the top right the way through are actually included in the success in the programme in the bonus structures of themselves and their staff', so they were all very, very highly motivated, if you like, to make the programme successful.

Participant 21

Those people who gained a formal Six Sigma qualification, the two that we went for was green belt and black belt, and we trained, I think two fulltime green belts and two fulltime black belts, and we recruited another guy who had a green belt and we gave them, the people who are still here after all this time, they're still here, they got an increment on their salary above and beyond what they would have just in the normal role that they're doing. I've got a black belt and a green belt here that have been with me for more than ten years and they did, you know, that training about 2003, 2004, 2005, and they've had that salary increment for all that time even though they've gone back to their normal role now but they're still able to bring that, you know, learning and analysis to difficult problems that we have in the company.

Participant 7

By contrast, Participant 20 talked about a company that launched an incentive

scheme whereby employees who came up improvement ideas would receive monetary reward, a scheme that yielded less than favourable results:

> *But what happened was that started this kind of culture where people were trying to cook up numbers and then showing improvement benefits, to gain the financial reward.*
>
> Participant 20

This highlights how pure financial rewards may be very useful in the short term to reach an immediate goal, but longer term they are not enough to drive the right behaviour around Lean Six Sigma, and continuous improvement in general, in the organisation. There is the need for employees to feel connected and empowered as a prerequisite for continuous improvement programmes: the reward system should provide incentives to motivate employees to participate further and continuously improve their own job (Sun et al., 2000).

6.4.2 Non-Financial Rewards

In their discussion of non-financial rewards, participants spoke about a variety of approaches that could be thought of on a spectrum ranging from what might be called symbolic recognition gestures to grounding qualifications and certification in career development pathways. Symbolic recognition gestures referred to management presenting project team members with souvenir plaques or cups, for example, or perhaps taking the team out for an evening's entertainment:

I've seen gift vouchers used, I've seen teams taken out for like a meal, so the manager or even the head of the site might take the team for like a celebratory meal, something like that.

Participant 13

However, while a celebratory dinner may not seem like an unusual gesture as a way for management to acknowledge a team's success, Participant 13 remarked on an unforeseen outcome of one such meal:

And funnily enough, I've seen those very well-received by the team involved but I have actually seen it generate suspicion within the kind of broader organisation because, certainly in the companies I have seen, it was unusual for shop floor people to be taken out for dinner with a department manager or the head of a site, and actually it created rumour and suspicion around the rest of the department and organisation, which we hadn't anticipated as a side-effect of just trying to say to this team thank you and well done, but other people wanted to know why these people were now the favoured few, if you like. So I've seen it well-received from the team but I've also actually seen it have a detrimental effect, more broadly.

Participant 13

Given that the notion of sharing ideas and collective problem-solving is central to Lean Six Sigma's philosophical underpinnings, it is regrettable that this gesture of thanks should have proved catalytic in generating a 'them and us' atmosphere in the workplace and this outcome could, perhaps, serve as a reminder of the centrality of cultural norms in organisational life and the need to take account of

them, for better or for worse, in the planning, executing and sustaining phases of Lean Six Sigma programmes.

With regard to employee motivation in relation to non-financial rewards, participants also talked about the role of recognition events and publicising of success stories in organisational literature and communication systems:

> *It's just recognising somebody for coming up with a good idea, recognising somebody for coming up with an improvement, so it's kind of embedded in your culture as important. But it's also important to have the formal recognition, like I say, events, you know, recognition events, weekly meetings, communications, newsletters, all of those things are important, everything that can re-enforce the message.*
>
> Participant 9

Other more substantial non-financial reward options talked about by participants included upon completion of training the newly qualified trainee would be assigned a project and provided with the resources necessary for its successful completion, or sponsoring employees for their further developmental needs, or rewarding project participants with certification:

> *There is one operational training that what we do is give recognition to the people who complete it in terms of providing them a function and delegation, providing support and delegation.*
>
> Participant 12

A good thing, good approach is in terms of reward and recognition which is not financial, maybe sponsor them for some, you know, off-site needs or sponsor them for some good training programme or reward them with some certification. So that could be a better way of sustaining the team.

Participant 20

Some participants suggested incorporating certification and qualifications into career development pathways as a non-financial reward system that could reap benefits both for the individual employee and the organisation as a whole:

Another type of reward is recognition in the organisation because in the organisation they are willing to do some appraisal system; some organisations, they give some weightage to Six Sigma-related activities in the appraisal system, so that it could help the goal of people to grow in that organisation also.

Participant 8

Many organisations, for example take these specialists, these process improvement specialists, and will intentionally take them out of their role and put them in a fulltime role as a black belt, or whatever the organisation chooses to call them, as an intern to your assignment, and their ability to migrate back into the organisation is based on their performance during this two-year period. And so if they thrive and do well they re-enter the organisation at a level above where they left as if they had been there for a couple of years; or if they don't do particularly well it's really obvious and they either aren't assimilated back into the organisation or they're

assimilated back in and have fallen behind their peer group. So I think…we don't usually put a lot of additional reward recognition stuff in place but instead try and align it so that it just is a natural part of the progression.

Participant 2

Finally, Participant 21 offered a vignette that is interesting for its portrayal of employee motivation that is rooted in both an individual and collective sense of fulfilment and pride in the organisation and its performance in a competitive environment:

One of the best companies that I worked with, at the time that we worked with them they were a winner of the European Quality award as well as running a Lean Six Sigma programme and PPM programmes and all the rest of it, the interesting thing is they got to a stage where eighty per cent of their workforce was actually involved in some kind of continuous improvement activity, which is really probably the biggest degree of engagement or depth of engagement that I've ever seen in an organisation. None of those people were financially rewarded in any way for what they did, at least not directly; but when you talked to them, what came across very strongly was they realised that firstly, it made their jobs more interesting and therefore they got a greater degree of job satisfaction in the day-to-day work they did, but secondly, they also felt that it gave the company competitive advantage and therefore was also making their jobs more secure. So the motivation in that company was very, very much one of job enrichment, job enjoyment and, if

you like, job security, and that was very, very powerful for them. But that degree of involvement, that degree of motivation had taken a very enlightened management team many, many years to actually get to that particular point.

Participant 21

Linking the Lean Six Sigma implementation to an appropriate set of rewards for the employees has been identified as a critical success factor in the literature, as seen in section 2.5 (Henderson & Evans, 2000; Snee & Hoerl, 2002; Coronado &_ Antony, 2002; Antony & Banuelas, 2002; Brue, 2002; Brun, 2011; Goldstein, 2001): truly changing behaviour over the long terms requires the Lean Six Sigma goals to be internalized from the employees on an individual level (Coronado & Antony, 2002), and the interviews showed us each individual may react differently to different incentives.

This is in line with literature on employee involvement as a pre-requisite to continuous improvement programmes (Sun et al., 2000). Employee involvement is defined as a process designed to empower members of an organisation to make decisions and to solve problems appropriate to their level in the organisation (Pace, 1989). The more employees are involved in continuous improvement programmes, the more they contribute to them, feeling a sense of ownership towards them, and are more committed to their success (de Jager et al., 2004).

Harry & Schroeder (2000) showed that 61% of the top performing companies link their rewards to their business strategies, while lower performing companies create minimal linkages: Lean Six Sigma provides a clear metric of success on projects' deliverables, that can be used for performance measurement and

compensation. This can, in turn, be used as a way to encourage successful selection and completion of Lean Six Sigma projects (Henderson & Evans, 2000), in a positive reinforcement loop.

6.4.3 Summary

While the theme of a 'reward system' emerged as a critical one while talking of employees' motivation, most participants suggested that there is no 'one size fits all' rubric on this issue, with many incentives, from financial to non-financial ones, used widely in the industry, dependent also on industry and regional norms of where the organization operates.

Most companies prioritized non-financial rewards, but organizations with more than 1,000 employees were twice as likely to consider financial as well as non-financial rewards. Companies based in the US were over represented in non-financial rewards, while the ones based in UK or Ireland were more likely to consider financial incentives as well as non-financial ones.

The discussion on rewards systems was dominated by three of the sectors in the study: retail & consumer service, internet & online, pharmaceuticals & biotechnology companies. Sixty percent of all data recorded at these codes in the interviews transcripts came from these three sectors, while representing approximately forty percent of total participants. These three sectors placed more emphasis on non-financial rewards than financial rewards.

Participants who deemed Lean Six Sigma deployment to be successfully in their organization almost universally spoke about non-financial rewards as best way to encourage employees' motivation, while those that felt the deployment was not

having a positive impact were those that discussed financial as well as non-financial rewards.

6.5 Findings on Leadership Style

In analysing participants' comments during telephone discussions on the theme of leadership style, each respondent framed their response around a series of factors that they thought shaped the leadership in their organisation. Hence, a category entitled 'differing approaches according to ...' emerged, in the interview coding, as a catch-all working title for housing participants' articulated experiences and perspectives on the relationship between leadership approaches and success levels of deployments. Having further analysed responses coded to this category, seven sub-categories or themes were identified suggesting that participants considered the role of leadership in Lean Six Sigma deployments against a background of seven contextual factors as follows:

- Hierarchical Roles, Responsibilities, Relations
- Leadership Perceptions of Lean Six Sigma
- Stage of Programme
- Programme Option
- Organisation Size and Culture
- Resources Available
- External Forces

Table 6.7 illustrates the number of interviews where 'differing approaches according to…' was mentioned as an important factor and the number of references to each one of the sub-themes:

Contextual Factor	Number of interviews mentioning each contextual factor	Number of references to each contextual factor
External Forces	1	1
Hierarchical Roles, Responsibilities, Relations	19	37
Leadership Perceptions of Lean Six Sigma	10	19
Organisation Size and Culture	1	3
Programme Option	5	6
Resources Available	2	3
Stage of Programme	9	12

Table 6.7 Number of References to Leadership Contextual Factors

The weighting of these themes in relation to each other are shown in Figure 6.4:

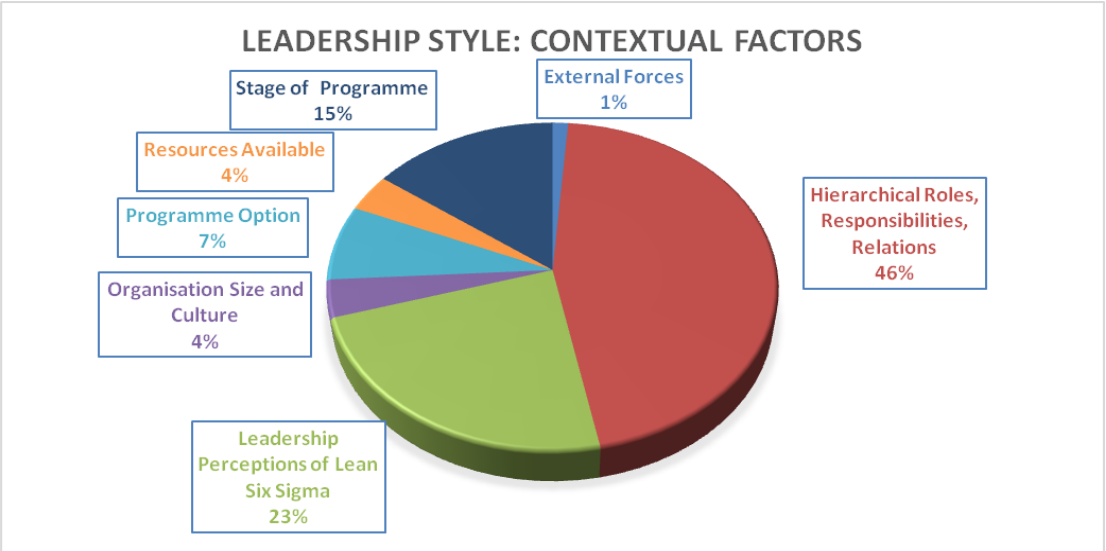

Figure 6.4 Leadership Style: Contextual Factors

Themes and issues relating to leadership style were significantly mentioned more by participants from organisations with less than one thousand employees, than by participants who hailed from organisations with more than one thousand employees (Table 6.8 shows the number of citations for each factor based on respondent's company size). Also, there was a clear pattern, with participants from retail and consumer services organisations talking significantly more about leadership style and related contextual factors, than did participants from any other sector (Table 6.9 shows the number of citations for each factor based on respondent's company sector).

T3- Leadership Style x Company Size	< 250	250 - 500	501 - 1,000	>1,000
Differing Approaches According to Contextual Factors	35	6	33	2
External Forces	0	0	1	0
Hierarchical Roles, Responsibilities, Relations	13	1	21	2
Leadership Perceptions of Lean Six Sigma	14	1	4	0
Organisation Size and Culture	3	0	0	0
Programme Option	2	1	3	0
Resources Available	2	1	0	0
Stage of Programme	6	2	4	0

Table 6.8 Matrix of Coding Pattern between Leadership Style and Company Size

T3 - Leadership Style x Sector	Health Care	Pharmaceuticals & Biotechnology	Internet & Online	Retail & Consumer Services	Management	Government & Trade	Industrial Goods & Services	Financial Services	Electronics & Semiconductors
Differing Approaches According to Contextual Factors	5	8	13	20	9	6	4	4	7
External Forces	0	0	0	0	0	0	0	0	1
Hierarchical Roles, Responsibilities, Relations	4	2	8	9	2	4	2	4	2
Leadership Perceptions of Lean Six Sigma	1	2	2	8	4	0	1	0	1
Organisation Size and Culture	0	0	0	0	3	0	0	0	0
Programme Option	0	1	1	2	0	2	0	0	0
Resources Available	0	1	0	0	0	0	0	0	2
Stage of Programme	0	2	2	6	0	0	1	0	1

Table 6.9 Matrix of Coding Pattern between Leadership Style and Company Sector

Without top management support and involvement the improvement effort is likely to wither on the vine (Snee, 2010): it is necessary for top management to create a real sense of urgency about the need to improve and doing things that increase the likelihood of success. This is even more visible in organizations with less than a thousand employees, where top management is less removed from the employees, versus a larger organization where interactions between top management and employees are less likely.

Although the Lean Six Sigma approach originate in the manufacturing industry, its popularity and usage in the service industry has grown significantly since the early 2000s (George, 2003): while manufacturing organizations built process improvement efforts on an established base of measurable processes and established quality management programs, service organizations have often struggled to develop and apply measurements of quality and process improvement (Antony et al., 2007). Hence the need for a stronger and steadier leadership intervention to support Lean Six Sigma deployment in service organizations, as highlighted from interviewees respondents from retail and consumer services organizations.

Lean Six Sigma is attractive to many service organizations because of its customer-driven methodology (Taghaboni-Dutta & Moreland, 2004): in many service organizations, the purpose of introducing a Lean Six Sigma program is to establish and map the key processes that are critical to customer satisfaction.

6.5.1 Hierarchical Roles, Responsibilities and Relations

Many of the participants pointed to the importance of these three R's in the context of good leadership practice, meaning clearly defined and understood roles and responsibilities at senior, middle and junior management levels and harmonious symbiotic relationships between these levels form the linchpin of successful approaches in rolling out and sustaining Lean Six Sigma improvement programmes, and this premise is succinctly and best exemplified in the following comment made by Participant 10:

> *I think the top leadership sets the strategic priority and cascades their vision for Lean and Six Sigma throughout the organisation. It's the next level, the director, leader, and manager level that translates that strategy into more operational and tactical goals for their department and their staff, so that everything is aligned, that they are supporting the day-to-day, month-to-month activities of the department, teaching you to improve utilising your standardised methodology, supporting things at their level, both championing to their staff and referring things to the top, so that everything continues to be aligned and progressing in a common direction.*
>
> Participant 10

Academic research on the exact roles and responsibilities within the Lean Six Sigma deployment has been limited (Zu et al., 2010; Schroeder et al., 2008), so often companies have assigned responsibilities following guidelines from benchmark organizations (e.g. Motorola, General Electric), Antony & Karaminas (2016).

Participant 16 pointed in more detail to the inter-dependent relationship between senior and middle management and, by drawing a distinction between the concepts of leadership and management, highlighted the differing skill sets needed at both these levels in order to best enact their mutually re-enforcing roles and responsibilities:

> *I mean for me, management is about managing complexity. I kind of fall back on my old Harvard Business School teachings where they used to say leadership is about managing change, management is about managing complexity, and the reason we get them confused is they've both got the word managing– one's managing change, one's managing complexity. For me, middle management is about managing the complexity of Lean Six Sigma, it's about managing the challenges, the resources, the plans, the roll-out, the implementation, the realisation of benefits; and that to me is a complex challenge and requires the very best in our Lean Six Sigma managers. From a Lean Six Sigma leadership point of view, this is more about communicating a vision, a message, of embracing a set of values on which Lean Six Sigma depends. It's about being able to, on the one hand, talk to the stockholders, on the other hand communicate to the board, on the other hand communicate to the customer, to be able to communicate to the employees, where you're trying to take this organisation, what you're trying to do with this organisation, and actually that's a very different skill set, it's about how you kind of motivate the resource to change, motivate the organisation to change,*

whereas those middle managers are charged with the job and the complexity of making that change.

Participant 16

Although the roles of middle and senior management may differ, particularly based on the organisation size, the difference between leading and managing is well known: while management implies leadership, it is possible for leaders to not be managers. Beech (2002) sees leadership as a facet of management that can be undertaken independently, without the formal authority of management.

Leadership is about making choices (Kouzes & Posner, 1987). It can be considered a source of beliefs and values with the ability to motivate people and get them to cooperate in order to achieve a particular goal (Mostovicz et al., 2010). The leadership adopted by the organisation management may have a significant influence on the employees: the leader's attitude may lead to a positive employee perception regarding his or her involvement in continuous improvement projects (Pamfilie et al., 2012). While Participant 16 pointed to the roles and responsibilities of senior and middle management, Participant 2 looked to the role of junior management and the skill set needed at this level if deployments are to be successful:

As you get closer and closer to the working level, familiarity with the actual problem-solving process which is a fundamental nugget of Six Sigma, and also a real working understanding of Lean, is ... a better understanding of those details is more and more important the lower that you go in the organisation, because at some point you need that, you're almost at the execution level and you get to the first level supervisor with a very small

team, they're actively engaged in identification and solving the problems, so they need to be expert in problem solving.

Participant 2

However, developing a workforce that is characterised by clear understandings of the various roles and responsibilities and by coherence in relationships along the chain of command is not without its challenges, as explained by Participant 11:

We are, I guess, two or three years into a process of implementation now and one of the challenges I have at the moment is figuring out, with the middle management, where the responsibilities lie in terms of sustaining this programme. So what has developed is a heavy reliance on the central Business Process Improvement Team and for lots of reasons, including capacity, that's unsustainable. So one of the large focuses for me at the moment is helping middle management understand what their role is in terms of Lean leaders longer-term. So they are supportive, but they're largely reliant on our team and it's something we just need to work on.

Participant 11

Participant 13 also commented on challenges that may impede improvement initiatives where, for example, tension arises between the priorities of projects and of day-to-day workloads:

In my previous job, what I did see was that they would select people based on their characteristics or their other abilities, if you like, other than knowledge

of the process. The difficulty, certainly that I saw, I've come across, was these people then when they were asked, let's just say they worked in sales but they were going to be part of a production project, their sales manager was very resistant to giving them the time to go and work on that project because it didn't directly impact him, so I've seen practical difficulty in getting those people involved in the projects.

Participant 13

Perhaps as a counter to this dilemma where managers may be reluctant to release project members, Participant 15 suggested a need for senior level management to take a firm stance in ensuring continuity of priorities along the chain of command and of shared management responsibility for the smooth running of deployment programmes:

I think from the top it has got to be, the top management has to take a hard-line approach to say 'yes you will do this'. It's in the objectives of the middle managements, so it's come down from the top to say 'this is your objective, you're going to be assessed on this, so you will need to do this' – and they're measured on it. So you're taking away the onus for success and failure from the belts and putting it on the managers, middle managers and senior managers.

Participant 15

There can be no doubt, however, that middle management plays a pivotal role in the deployment process as it is at this level that the improvement aspirations of

senior management are brought to life and, in order to execute the improvements, middle management needs adequate resources and support:

> *Yeah, I think there has to be dedicated focus on the middle management for basically bringing in a Lean Six Sigma focus or movement because to me middle management are the people that influence above and below, and I think that they have to be really given the right resources and the support and the training required. I think that's the area that senior team should really invest in, making sure that they are of a certain qualification, whether that be agree to be green belt because they will then influence their teams and also they're capable enough to influence the organisation as well. So I just think that the difference with them is the senior team really needs to get their buy-in and spend more time with them than say feeding this down to every part of the organisation, they're the key people to actually get to, in my opinion.*
>
> Participant 5

And indeed, Participant 18 spoke of instances where middle level managers had not only endorsed improvement projects but had signed up for training and led by example:

> *I've seen some of the very good middle managers have actually gone and done the Lean Six Sigma training, they show leadership by example, and even gone into a little bit more detail of it in terms of getting involved in the actual projects and participating, not just as a kind of a stakeholder, but as a project team member. I think that's very, very useful in terms of bringing everybody*

else along because they see that leadership in action and I think that's quite important.

Participant 18

Participant 9 suggested that the development of a workforce that is characterised by clear understandings of the various roles and responsibilities and by coherence in relationships along the chain of command cannot be attained unless both senior and middle management are bought in as a starting point:

Ideally, you have buy-in from both. If you don't have it in both cases you always have a dilemma because if the middle management have bought into it, they're going to come back and say, 'well, that's fine, but if my manager won't do it, then it won't work'. If the leadership are bought into it, then their challenge is how do they convince the middle management because they might see it as a threat. So I think fundamentally it has to be right in both cases. In terms of a priority, it probably has to be right at the site leadership first, then at the next level, but ideally it should be right in both.

Participant 9

6.5.2 Leadership Perceptions of Lean Six Sigma

In analysing participant discussions on the theme of leadership style, how leadership perceives Lean Six Sigma emerged as another contextual factor impacting deployments.

This is of particular importance, as top management support is considered a critical success factor for deploying Lean Six Sigma, as discussed in section 2.5 (Antony & Banuelas, 2002): without the continuous support and commitment from top management, the true importance of the deployment would start to be questioned from employees and it will be weakened (Pande et al., 2000). But for top management to properly support, and provision appropriate resources and training, it's dependent on the organization's leadership perceives Lean Six Sigma.

Participant 16 drew a distinction between leadership perceptions of Lean Six Sigma merely as a toolkit for fixing problems, or, primarily as a philosophy, a way of thinking, to be, over time, engrained into the workplace culture:

> *For me, it comes down to how the leaders of an organisation view Lean Six Sigma. If they view it as a collection of tools, methodologies and processes to solve a problem, when it becomes difficult those leaders will look for something else, they don't have faith in it. If you want a successful Lean Six Sigma implementation, it's vital that the leadership team believe that it is more than just a toolkit to solve problems, that they believe it's more than just a collection of methodologies and processes and ways of working, that actually there's a whole ethos, a whole mind-set that they are potentially embarking on.*
>
> Participant 16

If the organization's leadership perceives Lean Six Sigma as 'just another initiative', it will be difficult to overcame employees' resistance to change and get

them fully involved. But for leadership to be fully bought in, the underlying Lean Six Sigma principles must be taught to senior managers within the organization, for them then to strongly influence and enable the change in the business organization, also positively influencing employees' attitude to the program (Henderson and Evans, 2000).

Participant 5 commented too on lack of fully understanding the principles and practices of Lean Six Sigma and consequent lack of engagement as impediments to success in deployments:

> *Some of the bad practices are really probably around deployment, not really being the champions of it, so again, not investing their own time, not understanding it, talking the talk but not walking the walk, so very much kind of saying, you know, 'we want to be Lean, we want to have a Lean Six Sigma culture', but really not understanding the principles of it and they're not investing the time themselves or the resources, and actually doing things that are very much, you know, not a Lean Sigma methodology, pretty much doing what they've done before but, you know, not adopting 'okay this is the way it should be done' and taking the time to follow through on that methodology.*
>
> Participant 5

Participant 15 took possible implications of lack of understanding of Lean Six Sigma one step further:

> *Yeah, so I think there's still an issue, leadership tends to think they can just buy this, you know, pay somebody to come and do some stuff and it's going to*

turn their business around, so with that approach I think there's limited success.

Participant 15

Indeed, a successful implementation of Lean Six Sigma requires adjustments to the organization's culture and a change in attitude of its employees, that cannot be achieved with just the hiring of external consultants: it is difficult for employees to be motivated and accept responsibility for the quality of their own work, if they feel this is something imposed on them from a leadership team that doesn't understand the realities of the work.

Participant 16 suggested that, with experience, as deployments expand and develop, so too should leadership perceptions of Lean Six Sigma grow and develop, most notably in terms of increasing their understanding of potential applications for Lean Six Sigma in alignment with wider organisational strategies and goals:

It's critical that we think of leadership as managing change, we think of leadership as a way in which we mature into the situation. So a good leader will, in the early days think 'this looks an interesting idea, it's going to help me', but actually as their experience of Lean Six Sigma grows, they evolve in their understanding of what it can and cannot do for them, and they develop their business accordingly. But it's very much, for me leadership is key, it's probably more important than anything else in the sense that that drives the attitude towards Lean Six Sigma and it will drive the attitude of whether we want to fully embrace it or whether we just want to use it to solve a problem.

Participant 16

Overall, participants suggested that leadership fully understanding the principles and practices of Lean Six Sigma and leading by example is central to creating the ideal conditions for success in deployments, and this suggestion is encapsulated in the following extract:

> *I mean first they have to believe in it themselves. I think they have to really be champions for Lean Six Sigma and I think they have to, to bring them forward, they have to basically live by those rules, not doing things ad hoc, spur of the moment making decisions. I think they have to really, where possible, try and actually tap the right channels that they're actually doing it that way, that their senior team are adopting this mind-set. So I think it's a case of them casting the right shadow, them actually doing, making sure that their teams are fully trained in the disciplines and the tools and so on, so if they're doing it right within their teams, then that will actually grow into other parts of the organisation, but really making sure that they do it right themselves and then obviously then being able to share what they've actually done and follow it all the way through. I think that's the key to success there.*
>
> Participant 5

6.5.3 Stage of Programme

In analysing participant discussions on the theme of leadership style, the idea that rollout and sustainment phases require different forms of leadership emerged as another contextual factor impacting deployments, best articulated by Participant 3:

> *At the start of the programme I guess leaders are trying to generate some buy-in and some enthusiasm and, you know, provide a bit of a vision for the*

future, how things can be if people get involved in the programme and deliver some of the success. I think that's probably easier than when it comes later on to when you have to sustain it, because organisations these days are often already laden with regards to the resources that they have available to begin to work on some of these areas and because individuals probably already have quite a lot on their plate, it can be quite difficult to identify the time and the resources to sustain some of the improvements that are going on. So for the leadership that's required later on in the programme it's about not just falling back into firefighting mode and just dealing with the immediate needs of the organisation on a day-to-day basis but setting more of a longer-term view or vision for the organisation, and so that is a bit different from just generating enthusiasm at the start. You know, any programme will go through a cycle that normally you would start a programme with the high type of leadership that's required, and thereafter it's working through the lows and how to help people and support people and making sure that the whole thing just doesn't fall apart because immediate priorities can get in the way of longer-term views. So I do think that a little bit different leadership is required from the start and sustaining the programme.

Participant 3

Raje (2009) examined the level of maturity of a Lean Six Sigma deployment and individuated five different stages: launch, early success, scale replication, institutionalization and culture transformation.

The 'launch' stage is the starting point, where few employees start to get

involved, training is started, and projects begin. The 'early success' stage is where these initial projects start to bring results and early successes are achieved. The 'scale replication' stage is where the early success in some departments led to other areas of the organization to get involved into Lean Six Sigma, with a broader set of projects underway. The 'institutionalization' stage is where positive financial impact start to have an effect on the organization overall, the stage where Lean Six Sigma moves from being just another initiative to embed into the organization. Finally, the 'culture transformation' is where Lean Six Sigma became part of the organizational DNA.

Interviews highlighted how a different leadership style may be needed at different stages of the program: from the more entrepreneur style of the early phases, with the willingness of experimenting and piloting new approaches, to a more programmatic style when deploying the program at scale.

As the Lean Six Sigma program evolve in the organization, also its perception from leadership change: in the previous section it was noted that Participant 16 suggested that, as programmes mature and expand, so too should leadership's perception of Lean Six Sigma develop, especially in terms of gaining an increased understanding of potential applications for Lean Six Sigma in alignment with wider organisational strategies and goals. This idea, articulated by Participant 16, was re-enforced by Participant 21 in relation to stages and phases of deployments:

> *I think you need to look at the different stages, though, and degrees of maturity of Lean Six Sigma programmes here. Essentially, I could characterise the phases that most organisations start off a Lean Six Sigma*

programme in a kind of proof of concept type way, probably from a single function or single division; there is a degree of acceptance, if you like, and support from the leadership team but still some kind of, not total commitment yet, until they see the outcome of the proof of concept. Once you have proof of concept and it starts to roll out more widely, yes, you're more likely then to get stronger backing from the leadership. The next phase beyond that is when organisations start to use Lean Six Sigma more strategically, I would say rather than picking projects because they, you know, 'we've got a broken process here or our performance in a particular area of the business isn't what we'd seek it to be', they transition from that to 'so, what's our future business strategy, what's it calling for in terms of organisational and operational capability' and effectively align the selection of projects through some kind of strategy deployment mechanism, which obviously will be a significantly more advanced stage, obviously, to get to that stage you would have to have a very high degree of commitment to the approach from the leadership team.

Participant 21

As the deployment progresses from the 'launch' to the 'culture transformation' stages, a progress that can take years, the leadership's perception also evolve from an experimental to a more committal understanding of its benefits for the organization overall.

6.5.4 Programme Option

In analysing responses coded to the theme of leadership style, the programme option emerged as another contextual factor considered by participants, and this factor was closely related to leadership perceptions and understanding of Lean Six Sigma principles and practices:

> *I think it is a different approach but it's more to do with their understanding because what I'm seeing is people who don't understand Lean and Six Sigma, you know, they've picked something up but they think Six Sigma is the answer, and they try to dive in, which is normally a step too far for them to start doing complex Six Sigma projects.*
>
> Participant 15

Whether an organization gets to implement Lean Six Sigma starting from with Lean, or Six Sigma first, or directly into Lean Six Sigma, has an impact on leadership's perception of the program in its early stages and may requires a different leadership style. Often, as noted from Participant 15, the choice is more causal than intentional: leadership may be aware of a problem in their organization, and may have heard of Lean or Six Sigma and decided to give it a try.

Participant 15 also concluded that deployments are more successful where organisations embark on simple projects first, to understand the underlying methodology and to master the tools, and graduate to more complex projects afterward:

Where it's been more successful is they start off with simpler projects, so they're using more Lean and less Six Sigma, and then they progress onto the more complex project where it's the other way around, where they're using more Six Sigma techniques and less of the Lean techniques.

Participant 15

Participant 2 suggested that differing leadership styles are required according to whether the organisation opts for Lean or for Six Sigma deployments: with the former option, senior management can delegate to line management, whereas with the latter, a much more responsible and comprehensive approach is required of them:

I think they're slightly different. If you look at more traditional Lean, traditional Lean is much more a frontline-focused approach with daily huddles and local…easy to improve things for elimination of waste et cetera. Six Sigma always has as part of its roll out deployment some form of strategic alignment, some form of ensuring that the projects being worked on are related to some important task for the company. So for Six Sigma-related deployments, the senior executives are encouraged, strongly encouraged to come up with a few high level deployable priorities that are real clear with metrics and goals and compelling stories. And so much more active involvement in, if you were going to separate Six Sigma from Lean, much more active involvement in Six Sigma. And then Lean, they tend to deploy, tell somebody go do Lean, and it's viewed as much more of a frontline activity.

Participant 2

Lean has lower barriers to start, as it requires less technical knowledge and hence it is easier to engage front line staff on it, while Six Sigma, with its more technical basis, requires more intense training: as a result, most companies starts their Lean Six Sigma journey applying Lean tools and techniques first, before then moving to more complex Six Sigma tools and techniques (Antony, 2011). As the program evolves in an organization, so does the way it is perceived from leadership, and the leadership style adopted.

6.5.5 Organisation Size and Culture

In analysing responses coded to the theme of leadership style, organisation size and culture emerged as another contextual factor considered by participants.

An appropriate organizational culture is widely considered a necessity for successful implementation of Lean Six Sigma (Antony and Banuelas, 2002; Cheng, 2007; Kwak and Anbari, 2006), however little research has been done to examine the implementation of Lean Six Sigma relative to organizational culture. Schroeder et al. (2008) have called for research investigating the question of internal fit in Lean Six Sigma implementation, i.e. what types of organizations can successfully adopt Lean Six Sigma and what changes in culture and structure may be required.

Zu et al. (2010) highlights how leadership should assess their company's current cultural values and develop necessary action plans and policies to create a supportive cultural environment for Lean Six Sigma.

An example of this may be witnessed in a perspective offered by Participant 2:

> *What we've found in organisations which are open and receptive to change, who want to embrace the true meaning of Lean Six Sigma, actually starting it up and having a hundred per cent employee engagement is vital for success. If there is a history of negativity, a history of problems, a history of 'we've been there, we've done it before', much better to start right at the bottom, do a little revolution somewhere out of the way, very quietly, under the radar, and then build momentum from there. So I see it very much as two different approaches. Now, those two approaches can work well in tandem in very large organisations where actually there's often a disconnect, you work for an enormous organisation and you might feel at times that there's a real disconnect between the top of the organisation and the bottom, and in those kinds of environments it can work very well to start a revolution right at the bottom and right at the top simultaneously.*
>
> Participant 16

This also highlights that the relationship between organizational culture and Lean Six Sigma deployment is bi-directional: one on hand, Lean Six Sigma must fit to the existing culture to succeed; on the other hand, Lean Six Sigma implementation may change an organization's culture (Lewis, 1996): when an organization starts to adopt Lean Six Sigma, whether and how its existing culture can support it is important. However, with its continuous implementation, employees' beliefs and

attitude may be changed, leading to changes in the organization's culture (Zu et al., 2010).

6.5.6 Available Resources

In analysing responses coded to the theme of leadership style, the level of resources available emerged as another contextual factor impacting deployments. Participant 19 and Participant 9, stressed the importance of choosing projects for which adequate resources can be provided in order to meet the twofold aim of both achieving success and generating exemplar projects that can be showcased as a mechanism for keeping momentum in employee enthusiasm and commitment to improvement initiatives:

> *Now, when it comes to launching projects, they have to look at how much resources they've got, in other words the Six Sigma group, the Lean practitioners and the Six Sigma practitioners, how many resources do we have, and they have to take a vested interest in making sure that the right projects get launched. So in other words, it's all about prioritisation now, so leadership has to take an active role in making sure that the projects with the highest impact and the least amount of risk get launched, because you only have a finite number of resources and you have an infinite number of projects, leadership has to take an active role in making sure that the highest-impact, lowest-risk projects get launched and assigned the resources.*
>
> Participant 19

Focusing on one or two projects that you know are going to be resourced properly, that you know you're going to showcase the methodologies, and then, over time, start to roll it out to a wider audience.

Participant 9

It's a key leadership responsibility to ensure an effective organizational infrastructure is in place to support the Lean Six Sigma deployment: this goes from the appropriate level of training for the employees involved, to the executive sponsorship of projects, providing guidance to the project teams and to find and negotiate internal resources and budger for the project (Antony and Banuelas, 2002).

6.5.7 External Forces

Lean Six Sigma cannot be treated as yet another stand-alone initiative, but it needs to be clearly linked to the overall business strategy of the organization (Pande et al., 2000).

Participant 7 talked about the impact of external forces on deployment decisions, describing external factors, such as changing customer demands and economic environments, that forced change upon his organisation, but with positive longer-term outcomes, however:

Change is always difficult for people. So when you try and introduce anything, some employees think 'oh, it's just a new initiative, I've just got to wait long enough and we'll forget about it'. So a lot of people throughout the organisation have been reluctant to change but, you know, over the course of

the last twelve, thirteen, maybe fourteen years, we've had various, you could almost say crises, that forced you to change. One of them was this initial one where a customer suddenly came to us and they wanted a lot of product very quickly and that's when I first learned about Lean, about how in principle we could respond to that kind of demand. And other times when, you know, we've had depressions and recessions and all sorts and you just have to re-organise and we found that going the Lean way has really helped every time. We've done some recent Lean improvements in our order entry, automating as much as possible order entry from regular customers, and everybody now is really positive about that.

Participant 7

As the success of Lean Six Sigma deployment is based on adherence to a whole new way of conducting business, instead of just the usage of a few tools and techniques (Dale, 2000), in order for the organization to be able to respond effectively to external forces, it requires the program objectives to be linked to the overall business strategy, with clear criteria for the selection and prioritization of areas where to apply Lean Six Sigma first (Antony and Banuelas, 2002).

Pande et al. (2000) individuated three broad categories of prioritization criteria: business benefits criteria, feasibility criteria and organizational impact criteria. Linking Lean Six Sigma deployment success to the business strategy is an important leadership responsibility.

6.5.8 Summary

Leadership was the most discussed subject in the interviews: themes and issues relating to leadership style were significantly more talked about by participants from organizations with less than a thousand employees, than by participants from larger organizations. In organizations where leadership is more visible and closer to employees, its impact on deployment is larger than in organizations where leadership is remote due to the organization's size.

Almost 50% of all data coded to leadership styles came from retail and consumer services and from internet and online companies, and further statistical analysis in relation to the study sample sectors, figure 6.5, showed a clear pattern that participants from customer service led organizations talked significantly more about leadership style and related contextual factors, than did participants from any other sector.

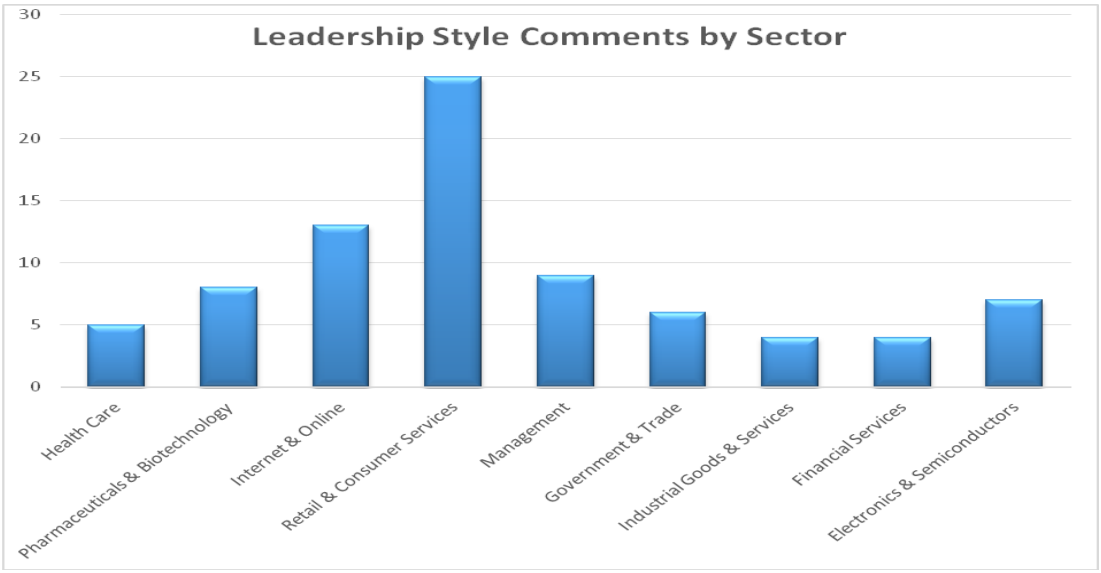

Figure 6.5 Number of Leadership style comments by sector

6.6 Findings for the Programme(s) Deployed

In analysing participants' comments during telephone discussions on the theme of programmes deployed (Lean, Six Sigma, Lean Six Sigma) three categories emerged under this topic, namely:

- Success Factors in Deployments
- Metrics for Evaluating the Success of the Programme
- Language / Terminology

The weightings of these three categories in relation to each other are shown in Figure 6.6:

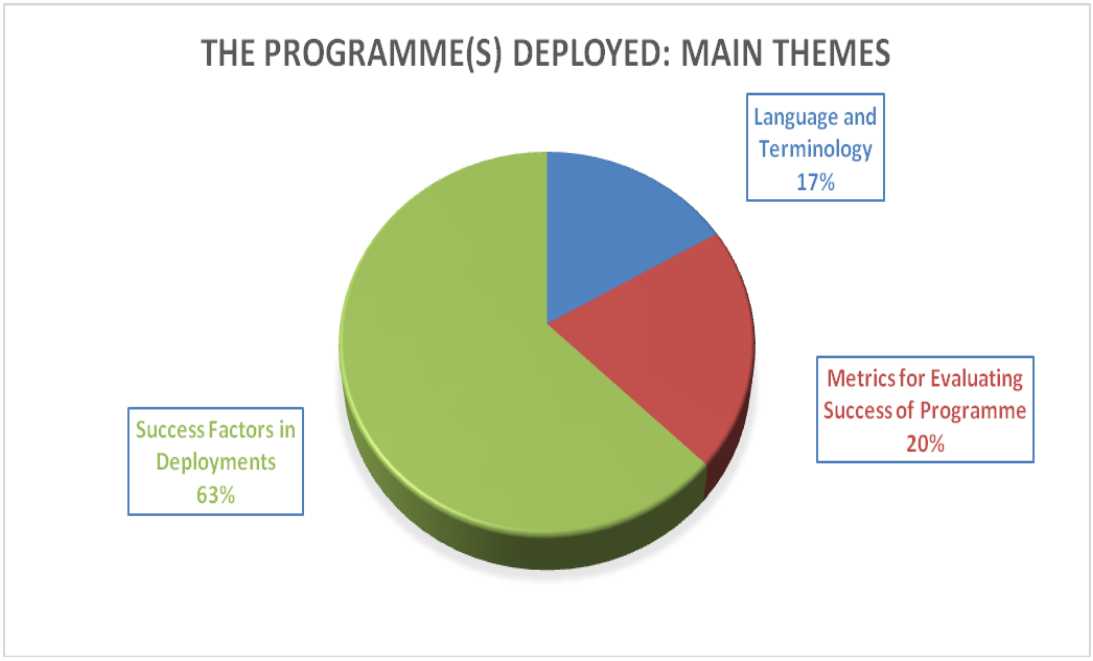

Figure 6.6 The Programme(s) Deployed: Main Themes

Issues relating to the programme(s) deployed, especially leadership commitment, were significantly more talked about by participants from organisations with less than one thousand employees (Table 6.10 shows the number of citations for each factor across different respondents' company size), and from participants operating in retail and consumer services, internet and on-line services, and healthcare (Table 6.11 shows the number of citations for each factor across different respondents' company sectors).

These coding patterns were consistent with the findings of the previous section: just as participants from smaller and service led companies talked more about leadership style than participants from any other sector, so too, participants from these sector types and company size talked more about leadership commitment as a CSF in Lean Six Sigma deployments.

T4 - The Programme(s) Deployed x Company Size	< 250	250 - 500	501 - 1,000	>1,000
The Programme(s) Deployed	23	7	41	4
Language and Terminology	4	3	5	1
Metrics for Evaluating Success of Programme	5	1	8	2
Success Factors in Deployments	15	3	30	1
Addressing Employee Concerns	0	0	4	2
Building Trust	0	0	4	1
Culture of Acknowledging problems	3	1	2	0
Inclusive Bonus Structure	1	0	1	0
Leadership Commitment	10	2	18	1

Table 6.10 Matrix of Coding Pattern between Programme(s) Deployed and Company Size

T4 - The Programme(s) Deployed x Sector	Health Care	Pharmaceuticals & Biotechnology	Internet & Online	Retail & Consumer Services	Management	Government & Trade	Industrial Goods & Services	Financial Services	Electronics & Semiconductors
Language and Terminology	3	2	2	3	0	1	0	1	1
Metrics for Evaluating Success of Programme	4	2	0	3	1	0	1	4	1
Success Factors in Deployments	9	4	9	10	2	3	3	2	7
Addressing Employee Concerns	0	0	1	0	0	0	1	3	1
Building Trust	2	0	1	0	0	0	0	1	1
Culture of Acknowledging problems	2	1	0	2	0	0	0	0	1
Inclusive Bonus Structure	0	0	0	1	0	0	0	0	1
Leadership Commitment	5	2	7	7	2	2	3	1	2

Table 6.11 Matrix of Coding Pattern between Programme(s) Deployed and Company Sector

Coding patterns consistently supported the outcome that smaller, service driven participants placed greater emphasis on leadership commitment in successfully deploying Lean Six Sigma in their respective organisations, as illustrated in Figure 6.7:

Figure 6.7 Leadership Commitment by Company Sector

This is also reflected in the literature: in smaller companies, the leadership is more visible and accessible to all employees, making it even more important for the

leader(s) to show commitment to Lean Six Sigma and come across as authentic (Jensen & Luthans, 2006).

The service industry has its own special characteristics, which differentiate it from manufacturing and make the application of Lean Six Sigma tools slightly different (George, 2003; Laureani & Antony, 2012). Special characteristics of the services industry can be summarised in the following main areas (Kotler, 1997; Regan 1963; Zeithmal, Parasuraman & Berry 1985):

- Intangibility: Although services can be consumed and perceived, they cannot be measured easily and objectively, like manufacturing products. An objective measurement is a critical aspect of Six Sigma, which requires data-driven decisions to eliminate defects and reduce variation. The lack of objective metrics is usually addressed in service organisations through the use of proxy metrics (e.g. customer survey).

- Perishability: Services cannot be inventoried, but are instead delivered simultaneously in response to the demand for them. As a consequence, service processes contain far too much ‘work-in-process’ and work can spend more than 90% of its time waiting to be executed (George, 2003).

- Inseparability: Delivery and consumption of service is simultaneous. This adds complexity to service processes, unknown to manufacturing. Having customers waiting in line or on the phone involves some emotional management, not present in a manufacturing process.

- Variability: Each service is a unique event dependent on so many changing conditions, which cannot be reproduced exactly. As a result of this, the variability in service processes is much higher than in manufacturing processes, leading to very different customer experiences.

Owing to these inherent differences, it has been harder for service organisations, such as financial companies, health-care providers, retail and hospitality organisations, to apply Lean Six Sigma to their own reality. However, there are also great opportunities in the service organisations (George, 2003):

- Empirical data has shown the cost of services are inflated by 30–80% of waste.

- Service functions have little or no history of using data to make decisions. It is often difficult to retrieve data and many key decision-makers may not be as 'numerically literate' as some of their manufacturing counterparts.

- Approximately 30–50% of the cost in a service organisation is caused by costs related to slow speed, or carrying out work again to satisfy customer needs.

In order to unlock these benefits, companies operating in the services industry need a visible, authentic leadership that can get employees involved and committed to continuous improvement (Kasper, 2002).

6.6.1 Success Factors in Deployments

Having further analysed responses coded to theses category, five sub-categories or themes were identified in relation to success factors in deployments, as the most often cited:

- Leadership Commitment
- Building Trust
- Culture of Acknowledging Problems
- Addressing Employee Concerns
- Inclusive Bonus Structure

Table 6.12 shows how often each was mentioned and Figure 6.8 illustrates the relative weight:

Success Factor	Number of interviews mentioning each contextual factor	Number of references to each contextual factor
Addressing employees' concerns	5	6
Building trust	4	5
Culture of acknowledging problems	4	6
Inclusive bonus structure	2	2
Leadership commitment	16	31

Table 6.12 Number of References to Success Factors in Deployment

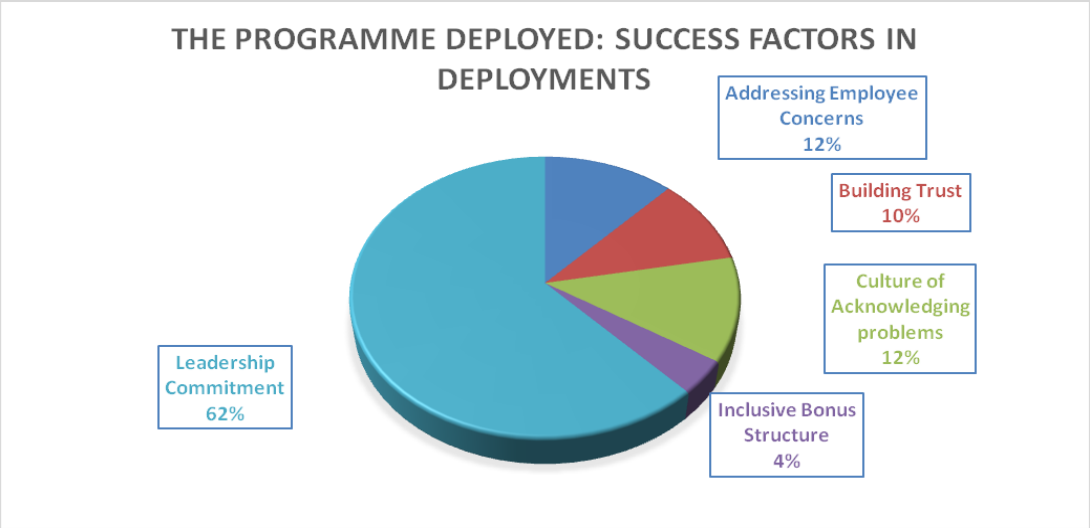

Figure 6.8 Success Factors in Deployments

6.6.1.1 Leadership Commitment

In analysing participant comments on success factors in deployments, leadership commitment emerged as the most heavily coded category; that is, strong, supportive and committed leadership was deemed by participants to be *the* most critical factor in ensuring success in deployments, supporting findings from the EFA of the survey responses in which leadership was identified as a significant CSF.

While all participants enthusiastically referred to the vital role of leadership in deployments, some of them articulated this notion in an abstract or unqualified sense, as typified, for example, in the following comment:

> *I would say it's hard to find anything more important in the success of either a Lean or a Six Sigma programme. I think leadership is the key to the success of any, actually, improvement initiatives.*
>
> Participant 3

Some participants offered more concrete examples of how leaders might demonstrate commitment, getting directly involved in Lean Six Sigma projects and activities, for instance, when they are seen to be actively involved and participating in development programmes:

> *There is one critical issue which I have felt in my experience of some organisations, where the top management is directly getting involved in the processes of Lean Six Sigma activities the things were more successful, things were much faster, and people were more serious; whereas in the organisations where the top management involvement is not as much of an issue, there the people were not that serious, things were taking more time and eventually the progress was not good. I'd say wherever there is leadership involvement and participation of the top management and wherever the top management is really committed to work with the initiative, there is success*.
>
> Participant 8

Collectively, participants offered examples of leadership commitment that encompassed a wide range of activities and actions. Such measures included: provision of all resources necessary to success, for example sufficient staffing levels, appropriate training, appropriate allocation of time, provision of peer support in the form of events and conferences as a platform for sharing good practice, and nomination to projects upon completion of training. All such elements of dedicated leadership are incorporated in the following concrete example offered by Participant 1:

I'm going to give you three very concrete examples. The first one is ... there is a saying that 'where you put your money and your time, is where your heart is', and I mean, they put a lot of investment on training. I mean there is a lot money put in place to train all the people coming into the programme, that's for one. The second example is every year, there is kind of a gathering where all the Lean Six Sigma black belts from all over the organisation, and this is a worldwide company, so you have Lean black belt Six Sigma's coming from Asia, from Latin America, from Europe, from within the States to get together and share experiences and look for those highly profiled successful project implementations, and basically it's a three full-day summit where everybody has a kind of lessons learned. So that's a good second example where you need to put money and time because you have a few of these companies coming to spend one, two, maybe three days with everybody, and I think that shows where your heart is, by dedicating that time and money, because you're bringing people all over the world to this unique week, and it's amazing how enriched people are, so that's a good second example. The third example is you come in to the programme and spend two, three, maybe four years doing implementation and then go out and, usually you do either a lateral move or you will get promoted to a new position, and in order to do that you need to have the support of the senior leadership. And I think that's when you see that they believe on that, that once an individual has passed through this training or Six Sigma assimilation, they force that individual to go and pretty much apply those concepts now in a day-to-day operation Sigma programme for what area you are in. They trusted you so you can put

in place those concepts, so that's pretty much how you can see that the senior leadership is engaged and they're putting their money and their heart on what they're saying.

Participant 1

Participant 17 also offered a concrete example from an organisation that bears all the hallmarks of inclusive, dedicated, committed leadership in action:

We have what we call a steering committee where we built that as a representative of the different executive leader functions, so for example, we have a representative for HR, we have a representative for the operations, a representative for the different divisions, like finance, or legal, or IT, so when we're doing the portfolio selection of projects, we're actually weighing them against their criteria. And these folks are meeting every week, so they have a weekly meeting where they review the strategic initiatives, the projects that they're working on, and oftentimes, you know, things are popping up that weren't on the portfolio and they're adding things to the portfolio in terms of projects they need to work on. The executive champions participate on the tollgate reviews, so while the sponsor is the one who still approves it and gives the go or no go, the executive champion is keeping an eye on those sponsors, they're actually showing up for these tollgates, asking questions, because they care about not only one project but oftentimes these other ones that they roll up beneath them. And so every week they get a report from the master black belt on the metrics, on the progress of the project, issues, and if there are issues or barriers these executive leaders often get involved with

removing them, where we'd normally see a sponsor do that, they step in and try to break that wall that's preventing the project from moving forward. So we see a very active executive leadership: they're involved in communications, they're involved with removing a barrier, so they play more of a sponsor role than we would typically, than normally we would typically see.

Participant 17

6.6.1.2 Building Trust

Participant 1 spoke of the need for trust-building as an important factor for achieving success in deployments. In this instance, building trust relates to building employee confidence in the approach and competence of leadership, and this participant suggested what might be termed a 'three C' model of trust-building for leadership:

To me, there are three components that are very, very important that you need to have in order to gain trust. The first one, you need to have, you need to have connection with the people that you're working with, that connection is making sure that you understand their needs before you try to be understood. So you need to have connection. The second thing is you need to show competence. You need to show that you know the technical, you have the technical skill, you know the toolkit of the Six Sigma that you're going to be trying to implement, you need to make sure that you show that competence. So, you have connection, you have competence, and lastly, I think you need to show character. Character is kind of very abstract, but

character is about ... there is a statement that I really like, it's one of my favourite statements that says: 'watch your thoughts because they will become words; choose your words because they will become actions; understand your actions because they will become habits; study your habits because they will become your character; and develop your character because that will become your destiny'. So it's about personality, being open to change and being able to always be learning, basically. So in summary, I think the three components to build that trust is having connection, showing competency, and also having character when you're having a stressful time, challenges and so on.

Participant 1

Zu et al. (2010) highlighted the importance of trust to build effective customer relationships and supplier relationships: as we have seen in section 2.5, linking Lean Six Sigma to customers and extending it to the supply chain are among the critical success factors for deployment.

6.6.1.3 Culture of Acknowledging Problems

As collective problem identification and problem-solving is a fundamental activity of Lean Six Sigma programmes, it is hardly surprising that participants should suggest shifting from a culture of allocating blame and scapegoating to a culture of facing up to and taking collective responsibility for problems and finding solutions as a factor necessary for success in deployments:

So it's all about if you want companies to improve performance, it means that it has to be done differently than it's being done today, so it's all under the

topic of kind of driving change, and that brings with it some level of discomfort because you end up having to, as a leader executive, bring to people's attention that what they're doing today is insufficient and it's not enough for the future, and you've got to paint for them what is necessary, and then you actually have to provide the tools, trainings, infrastructure, support, to really make it go. So one of the things you really encourage is the highlighting of problems and the facing of problems

Participant 2

I think you need people who have the ability to ask the right questions. So rather than saying 'who can I blame for this failure?', somebody asking the question in terms of 'what happened is …' and 'how can we avoid it happening in the future?' I think that's very important.

Participant 9

This change in attitude to problems, moving from managing blame to managing change, was mentioned by 20% of the respondents and the researcher has experienced this himself in his professional experience: it is not an easy change, difficult not only to put in practice, but also to measure and the role of leadership cannot be understated in showing by example this type of behaviour.

When looking at successful deployment programmes, the inability of most organisations to reap the full benefit of continuous improvement programmes has little to do with the specific tools they may use. Instead the problem has its roots in

how the deployment of a continuous improvement programme interacts with the physical, economic, social and psychological structures in which implementation takes place (Repenning & Sterman, 2001).

6.6.1.4 Addressing Employee Concerns

If, as suggested by Participant 2 above, facing up to problems can bring with it 'some level of discomfort', so too, improvement initiatives may, in some cases, give way to discomfort in the form of a perceived or real threat of job loss, and while headcount reduction may not always be the aim of improvement programmes, Participant 4 suggested that it is important to ensure that the goals of such programmes are communicated clearly to all staff impacted by the programme:

> *So even things like, you know, you get one of the most common ways across any organisation of showing I guess potential value is using FTEs (full time equivalent headcount), right, well people can get scared pretty easily when they see FTEs, to a lot of people that means 'oh, my job's going away', so it's more about, it's a lot about how you articulate that. I mean certainly in some cases that is the point of it, right, we want to eliminate jobs to save this much, but there's different flavours to that, so I think it's making sure that you're communicating whatever that goal is clearly and to those people.*
>
> Participant 4

Different industries use different metrics to track the success of their Lean Six Sigma programme: it goes from pure financial savings, as championed in General Electric (Harry, 1998), to reduction of hospital times in healthcare (Laureani et al., 2013, de Koning et al., 2006). Often, these are translated in the common

language of either dollar value (e.g. for capital expenses, costs reduction) or equivalent hours of work (e.g. full time equivalent) and this often creates anxiety among the employees, afraid of reduction in staff numbers. During these critical moments, often at the start of the implementation journey, it is essential for leadership to be visible.

Participant 12 also pointed to the need for addressing employee concerns. In this instance, the participant highlighted a need for leadership to achieve a balance in this endeavour by judging between concerns that, for whatever reason, could be termed 'legitimate', and concerns that could be termed 'obstructionist tactics', and to act in accordance with this judgement in driving change initiatives:

> *So you would have had a balance there that would have, you know, you would have started with people who are having concerns, try to understand their concerns, and any of their concerns you try and find solutions. If it is more professional concerns, we try and figure out a way of doing it. So while you do that, you also have to be sure that, first of all, if the concerns that are raised by the respective functions are not really a concern but they are just unwilling to adapt this methodology, you should have the ability to understand their concern but 'this is how it has to be driven and this is how it will be driven'.*
>
> Participant 12

The ability to differentiate legitimate professional concerns and general fear of change, addressing the first and consistently pushing to overcome the second, is an important skill for the leader of a Lean Six Sigma deployment.

6.6.1.5 Inclusive Bonus Structure

Finally, on the theme of success factors in deployments, two participants cited examples of structured bonus schemes positively impacting deployment outcomes:

> *I'll give you one very specific example. One client managed to achieve their whole planned financial benefits for the first twelve months of the programme, in eight months. And I asked the manager concerned what was the reason for that and he said, 'it's very, very simple, leaders from the top right the way through are actually included in the success in the programme in the bonus structures of themselves and their staff', so they were all very, very highly motivated, if you like, to make the programme successful.*
>
> Participant 21

> *We have a company bonus scheme and how well we do benefits all the employees, to a certain extent, so we have the annual bonus scheme announced in December of each year, so if the company makes more money, the employees get a bigger bonus, so it's in everybody's interest, you know, to adopt these practices.*
>
> Participant 7

Linking bonus or incentives structure to the success of Lean Six Sigma deployment is common across organisations, with General Electric, under the helm of CEO Jack Welsh, being among the first to introduce the concept (Henderson & Evans, 2000). Truly changing behaviour over the long term requires that Lean Six Sigma goals be accepted at the individual level, hence the need for incentive to

promote desired behaviour and results, from senior management down (Hendricks & Kelbaugh, 1998).

6.6.2 Metrics for Evaluating the Success of a Programme

In the quantitative dimension of this study, participants were asked to select the organisation's primary measure for success of deployments from a multi-choice option (see Appendix III for the full survey); however, in their telephone interviews, some participants talked about issues that may be worth noting in relation to measuring success levels of programmes deployed. For example, Participant 11 pointed, with hindsight, to an omission in the early stages of deployment that gave way to later problems regarding success measurement:

> *This is one of my key challenges at the moment. When this internal bottom-up approach started it was very much the view was that it should be a very bottom-up approach, there wasn't a clear baseline taken, there wasn't a clear set of goals, if you like, that we would save X million or, you know, there wasn't, people felt when there was an obvious link to the strategy of the company that we needed to improve, but they didn't set very clear targets and they didn't take a baseline in terms of capability or where certain KPIs were. So, one of my biggest challenges at the moment is trying to measure success.*
>
> Participant 11

Participant 2 suggested that ongoing review of the deployment, if grounded within the wider context of reviews of the organisation's success in relation to its

strategic goals, safeguards against deployments becoming isolated from overall business objectives, so to ensure an ongoing link to the business strategy:

> *And I think where it's most successful it goes beyond kind of describing it and it goes to an on-going very effective review process, so offering reviews where this is completely integrated into the review of progress that's being made for measuring business success is where it's most successful, because people then constantly reinforce, and it's reinforced within the environment of what's it being measured on, the success of their business or function.*
>
> Participant 2

Participant 21 suggested that, even though primary measures may be financial, concomitant monitoring of effectiveness or otherwise of operational processes is not uncommon in gauging the success of deployments:

> *In terms of how it's measured, despite the fact that it may be for financial reasons that they're driving it, very often, the measures are still operational on the individual projects but there are financial measures associated with that. So yeah, they might be wanting to save, let's just call it €100,000 from a project or something like that, nonetheless, the primary metric probably in projects is still going to be operational of some sort, how many heads saved or what reduction of waste, or whatever the case may be. So yeah, the financial measure would be probably collateral with the operational measure.*
>
> Participant 21

To be successful, Lean Six Sigma cannot be treated as yet another stand-alone initiative, but it requires adherence to a new way of working, rather than just the usage of a few new tools and techniques (Dale, 2000). This is also reflected in the way the success of the deployment is measured: the link between each Lean Six Sigma project's objectives and the overall business strategy should be identified (Antony and Banuelas, 2002).

6.6.3 Language / Terminology

Some participants made interesting comments in relation to language and terminology adopted in organisational discourses on improvement initiatives. For example, Participant 10 contrasted two workplace experiences remarking on the difference between, in the first case, covert, and in the second case, overt, approaches to Lean Six Sigma deployments:

> *It wasn't 'we are going to engage in this as an organisation' and have the CEO stand up in front of everybody to explain why and how we're going to do this. It was very much as problems evolved, people were going to be asking, 'what happened, what's different, why did that work this time?', and that Lean would be the vehicle for that, but it would be much more covert rather than overt. ... Where I am now, there's been much more support from senior leadership, Lean and Six Sigma are not scary words around here, people know that this is the methodology that we're going to be using, we're engaging with a consulting group to begin training all staff in a common vernacular for Lean and Six Sigma ...*
>
> Participant 10

Although commenting on improvement initiative discourses, no participant offered an explanation for their organisation's choice of language and terminology concerning deployments. However, Participant 2 suggested '*one of the things that Six Sigma in particular has been criticised for is forming a kind of a secret society, a club that requires admission to and it's not available to everyone*' and, perhaps, limiting the use of highly specialised language may be a mechanism for changing employee perceptions of Lean Six Sigma as exclusive and only open to a chosen few.

Participant 11 also talked about taking a covert approach to training employees in Six Sigma methods:

> *In the last year or so, I've put a number of people through green belt, what it's been has been a Lean Six Sigma green belt. So essentially, what I've started to do with a few people is introduce DMAIC, almost without them realising, but we would still refer to this as a Lean implementation in the company*.
>
> Participant 11

In talking (above) about an organisation that is taking an overt approach to implementing improvements through training its entire staff in 'a common vernacular', Participant 10 stated '*Lean and Six Sigma are not scary words around here*', resonating, perhaps, with the idea that such programmes may engender a sense of fear that one's job is at stake, as already discussed in the section on addressing employee concerns.

Finally, on the topic of improvement initiative discourses, Participant 17 talked about naming programmes without mentioning Lean and or Six Sigma in the

title, while Participant 5 talked about re-naming programmes in the sustainment phase as a means of keeping employees focused:

> *Yeah, the company that I'm working with right now, they've started with Lean Six Sigma, they don't call it, they call the programme a continuous improvement versus Lean Six Sigma deployment, so it's a CI programme but it is a Lean Six Sigma programme, so we're actually approaching it with an integrated methodology.*
>
> Participant 17

> *I think programmes can get stale and I've evidenced that myself that whether it's, you know, you revisit with a campaign, you mix it up a little bit by maybe asking some external consultants to come back in to have a look and to review the actual process, it could be a combination of things, you know, re-branding what we actually call the actual programme, because what will happen is people will just think of the same thing, 'ah, you know that's, yeah, we've been doing that for years' and they lose sight of the actual focus.*
>
> Participant 5

We have discussed how employees' engagement is critical to a real cultural change, that is one of the critical success factors for the effective deployment of Lean Six Sigma (section 2.5): the interviews highlighted how the language used from Leadership, and even the terminology used in trainings, can have an impact on the

level of employees' engagement. It is important that Leadership carefully develop a communication strategy.

6.6.4 Summary

Issues relating to the programme(s) deployed, expecially leadership commitment, were significantly more talked about by participants from organizations with less than a thousand employees: strong, supportive and committed leadership was deemed to be the most critical factor in ensuring success in deployments, supporting findings from the exploratory factor analysis of the survey responses in which leadership was identified as a significant critical success factor.

Participants operating in retail and consumer services, internet and on-line services, and healthcare were the ones commenting more on the leadership commitment theme: the more visible the leadership is, the more important is to show commitment to continuous improvement programs.

These coding patterns are consistent with the findings of the previous section: just as participants from organizations with less than a thousand employees and service led companies talked more about leadership style than did participants from any other sector, so too, participants from these sector types and company size talked more about leadership commitment as a critical success factor in Lean Six Sigma deployment.

6.7 Findings on Training Approaches

According to Coronado and Antony (2002), training is one of the key factors for the successful Lean Six Sigma deployment: Linderman et al. (2003) claimed the feeling of uneasiness and uncertainty associated with a new change management initiative can be reduced significantly, when employees have received the appropriate training. The training process has to be focused on developing all those skills needed for BB practitioners to perform their role and carry out assigned projects (Hoerl, 2001).

Participants' views on the idea of widespread basic training as a mechanism for engaging the workforce in improvement initiatives has already been discussed in the previous section; however, apart from the concept of widespread training, analysis of participants' comments during telephone discussions on this topic yielded three main themes, namely:

- Selecting Candidates for Training
- Training Formats
- Evaluating Effectiveness of Training

Table 6.13 shows how often each was mentioned and Figure 6.9 illustrates the relative weight:

Training Approaches	Number of interviews mentioning each contextual factor	Number of references to each contextual factor
Evaluating effectiveness of training	14	21

Select candidates for training	19	52
Training formats	16	28

Table 6.13 Number of References to Training Approaches

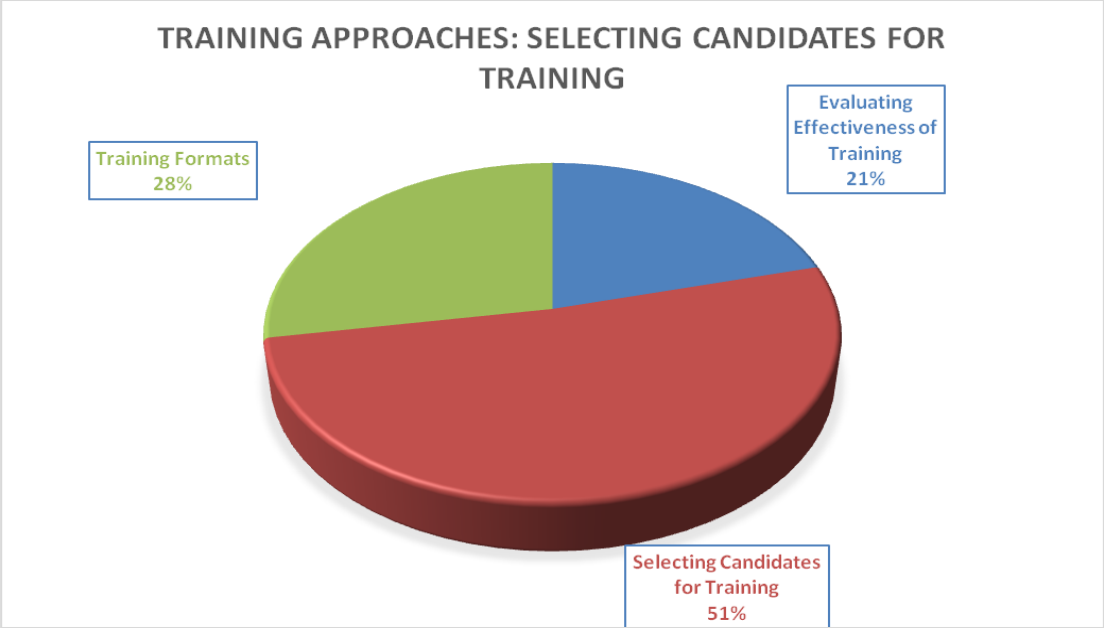

Figure 6.9 Training Approaches - Key Themes

Discussions around training were mostly coming from participants from smaller companies (Table 6.14 shows the number of mentions of different training approaches by company size of the respondent) and particularly from the sectors of industrial goods and services and healthcare (Table 6.15 shows the number of mentions of different training approaches by sector of the respondent): given the emphasis on quality output in these two sectors, it is not surprising that such a high emphasis on training was placed in industrial goods and services and healthcare.

T5- Training Approaches x Company Size	< 250	250 - 500	501 - 1,000	>1,000
Training Approaches	30	10	44	8
Evaluating Effectiveness of Training	4	2	10	5
Selecting Candidates for Training	18	5	26	3
Don't Train When No Project	2	1	2	0
Generic Traits	7	2	12	2
Relative to Project Area	7	3	6	0
Specific Skills	1	0	7	1
To Meet Coverage Targets	4	0	1	1
Track Record	3	0	10	0
Training Formats	12	4	12	0
Classroom-Based, Instructor Lead	1	1	6	0
During + Post Training Support Mechanisms	3	0	1	0
Dynamic Combination	6	2	2	0

Table 6.14 Matrix of Coding Pattern between Training and Company Size

T5 - Training Approaches x Sector	Internet & Online	Retail & Consumer Services	Health Care	Industrial Goods & Services	Pharmaceuticals & Biotechnology	Management	Electronics & Semiconductors	Government & Trade	Financial Services
Training Approaches	11	9	20	23	5	7	3	8	6
Evaluating Effectiveness of Training	3	2	3	3	1	2	1	5	1
Selecting Candidates for Training	7	4	12	13	4	3	1	3	5
Don't Train When No Project	0	1	2	1	0	0	0	0	1
Generic Traits	4	1	5	4	2	2	0	2	3
Relative to Project Area	2	3	3	3	0	1	1	0	3
Specific Skills	1	0	3	1	1	2	0	1	0
To Meet Coverage Targets	0	0	1	4	0	0	0	1	0
Track Record	6	0	1	3	1	1	0	0	1
Training Formats	2	4	7	10	0	2	1	0	2
Classroom-Based, Instructor Lead	0	0	4	1	0	2	1	0	0
During + Post Training Support Mechanisms	0	0	0	3	0	0	0	0	1
Dynamic Combination	0	2	1	6	0	0	0	0	1

Table 6.15 Matrix of Coding Pattern between Training and Company Sector

It is interesting to note the very few citations around 'Classroom based, Instructor lead' training, a sign of the evolution of training, in line with the development of technology. eLearning, made possible from faster broadband and technology, is cheaper and becoming pervasive in the corporate world (Zhang et al., 2004, Burns, 2005).

6.7.1 Selecting Candidates for Training

Selection of the right employees to be engaged in Lean Six Sigma, starting from the training phase, is a critical success factor for the deployment: having the top talent in the organization involved in the early stages of deployment, providing them with the right tools and making them accountable for the success of their projects are among the responsibilities of the organization leadership (Panizzolo et al., 2012).

In analysing participant discussions on approaches to selecting candidates for training, six themes emerged as follows:

- Generic Traits
- Relative to Project Area
- Track Record
- Specific Skills
- To Meet Coverage Targets
- Don't Train Without a Project

Table 6.16 shows how often each was mentioned and Figure 6.10 illustrates the relative weight:

Training Approaches – Selecting candidates for training	Number of interviews mentioning each contextual factor	Number of references to each contextual factor
Don't train without a project	5	5
Generic traits	14	23
Relative to project area	11	16
Specific skills	7	9

To meet coverage needs	4	6
Track Record	10	13

Table 6.16 Number of References to Training Approaches

The weightings of these categories in relation to each other are shown in Figure 6.10:

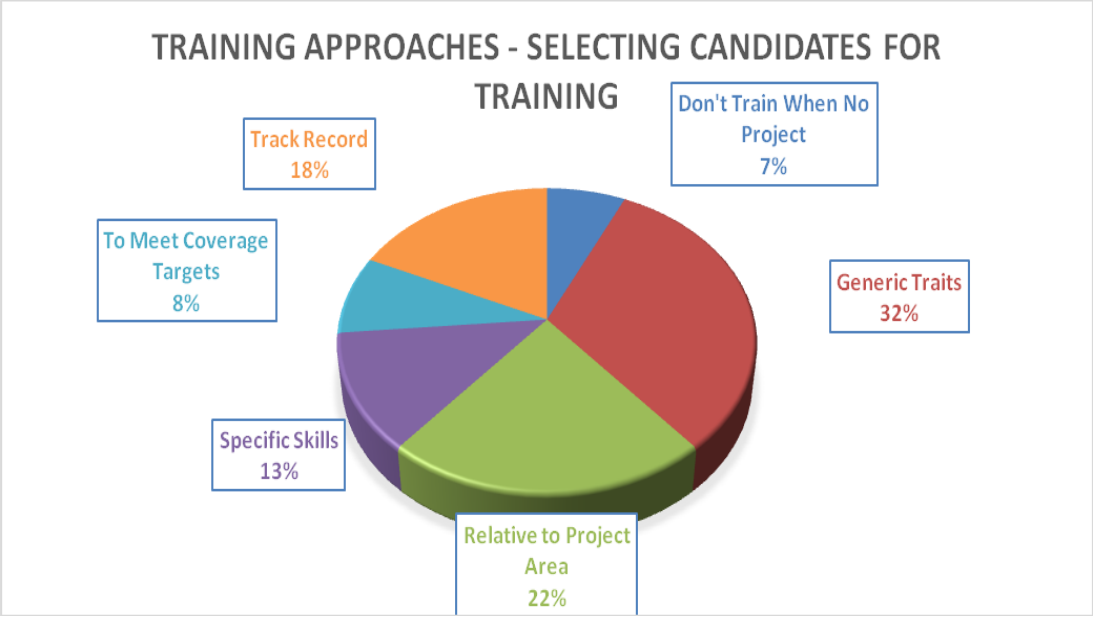

Figure 6.10 Training Approaches - Selecting Candidates for Training

6.7.1.1 Generic Traits

The generic traits most commonly cited by participants included: excellent communication skills, ability to create and sustain productive working relationships, people who are well respected by their peers and superiors, ability to lead, willingness to question the status quo and embrace change, and attentiveness to detail. In addition to these frequently cited generic traits, Participant 19 added willingness to be disciplined and to develop self-discipline as an important trait to be sought after in potential candidates for Lean Six Sigma training:

You have to have somebody that's willing to be disciplined because there's a specific road map, there's a specific set of instructions in regard to how to go through a process improvement project and it's that way for a purpose; it's that way to make sure that you ensure a sustainable improvement and you don't create a lot of side effects and things like this, so the instruction is very critical, and what I mean by that is the DMAIC methodology for Six Sigma, the Toyota production system for Lean, so there's a set of guidelines and rules as to how you go through a project. So those people, those candidates, that are going to get trained, they have to be willing to give up their old methods to some degree and abide by the new methods of how they're being trained, they have to pay attention to detail and they have to be disciplined in regard to doing things the right way.

Participant 19

Participant 2 offered an interesting perspective on the potential benefit of selecting people that are sceptical of improvement and change initiatives for training:

Yeah, I think that it's hard to tell when you first interact with a group of middle managers who's really going to be great and who's not because some of the people that are the very best are the very most sceptical when you initially meet them because they've actually made an investment in the way that they currently do things, they know and understand and have great confidence in it, and they sometimes are the very best because as they become exposed to this, they understand it, they apply it, and now they're as

protective of it and sceptical of changing from it to anything else. So sometimes they're the very best.

Participant 2

Participant 3 also commented on the potential benefit of recruiting 'sceptics' to training initiatives:

So it may be worthwhile, you know, to throw in the odd sceptic or two, almost as a plan, and see whether there is something to maybe turn the attitudes of these folks around a little bit, because if you can do that you've got a real weapon because they'll begin to bring everyone else with them as a result.

Participant 3

6.7.1.2 Relative to Project Area

Participant 21 spoke of the benefits of selecting candidates for training that already have a vested interest in the area designated for improvement measures:

What we're seeing these days is a greater focus in organisations on green belts as opposed to black belts, and the reason that I make that distinction here is that green belts are leading projects in the areas for which they've actually got operational responsibility, whereas black belts are just as likely to be leading cross-functional or across organisational projects and they will not, in all probability, have current live operational responsibilities for the processes or the activities that are the subject of their projects. Now,

obviously, if somebody has got a particular vested interest in the performance of a function or a process or whatever, and they are leading a project that relates to that, they've got the double motivation, if you like, to do a good job.

Participant 21

Indeed, selecting candidates relative to designated project areas may, perhaps, safeguard against problems such as that discussed in the section hierarchical roles, responsibilities and relations, whereby, on occasion, managers may be reluctant or unable to release their staff from day-to-day operations in order to participate in projects occurring in a different area of the organisation. Participant 8 also commented on an approach whereby training and deployment of improvement programmes are integrated and conducted in a self-contained sort of way in various units of the business but enacted simultaneously:

At an organisation level, they take a policy decision to implement these concepts in the organisation and the management generally requests all the functions like finance, HR, or operations to join these movements by participating in terms of projects as well in training. Therefore, generally, all these departments and functions, they nominate people for training, and they take some projects and get it completed through that function.

Participant 8

6.7.1.3 Track Record

Participants' comments coded to this category overlapped with comments coded to the category generic traits in that a key generic trait sought in potential

candidates for training was ‘ability to lead’, and, as the following comments illustrate, selection on the basis of proven track record related strongly to candidates’ demonstration of leadership skills, as well as having a history of achieving targets and results. Demonstration of leadership qualities, in the context of a proven track record, also related to the wider context of an organisation’s succession plans:

> *This is not just people volunteering, these are people that have had outstanding performance reviews in the past, that are viewed as informal leaders within their department, that could be groomed for additional leadership opportunities and this is kind of a development chance for them to move out of the frontline role for ten per cent of their time and to be more a problem-solver and systems-thinker, and then that being kind of the step in-between going from frontline into management.*
>
> Participant 10

> *I think the most important criterion for finding these employees are those employees with a track record of accomplishing significant results, that is, no matter what their discipline, we want people who have proven that they can get good results.*
>
> Participant 14

6.7.1.4 Specific Skills

The most frequently cited specific skills to be sought in potential Lean Six Sigma training candidates centred on: ability to problem-solve, having an analytical mind-set, being quantitatively orientated and having an interest in statistics. These are in agreement with the most important skills for a Lean Six Sigma practitioner that Antony and Karaminas (2016) compiled.

Participant 4 suggested clustering candidates with differing background experiences and knowledge of the organisation when selecting teams:

> *I think if you're building a team, you'll probably need people who maybe have different experiences within the organisation, you know, maybe there's a very technical person, maybe there's a person comes from a product side, maybe there's a person comes from a business operation, so I think, you know, if you're going to cherry pick a team, you'll probably want a few flavours of everything, so.*
>
> Participant 4

Selecting the right people for a team or project in an organization is an important leadership responsibility, with most practitioners considering that a mixture of soft and hard skills is essential for an effective Lean Six Sigma deployment (Antony and Karaminas, 2016).

6.7.1.5 To Meet Coverage Targets

Participant 15 highlighted potential drawbacks in selecting candidates for Lean Six Sigma training on the basis of coverage targets across an organisation:

> *So when you start new in an organisation to implement this stuff and a decision is made that we're going to train some people, we're going to train some green belts, the danger is it's bums on seats, so now department heads nominate people to go and do this training who aren't necessarily the right people.*
>
> Participant 15

Selection of staff to participate in Lean Six Sigma training is an issue that has been explored in the literature (Kwak & Anbari, 2006), as it impacts the effectiveness of training (Clegg et al., 2010) and ultimately has a bearing on the success of individual projects and the overall initiatives.

Often, the way employees are selected goes back to the culture of the organisation: is Lean Six Sigma seen just as the latest flavour of the month initiative, for which management just want to fill the trainings, or is it seen as a real transformational opportunity, and hence only the highest performers and more motivated people are sent to be trained.

However, this participant suggested an approach that might circumvent allocation of training places to candidates that may not be suitable or that may not be fully committed to learning, understanding and implementing Lean Six Sigma principles and practices:

So the way we go about that is, if I'm doing the training, before the training starts I will interview all of these people and ask them, you know, why they're doing it and where they're coming from, and nine times out of ten these guys are only doing it because they've been told to go and do the course, and they are not necessarily the right people.

Participant 15

Again, in relation to the candidate selection process, Participant 15 emphasised the importance and potential long-term significance of 'getting it right':

So there's quite a mix there and I think you have to get that right. You can train, you know, twenty people and if you don't get this right only one or two of them might actually go on to do something; whereas you can train twenty people and the majority of them will then go on to do Six Sigma type projects.

Participant 15

6.7.1.6 Don't Train Without a Project

As already discussed under the theme of practices for engaging the workforce, some participants raised the idea of running widespread basic training and awareness-raising programmes as a potential means of generating buy-in to improvement initiatives. However, beyond the foundational level, some participants cautioned against placing employees on training programmes if there are not to be follow-up project placements whereby such graduates can apply their learning and test their understanding of Lean Six Sigma principles and practices; and that caution was reiterated in comments coded to this category:

I think, you know, it needs to be, especially if it's new training, I think it needs to be almost just in time training, not like having somebody do the training and then not do anything with it for another year until they finally have a project to kind of apply that, especially if it's, you know, a green or a black belt.

Participant 4

Participant 19 echoed this caution, suggesting that training for training's sake can be disadvantageous, not just for the employee but for the organisation too:

I think the communication there's got to be opposite of what General Electric did. Basically, you shouldn't go out and just train everybody that you have because what it does is it makes an academically-built whole bunch of machine resources that are green belts or black belts or Lean practitioners, and you don't have the resources to get them into an active project and keep them in active projects, so what happens is that that inventory of knowledge that you've trained then gets corroded, plus they forget things, and they don't end up applying what you've given them. You don't want to send people that aren't going to be active in projects and give them a whole bunch of knowledge, that's just wasting their time, they're not going to use it, they're not going to remember it, they're not going to even understand it.

Participant 19

6.7.2 Training Formats

Three themes emerged in analysis of participant discussions on training formats:

- Dynamic Combination
- Classroom-Based, Instructor Led
- During and Post Training Support Mechanisms

Table 6.17 shows how often each was mentioned and Figure 6.11 illustrates the relative weight:

Training Formats	Number of interviews mentioning each contextual factor	Number of references to each contextual factor
Classroom based, instructor lead	7	8
During + Post Training support mechanisms	3	4
Dynamic combination	6	10

Table 6.17 Number of References to Training Formats

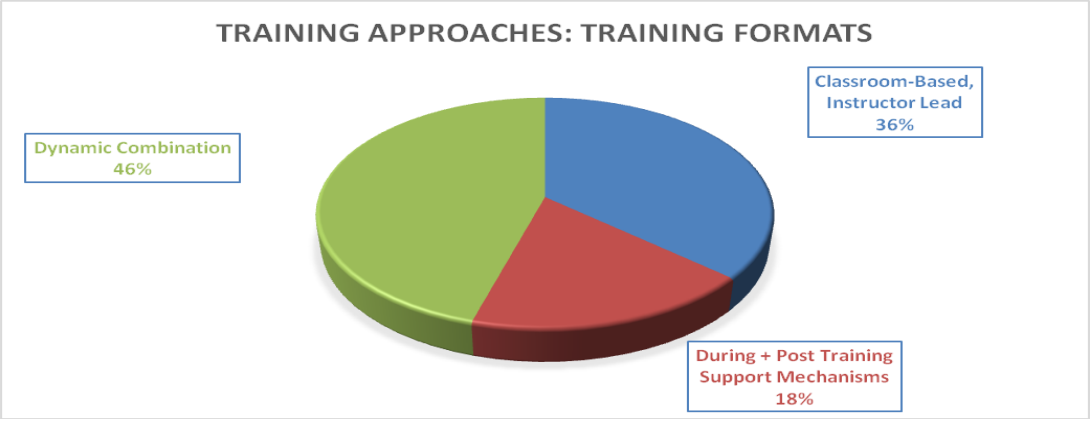

Figure 6.11 Training Approaches - Training Formats

Participants' comments coded to the categories classroom-based, instructor-led and dynamic combination contained miscellaneous training format options ranging from purely classroom-based to formats that combine theory and practice, and / or combine in-person and online dimensions. Participants stressed that there is no one-size-fits-all training model, rather models adopted are context-bound, in other words, training options and combinations of options differ across organisations depending on such variables as size, sector, resources, culture, for example.

6.7.2.1 Dynamic Combination

Participant 15 talked about an approach that, rather than providing fulltime intensive training that endures without a break, offers a protracted programme that combines theory and practice and is bolstered by on-going support and mentoring mechanisms:

> *So what we tend do is break it up a little bit. So we would probably do one or two days, take them through define and start thinking about measure, then let them, give them some projects, let them go and start projects, let them start doing defining, let them start to do some measurement and stuff. And we would probably leave a gap of four, five, six weeks in between and then bring them back and complete the course. That way, when they come back they've had some experience, you know, we can go through what they've already done in define and measure, and then they've got some real information, they've got some real data, and then they can use that actual data to complete the rest of the course through the analyse, improve, and control phases. And*

what we find is that works better both because they've got some real information to work with and they can relate it to something, and two, we haven't overloaded them with a load of information all in the space of one week. And also the time in between we also use that, we don't just leave them alone, we say, you know, 'we're here to help, advise and support you whilst you're doing that', so, you know, they've got some mentoring and coaching out there doing that work as well.

Participant 15

While this model may not work everywhere, as it imposes extra strain on both employees' time and budget, with multiple travels to attend classes at different times, the idea of combining training with real experience, letting participants take their time to apply knowledge to real time projects is a valuable concept. To overcome the logistical and budgetary issues, e-learning is now commonly being leveraged to mix practical experience and theoretical learning.

Participant 21 talked indeed about a programme that combines classroom and online training, across geographical and time-zone boundaries:

We're also seeing increasingly, e-learning and blended learning coming into the frame these days, sometimes simply because people want to cut the cost of training but increasingly, it's the availability of people that's the constraint very often more than in the past, or it could be the fact that in a multinational organisation you've actually got people working together on projects who are geographically dispersed. So I can cite you one very recent example

where we've actually used a blended learning approach with a virtual classroom situation with students in China, in the UK and across the United States - in short, a virtual classroom situation, and when I say in short, I'm thinking of an hour, hour-and-a-half in time; where the Europeans have got a nice kind of time zone slot, those in Asia are having to stay pretty late in the day after a day's work and those in North America are probably having to come in a bit early and undertake the training before they start work. That, coupled with local coaching and some degree of self-study has also proven to be very, very effective indeed in that organisation.

Participant 21

E-learning is transforming education, providing opportunities for learning anytime, anywhere (Conole, 2004), but it comes with benefits and limitations (Appana, 2008). Benefits for organisations in using e-Learning for their training programmes are increased access, with employees having greater control over where and when to engage in training (DeRouin et. al., 2005), time and cost savings versus classroom based training, the ability to track what the learner did, measuring precisely the impact of the e-Learning investment (Servage, 2005). However, while e-Learning can provide the illusion that knowledge can be produced, packaged and consumed online, an abundance of literature makes a strong case that in highly social contexts meaningful learning and creative problem solving are likely to occur (Servage, 2005). The author's experience has been that a mix of classroom-based and e-Learning courses (blended learning) works best.

6.7.2.2 Classroom-Based, Instructor Led

On the other hand, whilst acknowledging that there are pros and cons for various training models, Participant 18 made a strong case in favour of classroom-based programmes:

> *So I guess there are different forms and I think all of them have their own pros and cons, but in my experience the classroom-based is probably the most effective and the reason being there's less distractions. I think it's more difficult to study and to train when in an environment that you have to deliver. I think with the online, and even with conference-based training, in my experience, the setting or the environment that you're put in to do that training hasn't been very conducive to the learning activity, so when you actually take time out and go to a completely different venue where the sole purpose is to learn, I think it's far more effective. So it's an interesting one; if you didn't have all the distractions would the learning be the same as classroom-based? I still think the classroom based is still winning because you probably have a better degree of ease to ask questions and to make clarifications of the training material, to facilitate it more easily.*
>
> Participant 18

6.7.2.3 During and Post Training Support Mechanisms

While many participants talked about on-going support and mentoring mechanisms for employees both during and following training programmes, Participant 7 talked in depth about what could, perhaps, be classified as an ideal

model in terms of the high and intensive level of support given to trainees and their consequent one-hundred per cent success rate in achieving accreditation:

> *So it was off-site training and they did the exams and all this sort of thing. And what we did for everybody who went on the Lean Six Sigma, first of all, we bought them a laptop, gave them the laptop, gave them a copy of something called Minitab, which they use to calculate all the statistics while they're doing the project. They went away for a residential course, I think it was a week, but it was four nights away from home and that can be hard, particularly for married people with children. And then a month or two later, they went back for their second week, and then a month or two later they came back for their third week, and then went back for their fourth week. They had to pick a project and then do the project over three to six months, write it all up and then take it back to get assessment at Smallpeice. So the fact that it was independently assessed and they were in a training session with people from other companies, there may be twenty other people also being trained and they could see ... and perhaps some of the feedback I got from the staff was that people from other companies on the same training course at Smallpeice, sometimes the other companies didn't give them the dedicated time to work on their projects, their Lean Six Sigma projects, so they had to do it in their own time in the evenings and things like this, but the fact that we gave them dedicated time always, that was, you know, a big boost to our staff. And a lot of, there's a high fall-out rate on these courses, people who started the course but failed either to complete the project or to present it, whereas we made sure that we gave as much help as possible so that*

everybody we sent on these accreditations actually passed them. We pulled them all the way through the training, we gave them, you know, external training but, you know, the guy that became the first Six Sigma black belt leader, he basically has mentored everybody else through their training course as well as it being done externally.

Participant 7

6.7.3 Evaluating Effectiveness of Training

Participants' comments in relation to methods of evaluating the effectiveness of training, ranged from having no formal or only informal methods, to use of external measures such as HETAC (Higher Education and Training Awards Council) or ASQ (America Society for Quality) qualifications, to evaluating effectiveness of training in relation to success levels of projects. Participants mostly talked about this latter method, that is, regardless of whether training had been conducted on-site or off-site and regardless of certification attained, participants mostly spoke about evaluating training in terms of success levels of subsequent projects, as exemplified in the following comments:

I mean, so right, the test is one thing, but just like any test, some people are good at it, some people are bad at it, so I think the tests tell you, okay that person, did they understand what we taught them and did they pay attention, right, so I think that's a good way to measure that, but then, that's what I was saying about the timing of the training, because I think that really the test is can you apply this in the real world, so I think that's where, you know, you'll see whether somebody really understands or not, by putting them on a real

project and having them drive that. So that's kind of how I would more or less ... that would be a more important measure of success, of how well they applied the concept versus how well did they do on the test.

Participant 4

You can really see the effectiveness of the training through the successful implementation of Six Sigma projects. Generally, the evaluation is like this in our type of scenario: once the course is completed, a comprehensive test will be conducted to evaluate the knowledge depth and then there will be a complete evaluation of the first project that will be done by them through the workplace to understand their depth of knowledge and type of application. There will be evaluation done in either way, one is through test, the other is through the activity that is reviewed.

Participant 8

Although there is some variation, due to a lack of a standard certification process, the requirements for certification at different levels broadly converge to the following (Laureani & Anthony, 2012b):

- Black Belt: leading a minimum of two projects, with either a financial benefit of $100,000 or a 30% improvement in the key metric measured;
- Green Belt: leading a minimum of one project, with either a financial benefit of $25,000 or a 10% improvement in the key metric measured.

6.7.4 Summary

Participants from organizations with less than a thousand employees were more likely to discuss themes related to training as important factors for a successful deployment, particularly candidate selection, generic traits, track record and training approaches.

A greater emphasis on generic traits in candidate selection process was given from participants based in US companies, while the sectors of industrial goods and services and healthcare accounted for the largest share, almost half, of all comments: given the emphasis on quality outputs in both healthcare and industrial goods and services, it is hardly surprising that these sectors would place such a high emphasis on training in the context of deploying Lean Six Sigma.

6.8 Summary

Leadership, as a CSF in Lean Six Sigma deployments, was identified as a key finding from the quantitative element of this study, and this qualitative dimension set out to further explore this correlation and tease out its implications. The findings were presented in five parts corresponding to the five key themes that emerged in the analytical process, namely: communication, employee motivation, leadership style, the programme deployed, and training. Exploration of these themes provided rich insights into participants' experiences and views concerning the relationship between leadership and success levels in Lean Six Sigma deployments.

Further analyses involving cross comparisons between the qualitative and quantitative data sets yielded results that identified correlations between coding patterns across the five themes and variable survey information such as organisation

size, sector, location, metrics used for evaluating deployment, and estimated success level. Two key correlations are worth noting, in that they relate more directly to correlations between the concept of leadership per se and Lean Six Sigma deployments, the core of the research inquiry. Themes and issues relating to leadership style were significantly more talked about by participants from organisations with less than one thousand employees, than by participants who hailed from larger organisations (Table 6.8); and participants from customer service led companies talked significantly more about leadership style and related contextual factors than did participants from any other sector (Table 6.9).

With regard to success factors in deployment, the leadership commitment was the most mentioned success factor. Further comparisons between coding patterns and participating organisation profiles pointed to correlations between this theme and organisation size and sector. In summary, leadership commitment as a CSF was significantly more talked about by participants from organisations having fewer than one thousand employees, than by participants who came from larger organisations (Table 6.10); and participants from customer service led companies talked significantly more about leadership commitment than did participants from any other sector (Table 6.11).

Thus it may be said that the qualitative dimension of this mixed-methods study exploring the relationship between leadership and success levels in deployments of Lean Six Sigma has assisted in affirming and expanding on the quantitative dimension, that identified leadership as a CSF for Lean Six Sigma deployment.

Chapter 7

Leadership Framework for Lean Six Sigma

7.0 Introduction

Leadership, as a CSF in Lean Six Sigma deployments, was identified as a key finding from the quantitative element of the study, and the qualitative element of the research has assisted in affirming and expanding on it. This chapter illustrates what conclusions we can obtain from the quantitative and qualitative studies on the main traits of the leadership needed for successful deployment of Lean Six Sigma.

First, from the qualitative analysis of the semi structured interviews conducted, and the coding of their transcripts, a Leadership dependency model is put forward, particularly investigating how organizations in different industries sectors rely differently on Leadership for a successful Lean Six Sigma deployment (RQ2), then the Leadership traits more conducive to a successful Lean Six Sigma deployment are discussed.

7.1 Leadership Dependency Model

7.1.1 Significant factors for the model

A leadership dependency model was developed from the interviews analysis which cross referenced the inductively coded content in all five themes against the five variables participants provided during their separate survey questionnaires prior to the in-depth interviews.

The five variables were: 1. The size of company by number of employees, 2. The location of participating company, 3. the sector in which the company operates, 4. the ways in which the participating company measures success of Lean Six Sigma deployment, and 5. the extent to which the participating company deemed the roll out of Lean Six Sigma to have been successful.

Table 7.1 illustrates the breakdown of interviews respondents accordingly the these five variables:

Identifier number	**Employees size**	**Sector**	**Location**	**Success Measure**	**Perceived Success**
1	> 1,000	Financial Services	UK / Ireland	Cost Savings	Neither successful or unsuccessful
2	> 1,000	Internet & Online	UK / Ireland	Cost Savings	Extremely Successful
3	> 1,000	Industrial Goods	Asia	Cost Savings	Neither successful or unsuccessful
4	> 1,000	Financial Services	USA	Cost Savings	Successful
5	251 – 500	Management Consulting	USA	Productivity increase	Neither successful or unsuccessful
6	> 1,000	Industrial Goods	Asia	Cost of Poor Quality	Neither successful or unsuccessful
7	< 250	Health Care	USA	Productivity increase	Extremely Successful
8	501 – 1,000	Government & Trade	UK / Ireland	Leadership development	Successful
9	> 1,000	Pharmaceuticals	UK / Ireland	Cost Savings	Neither successful or unsuccessful
10	< 250	Management Consulting	UK / Ireland	Combination of multiple ones	Successful

11	> 1,000	Internet & Online	UK / Ireland	Cost Savings	Extremely Successful
12	> 1,000	Electronics & Semiconductors	Asia	Reduce Defects	Successful
13	< 250	Health Care	USA	Cost Savings	Neither successful or unsuccessful
14	501 – 1,000	Retail & Consumer Services	USA	Cost Savings	Neither successful or unsuccessful
15	> 1,000	Pharmaceuticals	UK / Ireland	Cost Savings	Extremely Successful
16	< 250	Retail & Consumer Services	UK / Ireland	Customers Satisfaction	Extremely Successful
17	< 250	Health Care	UK / Ireland	Cost Savings	Neither successful or unsuccessful
18	> 1,000	Internet & Online	UK / Ireland	Cost Savings	Neither successful or unsuccessful
19	< 250	Retail & Consumer Services	USA	Leadership development	Unsuccessful
20	> 1,000	Electronics & Semiconductors	USA	Improve Processing Times	Successful
21	< 250	Retail & Consumer Services	USA	Cost Savings	Successful

Table 7.1 Interviews respondents by Main Variables

During the inductive coding process, background or profiling information of the respondents were not considered. The correlation with the five aforementioned variables only occurred after coding was completed, and we could compare the amount of codes in the transcripts with these demographic variables.

During this process, two variables revealed clear patterns in the data and emerged as significant factors:

1. The size of the organisation as measured by number of employees
2. The sector in which the organisation operated

We then used these two variables to investigate how different organizations, based on size and/or sector, rely on Leadership for a successful deployment, answering RQ2.

The next two sections investigate the impact of each of these two factors on Leadership style, before then describing the suggested Leadership Dependency model.

7.1.2 Impact of the size of organization on Leadership

Tables 6.8 and 6.10 show that smaller companies, defined in this research as less than one thousand employees, had a greater dependency on leadership than larger organisations. Although 10 out of 21 (approx 50%) respondents were from companies with less than a thousand employees, the vast majority of data coded to leadership in the interviews transcripts came from organizations with less than a thousand employees.

In smaller organisations, with a flat organizational structure, leadership is more concentrated in a small number of people, compared with very large organizations where leadership is shared to a greater extent, dispersed and institutionalized.

Often, leaders in smaller organizations are the first to be trained in Lean Six Sigma, adopt it in their daily work, being directly involved in the process, and even training the employees (Shea & Gobeli, 1995): this makes leaders more visible to the

employees, and as such it is even more important for them to communicate in a clear and consistent manner around Lean Six Sigma, set the vision of the organization overall, and leading by example.

Such direct involvement put organizational leaders at the fore front of the deployment effort, playing a critical role in its success (Garengo et. al, 2005): a message highlighted from the interviewees respondents from organization with less than a thousand employees.

In very big organisations, with more than a thousand employees, the leadership responsibilities are shared among different management layers, geographies and offices, and the organization leadership is less directly visible (Shea and Gobeli, 1995).

Larger organizations are also characterized from a more rigid structure and information flow, with internal communication departments diluting the message coming from the organizational leadership (Garengo et. al, 2005).

Another significant difference between the smaller and larger organizations that came across during the interviews is that approach to their internal systems and procedures: the smaller the organization, the lower the degree of standardization and formalization of their processes, while large organization have more formalized processes, although less adaptable to changing circumstances (Yusof and Aspinwall, 2000a and 2000b).

Overall, smaller organizations are more dependent on leadership for a successful Lean Six Sigma deployment.

7.1.3 Impact of sector in which the organization operates on Leadership

Tables 6.9 and 6.11 clearly show a higher dependency on leadership amongst service driven companies such as internet providers, retailers and consumer services: although 33% of the interviews respondents came from retail & consumer services and internet & online companies, 50% of all data coded to leadership in the interview transcripts came from these two sectors.

We have discussed, in the literature review chapter, how the principles under pinning Lean Six Sigma originally developed in the manufacturing industries, where the extent of improvement achievable is quantifiable, with processes clearly defined and defects measurable. Over time, there has been increasing evidence of Lean Six Sigma application in service sectors, with literature showing empirical evidence of its success in banking, call centre, health care and consumer services (Hensley and Dobie, 2005).

The proposition that services are fundamentally different from manufacturing and that these differences contribute to the increased complexity of service quality is well documented in the literature (Hensley and Dobie, 2005): differentiating factors include customer participation, inseparability, perishability, labor intensiveness, intangibility and difficulty in measuring output intangibility (Fitzsimmons and Fitzsimmons, 1994; Lovelock and Gummesson, 2004).

As Lean Six Sigma deployment expands to the service industry, benefits include increase in customer satisfaction, and employee morale; reduced cost of poor quality, and improved consistency level of service; increased awareness of problem

solving tools and techniques, and effective management decision based on data (Antony et. al, 2007).

However, the differentiating factors of the service industry also introduce challenges to the deployment of Lean Six Sigma that are specifics to the service industry, such as (Antony et. al, 2007):

- It is more difficult to collect data in service settings than in manufacturing
- The measurement of customer satisfaction in a service environment is more difficult due to the human behavioural interaction associated with the delivery of the service (Ghobadian et al., 1994)
- The resistance to change from employees in a service focused environment is comparatively higher than in a manufacturing setting due to the human aspect associated with the interaction (human behaviour, friendliness, honesty, courtesy, etc..)
- Service processes are subject to more noise or uncontrollable factors as compared to manufacturing processes, that are more repeatable
- The measure and control phases of Lean Six Sigma are more difficult to control in services because sub-processes are harder to quantify and the measurement data is harder to gather (Hensley and Dobie, 2005)

Overall, service processes are much more dependent on human and organizational change than the changes to manufacturing processes: the nature of service processes is so different from industry to industry (e.g. standardized services

in banking and telecommunications, versus non-standardized services in architecture and entertainment industry) that quality requirement varies, processes are less stable and mature, and Lean Six Sigma deployments need to adapt to be effective in the service industry (Nakhai and Neves, 2009).

This makes service processes more reliant on Leadership for a successful deployment of Lean Six Sigma, as it came apparent in the interviews analysis, where respondents from companies in the service industry spoke more about the importance of their organization Leadership in the deployment than respondent from manufacturing organizations did, so addressing RQ2.

7.1.4 Leadership Dependency Model

A leadership dependency model was developed from the interviews analysis, leveraging the two factors of organization size and sector described above.

The proposed model is based on the following three assumptions:

1. Successful deployment of Lean Six Sigma requires leadership and business processes, as we have seen in the quantitative study results of this research.
2. These two inputs are not mutually exclusive.
3. Scoring high in either leadership or business processes means less or equal dependency on the other, so participants were rarely high or low in both: participants scoring high on leadership in their organisation required less business processes in place to make deployment work, and the other way

around for organisations with highly organised and mature business processes, that relied less on leadership.

Table 7.2 summarizes interviews responses based on the main factors of employees' size (for the purposes of this research we identify as small organizations with less than a thousand employees), the sector, whether service or manufacturing, and whether in the interviews they identified Leadership or Processes as the main factor they depended on for a successful Lean Six Sigma deployment.

Identifier number	Employees size	Sector	Dependency
1	Large	Service	Equi-dependent on Leadership and Processes
2	Large	Service	Equi-dependent on Leadership and Processes
3	Large	Manufacturing	High on Processes Low on Leadership
4	Large	Service	Equi-dependent on Leadership and Processes
5	Small	Service	Low on Processes High on Leadership
6	Large	Manufacturing	High on Processes Low on Leadership
7	Small	Service	Low on Processes High on Leadership
8	Small	Service	Low on Processes High on Leadership
9	Large	Manufacturing	High on Processes Low on Leadership
10	Small	Service	Low on Processes High on Leadership
11	Large	Service	Equi-dependent on Leadership and Processes
12	Large	Manufacturing	High on Processes Low on Leadership

13	Small	Service	Low on Processes High on Leadership
14	Small	Service	Low on Processes High on Leadership
15	Large	Manufacturing	High on Processes Low on Leadership
16	Small	Service	Low on Processes High on Leadership
17	Small	Service	Low on Processes High on Leadership
18	Large	Service	Equi-dependent on Leadership and Processes
19	Small	Service	Low on Processes High on Leadership
20	Large	Manufacturing	High on Processes Low on Leadership
21	Small	Service	Low on Processes High on Leadership

Table 7.2 Interviews respondents by Main Factors

We generalized those findings to put forward a Leadership Dependency model (Figure 7.1): according to the model, a manufacturing organization, with stable, repeatable and mature business processes would be less reliant on Leadership for a successful Lean Six Sigma deployment than a service organization, with typical less mature processes. Similarly, organizations with less than a thousand employees are more reliant on Leadership for a successful Lean Six Sigma deployment, than organizations with a larger employee base.

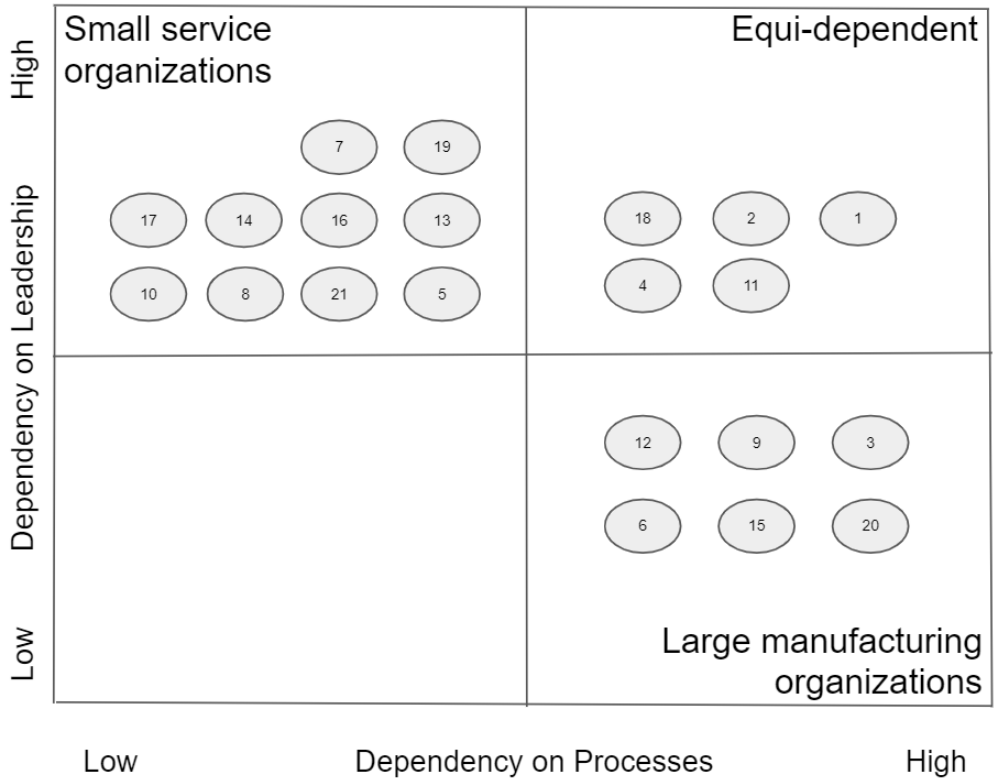

Figure 7.1 – Leadership Dependency Model

Figure 7.1 also plots the 21 interviews across the dependency on Leadership and Processes. The model allows companies to plot their dependency on these two variables according to their individual needs to help design and implement optimum rollout of Lean Six Sigma: a small services company would have a high dependency on Leadership to successfully implement Lean Six Sigma, while the opposite would be the case for a large manufacturer with stable and repeatable processes in its plant, who would depend more on having the right processes in place to optimise rollout. At the center of the model, with equi-dependence on both Leadership and Processes, there are small manufacturing organizations and large service organizations: these

will be equally dependent on Leadership and Processes for a successful Lean Six Sigma deployment.

Awareness of this dependency may help an organization that is about to embark on a Lean Six Sigma deployment journey to find the right balance between investing in more stable processes or in getting the right leadership in place.

As discussed, the service industry has its own special characteristics, which differentiate it from manufacturing and make it harder to apply Lean Six Sigma tools (Kotler, 1997; Regan 1963; Zeithmal, Parasuraman & Berry 1985): intangibility, perishability, inseparability and variability are all factors unique to the service industry, requiring a stronger leadership for a successful deployment of Lean Six Sigma. The manufacturing industry is more stable and repeatable and can rely more on robust and standard business processes for a successful deployment.

Companies with less than one thousand employees rely more on leadership, which is closer and more visible to employees; less dependency on the leadership is reported for very large companies, where the interactions between employees and senior leaders are brief and scarce.

In summary, from the qualitative analysis of the semi-structured interviews, we can gather that the more service-centred the sector and the smaller the company, the greater the need for strong leadership to successfully implement Lean Six Sigma in participating organisations.

We are now going to explore the traits of strong Leadership for Lean Six Sigma deployment, based on the qualitative study of the semi structured interviews.

7.2 Leadership Traits for Lean Six Sigma

This section of the study highlights the Leadership traits more conducive to a successful Lean Six Sigma deployment, as highlighted during the semi-structured interviews. Five key themes emerged in the analytical process of the interview transcripts, namely: communication, employee motivation, leadership style, the programme deployed, and training. Exploration of these themes provided rich insights into participants' experiences and views concerning the relationship between leadership and success levels in Lean Six Sigma deployments.

As we have just discussed, themes and issues relating to leadership style were significantly more talked about by participants from small organisations, defined as having fewer than one thousand employees, than by participants who hailed from larger organisations (Tables 6.8 and 6.10). This highlights the importance for leadership to be **visible** (Laureani & Antony, 2015).

Lean Six Sigma is a transformational journey for an organisation, radically changing the way things are done. It is necessary for the leader to be visible at the fore front of this journey, personally leading the charge and being identified with it. Establishing and utilising effective **communication** systems and structures emerged as the most talked about suggestion for good practice in engaging the workforce and achieving buy-in to improvement measures. Participants' comments suggested a need for both verbal and visual communication systems as mutually-re-enforcing mechanisms for communicating the message. At perhaps the most fundamental level of communication, the idea of senior management constantly reiterating the importance of improvement initiatives and using Lean Six Sigma, in and of itself, as

an effective communication tool for Leadership underpins what an effective communication strategy is.

Participants from service organizations talked significantly more about leadership style and related contextual factors than did participants from any other sector (Tables 6.9 and 6.11), highlighting the need for leadership to be **inspirational**. Leaders need to inspire a vision that can engage with employees at a personal level: the start of a Lean Six Sigma journey can be worrisome for employees, who may be wondering whether they will have a job at the end of it, hence it is necessary for leaders to inspire them and make it clear what the benefits will be for themselves. In this respect, communication is critical, emphasising this is not an imposed from above, but something employees can identify with and help shape: while we have discussed the vitally important role communication plays in engaging the workforce and achieving buy-in to improvement processes, caution is needed against communicating too much, too soon, to too many, suggesting instead a more 'those-to-be-affected' basis for communicating the message. This 'those-to-be-affected' basis is not intentioned as an exclusionary approach but rather as a caution against unduly raising widespread employee expectations that will not be immediately met. Thus, employees directly impacted by a given initiative need to be well-informed on what to expect and how the improvement process will affect their day-to-day role, and then, as initiatives may develop and expand over time, other employees impacted by the process need to be informed of the implications, but communicating to those not yet affected may, inadvertently, lead to employee apathy in the longer term.

The importance of the **three R's** (Roles, Responsibilities and Relations) in the context of good leadership practice was also discussed in the interviews and

cannot be overstated: clearly defined and understood roles and responsibilities at senior, middle and junior management levels and harmonious symbiotic relationships between these levels form the linchpin of successful approaches in rolling out and sustaining Lean Six Sigma improvement programmes. While the Top Leadership sets the strategic priorities and cascade their vision for Lean Six Sigma throughout the organization, it is the next level down, the Director or Manager or Team Leader, that translates that strategy into more operational and tactical goals for their staff so that everything is aligned. In other words, leadership at all levels need to be **consistent**, constantly reinforcing the main message. Participants also discussed the inter-dependent relationship between senior and middle management and, by drawing a distinction between the concepts of leadership and management, highlighted the differing skill sets needed at both these levels in order to best enact their mutually re-enforcing roles and responsibilities during a Lean Six Sigma deployment.

No matter how successful a Lean Six Sigma programme appears to be, inevitably there will be operational issues, budget constraints, urgent issues that will divert the organisation's attention from the programme. At these stages, it is critical for leadership to show unresolved commitment to the programme (Jones et al., 2010), with a strong and determined resolve to keep the programme going and not having it fade in favour of other priorities of the moment. Attending the opening of all Six Sigma trainings, and mentioning the programme in corporate messages and reports, are examples of how to keep it at the forefront of the minds of all employees and stakeholders.

As with any change management programme, Lean Six Sigma is going to face resistance; not all employees, managers and otherwise, are going to be on-board

from the start. It is important leaders recognise this, individuate the areas of biggest resistance and get personally involved to overcome them. A leader devoting personal time to overcoming an obstacle will be of inspiration to others and underscore the commitment of the organisation to the success of the programme. Leadership needs to be **targeted** to the areas of critical resistance, focusing deployment efforts on these areas first will be a major breakthrough for the entire organisation.

However, an inspired vision needs to be accompanied by details that show the leadership being in sync with the day-to-day activities of the organisation. It is important leaders allocate adequate resources to Lean Six Sigma, both in terms of top talented staff, training and budget and set realistic objectives. It is important to choose projects for which adequate resources can be provided in order to meet the twofold aim of both achieving success and generating exemplar projects that can be showcased as a mechanism for keeping momentum in employee enthusiasm and commitment to improvement initiatives.

In analysing participant discussions on the theme of leadership style, how leadership perceives Lean Six Sigma emerged as another contextual factor impacting on deployments. Participants also commented on leadership lack of fully understanding the principles and practices of Lean Six Sigma and consequent lack of engagement as impediments to success in deployments.

Leadership commitment emerged as the most heavily coded category; that is, strong, supportive and committed leadership was deemed by participants to be the most critical factor in ensuring success in deployments, supporting findings from the exploratory factor analysis of the survey responses in which leadership was identified as a significant critical success factor. Collectively, participants offered examples of

leadership commitment that encompassed a wide range of activities and actions. Such measures included: provision of all resources necessary to success, for example sufficient staffing levels, appropriate training, appropriate allocation of time, provision of peer support in the form of events and conferences as a platform for sharing of good practice, and nomination to projects on completion of training.

Overall, participants suggested that leadership fully understanding the principles and practices of Lean Six Sigma and leading by example is central to creating the ideal conditions for success in deployments.

It is important for leadership to perceive Lean Six Sigma not just as a toolkit for fixing problems, but as a **philosophy**, a way of thinking, to be, over time, engrained into the workplace culture. To achieve that, leadership needs to engage with Lean Six Sigma, understand the key principles and the potential applications for Lean Six Sigma in alignment with wider organisational strategies and goals, all while **leading by example**, particularly in ensuring a transparent and data-driven decision making process.

Leadership's role, and hence its traits, need to adapt to the stage the Lean Six Sigma programme is at, as requirements for leaders to launch a programme are different from the ones to maintain and sustain it after a few year. As programmes mature and expand, so too should the leadership's perception of Lean Six Sigma develop, especially in terms of gaining an increased understanding of potential applications for Lean Six Sigma in line with wider organisational strategies and goals. Leadership needs to move Lean Six Sigma from a tactic, 'fire fighting' position, to a more strategic one, setting the tone for the longer-term vision of the

organisation. In this respect, leadership needs to be **flexible**, moving from the particular to the larger view, and backwards, as needed.

Participants also spoke about the need of trust-building as an important factor for achieving success in Lean Six Sigma deployments: the ability of building trust with the people you work with is another essential leadership trait. As collective problem identification and problem-solving is a fundamental activity of Lean Six Sigma programmes, it is hardly surprising that participants should suggest shifting from a culture of allocating blame and scapegoating to a culture of facing up to and taking collective responsibility for problems and finding solutions as a factor necessary for building trust in the organization and hence success in deployments.

The capacity of building employees' confidence in the approach and competence of leadership itself, with what can be termed as **three C's** model of trust-building for leadership:

- Connection: make sure to understand your employees' needs before trying to be understood. If, as suggested by some participants, facing up to problems can bring with it 'some level of discomfort', so too, improvement initiatives may, in some cases, give way to discomfort in the form of a perceived or real threat of job loss, and while headcount reduction may not always be the aim of improvement programmes, it is important to ensure that the goals of such programmes are communicated clearly to all staff impacted by the programme
- Competence: make sure to display the right technical skills and understanding of the Lean Six Sigma toolkit, so to be able to meaningfully engage employees;

- Character: being open to change, always be learning, be an example of 'open mind' to the employees.

We can then summarise the 10 key traits for Leadership, that emerged from the semi structured interviews transcript analysis, to successfully deploy Lean Six Sigma programmes in organisations as follow:

- Visibility
- Excellent communicator
- Inspirational
- Three R's (Roles, Responsibilities, Relations) clearly defined
- Consistent
- Targeted
- Building a philosophy, a way of working
- Leading by example
- Flexible
- Three C's (Connection, Competence, Character)

If we cross-reference these ten leadership traits from the research, with the leadership styles' traits identified in the literature (see Table 2.2), we notice that some are already explicitly stated as traits of a pre-existing leadership style:

- *Visibility* is a trait of the Transformational Leadership style.
- *Inspirational* is a trait of Transformational and Visionary leadership.
- *Consistent* is a trait of 5-Level and Six Sigma.

- *Targeted* is a trait of 5-Level, Six Sigma and Transactional styles (also identified as *goal-orientation*).
- *Flexibility* is a trait of 5-Level and Six Sigma styles.
- *Three C's* (*Connection, Competence, Character*) are traits of the '*climate of trust*' in Affiliative, Participative and Transcendent styles.

Others are instead not clearly articulated in the literature yet:

- Excellent communicator
- Three R's (Roles, Responsibilities, Relations) clearly defined
- Building a philosophy, a way of working
- Leading by example

Although some of the Leadership traits are not fundamentally new, as already described in the Leadership literature covered in Chapter 2, what is new is their unique arrangement.

Each Leadership style identified in the literature, and summarized in Table 2.2, embodies a different set of traits, with some traits recurring across different styles: following the qualitative study of the semi-structured interviews, this research puts forward a new arrangement of Leadership traits conducive to a successful Lean Six Sigma deployment, effectively forming a new unique Leadership style. This new Leadership style is needed to successfully guide an organisation through a Lean Six Sigma deployment journey: a leadership style integrating some of the traits of pre-existing styles, plus a few additional ones, in a new blend of leadership.

7.3 Leadership traits and Dependency Model

It is possible to integrate the ten Leadership traits described in the previous paragraph with the Dependency model illustrated in section 7.2, through cross referencing the inductively coded content in the interviews' themes with the variables participants provided during their separate survey questionnaires prior to the in-depth interviews.

Three Leadership traits were significantly more talked about by participants from smaller organizations, defined as having fewer than one thousands employees and from services sector organizations: the importance for leadership to be **visible**, **inspirational**, and being able to build employees' confidence in the approach and competence of leadership itself (the **three C's** mode of trust-building).

Respondents from smaller service organizations highlighted the importance for the leadership team to be visible: Lean Six Sigma is a transformational journey, and it is necessary for the leader to be seen at the fore front of this journey, particularly in organizations where employees have a more direct access to leadership, such us in smaller service companies. The need for leadership to be inspirational is also particular important in a context where leaders can engage with employees at a personal level, building personal trust and employees' confidence in the approach and competence of the leadership of the organization.

Three other Leadership traits were instead more talked about by larger organizations, defined as having more than one thousands employees and from manufacturing organizations: the need for Leadership to be **targeted**, **flexible**, and

for Leadership to perceive Lean Six Sigma not just as a toolkit for fixing problems, but as a **philosophy**, a way of thinking, to be engrained into the workplace culture.

In large organization, with more than a thousand employees, the organizational structure tend to be setup around departmental functions: it is important for leadership to target the functional areas, or departments, where the largest opportunities for breakthrough improvements are, focusing there the deployment efforts.

Respondents from larger organizations also mentioned how different departments can be at a different maturity stage of Lean Six Sigma deployment, so it's important for leaders to be flexible and adapt to the different needs of the deployment.

In larger organization, respondents also highlighted the risk of initiatives' fatigue, where different programs and initiatives are launched, causing scepticism among employees, hence the need for leadership to perceive Lean Six Sigma as not just a toolkit to fix problems, but as a philosophy that permeate the way the organization operates.

Finally, the remaining four Leadership traits were equally mentioned from all respondents: **communication**, **leading by example**, **consistency** and clear roles and responsibilities (**three R's**) were mentioned with equal emphasis from the respondents belonging to organizations of different sizes and sectors.

Figure 7.2 illustrates the Leadership traits by sector and employees' size, expanding the Leadership Dependency model previously illustrated in Figure 7.1:

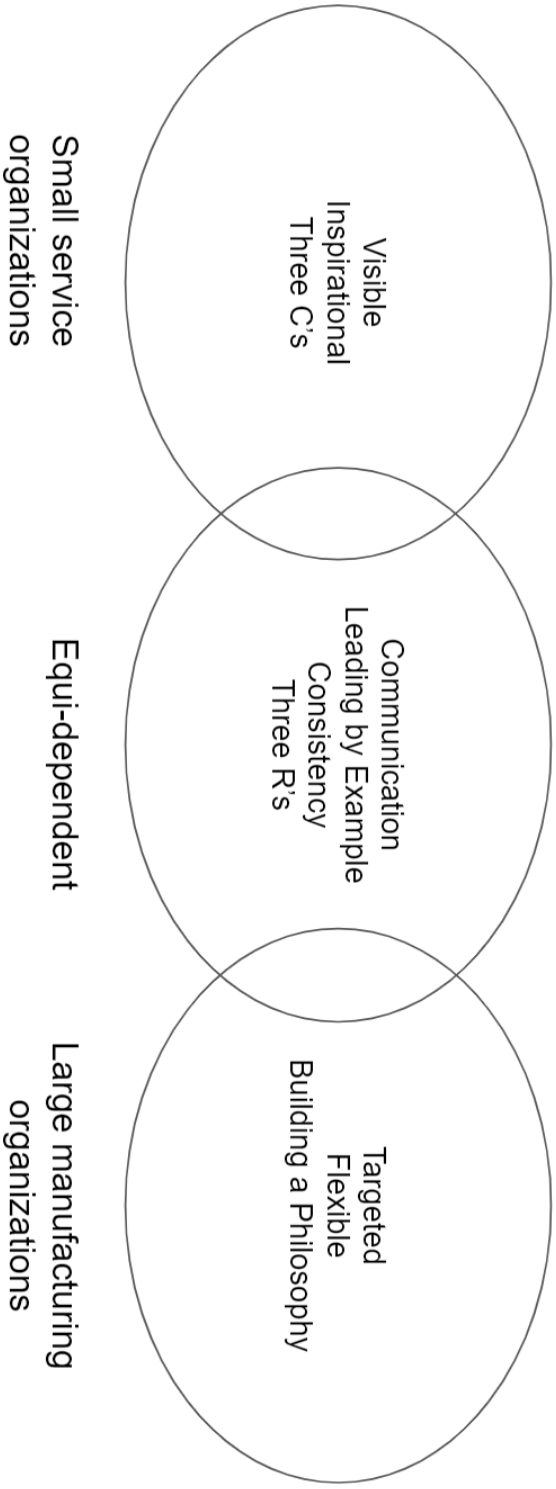

Figure 7.2 – Leadership traits by sector and employees' size

7.4 Summary

Leadership, as a critical success factor in Lean Six Sigma deployments, was identified as a key finding from the quantitative element of this study, and the qualitative dimension sets out to further explore this correlation and tease out its implications.

Further analyses involving cross comparisons between the qualitative and quantitative data sets yielded results that identified correlations between coding patterns across the interviews' themes and variable survey information such as organisation size, sector, location, metrics used for evaluating deployment, and estimated success level. Two key correlations were highlighted, the size of the organization and the sector it operates in, as they relate more directly to correlations between the concept of leadership per se and Lean Six Sigma deployments, the core of the research inquiry.

It was concluded that the more service-centred the sector and the smaller the company, the greater the need for strong leadership to successfully implement Lean Six Sigma, leading to a Leadership dependency model.

Additionally, through analysis of the interviews transcripts, it was possible to articulate the Leadership traits more conducive to successful Lean Six Sigma deployment in organizations, and map them on the same dependency model: these traits, although not all completely new in the literature, are organized in a novel way, spanning across different Leadership styles articulated in the literature.

In summary, the quantitative and qualitative dimensions of this study have integrated and reinforced each other, with the following overall conclusions that may be drawn:

- A Leadership Dependency Model was developed and presented in relation to participating organisations (Figure 7.1), outlining that the more service-centred the sector and the smaller the company, the greater the need for strong leadership to successfully implement Lean Six Sigma in participating organisations, so addressing RQ2;
- A new Leadership style was suggested as the most conducive to Lean Six Sigma deployments. Its traits are as follow:
    - Visible
    - Excellent communicator
    - Inspirational
    - Three R's (Roles, Responsibilities, Relations) clearly defined
    - Consistent
    - Targeted
    - Building a philosophy, a way of working
    - Leading by example
    - Flexible
    - Three C's (Connection, Competence, Character)

These Leadership traits were also integrated with the Dependency model (Figure 7.2), showing how smaller service organizations are particularly dependent on leadership to be visible, inspirational and the ability of its leaders to connect with

employees; while larger manufacturing organizations rely more on leadership being targeted, flexible, and capable of building a philosophy of working around Lean Six Sigma.

The next chapter includes discussions and limitations of this study and agenda for future research.

Chapter 8

Discussion, Conclusion and Agenda for Future Research

8.0 Introduction

This research adopted a mixed methods approach to contribute to the advancement in application within the Lean Six Sigma research: this research was undertaken to assess the impact of Leadership on Lean Six Sigma implementation in organisations and thereby develop a Leadership style and dependency model to facilitate successful implementation of Lean Six Sigma. This research attempted to answer two RQs, discussed in the next section, and to develop a better understanding of how leadership impacts Lean Six Sigma. This final chapter summarises the key findings from the research, the contributions to the theory and practice, limitations and agenda for future research.

Research findings were presented and discussed at various international conferences in Europe and the USA, and published in articles in peer reviewed academic journals (list of published articles on page 5). This provided valuable feedback and input that improved the research process and outcome.

8.1 Discussion of Key Findings

The main objective of this work was to theoretically and empirically contribute to the scientific knowledge about Lean Six Sigma and was developed to answer two RQs.

The study has broader implications for managers and Lean Six Sigma practitioners who deploy quality improvement programmes with a hope that these programmes enhance performance and outweigh the investment made (Arumugam et. al, 2012). This study highlights the importance of having the right leadership in place to ensure successful deployment, coupled with the top talent in the organisation involved in Lean Six Sigma, providing them with the right project management tools, and making them financially accountable for the success of their initiatives.

Overall, organisations need to make sure they have in place committed leaders, to inspire employees and set the right environment for continuous improvement, in order to reap the benefits from a Lean Six Sigma deployment.

***RQ 1**: What leadership traits are more conducive to a successful deployment of Lean Six Sigma?*

The qualitative findings from the semi-structured interviews conducted (see Chapter 6 for details), exploring the concept of organisational leadership in the context of Lean Six Sigma, were presented in five parts corresponding to the five key themes that emerged in the analytical process, namely: communication, employee motivation, leadership style, the programme deployed, and training. Exploration of these themes provided rich insights into participants' experiences and views concerning the relationship between leadership and success levels in Lean Six Sigma deployments. Further analyses involving cross comparisons between the qualitative and quantitative data sets yielded results that identified correlations between coding patterns across the five themes and variable survey information such as organisation

size, sector, location, metrics used for evaluating deployment, and estimated success level.

The qualitative analysis ultimately highlighted the following ten leadership traits to be conducive to a successful deployment of Lean Six Sigma:

- Visible
- Excellent communicator
- Inspirational
- Three R's (Roles, Responsibilities, Relations) clearly defined
- Consistent
- Targeted
- Building a philosophy, a way of working
- Leading by example
- Flexible
- Three C's (Connection, Competence, Character)

Although some of the Leadership traits are not fundamentally new, as already described in the Leadership literature covered in Chapter 2, what is new is their unique arrangement.

Each Leadership style identified in the literature, and summarized in Table 2.2, embodies a different set of traits, with some traits recurring across different styles: following the qualitative study of the semi-structured interviews, this research puts forward a new arrangement of Leadership traits conducive to a successful Lean Six Sigma deployment, effectively forming a new unique Leadership style.

This new Leadership style is needed to successfully guide an organisation through a Lean Six Sigma deployment journey: a leadership style integrating some of the traits of pre-existing styles, plus a few additional ones, in a new blend of leadership.

These Leadership traits were also correlated with employees' size and industry sector of the organizations, showing how smaller service organizations are particularly dependent on leadership to be **visible**, **inspirational** and the ability of its leaders to connect with employees (**three C's**); while larger manufacturing organizations rely more on leadership being **targeted**, **flexible**, and capable of **building a philosophy** of working around Lean Six Sigma.

Finally, the remaining four Leadership traits were equally mentioned from all respondents: **communication**, **leading by example**, **consistency** and clear roles and responsibilities (**three R's**) were mentioned with equal emphasis from the respondents belonging to organizations of different sizes and sectors.

***RQ 2**: To what extent do different types of organizations rely on Leadership for a successful Lean Six Sigma deployment?*

The results of the qualitative analyses of the semi-structured interviews showed a higher dependency on leadership amongst service driven companies (such as internet providers, retailers and health services) and companies with less than one thousand employees, with respondents from those companies mentioning leadership as a critical success factor more than respondents from companies in other industries and with a larger employees' base. The more people-centred and service-centred the

sector and the smaller the company, the greater the need for strong leadership to successfully implement Lean Six Sigma in participating organisations: based on these findings, a Leadership Dependency Model was put forward (Figure 7.1), showing the dependency on Leadership and Processes for a successful Lean Six Sigma deployment in organizations, based on the organization size and sector.

This Leadership Dependency Model was integrated with the Leadership traits from RQ1, to show how organizations of different size and sector rely more on certain Leadership traits (Figure 7.2).

8.1.1 Quality of Research

This section discusses how the quality criteria of reliability and validity were met (Easterby-Smith et al., 2002; Yin, 2003; Voss et al., 2002) and the contribution to the Six Sigma body of knowledge and practice and leadership theory.

The summary of quality criteria for this research is presented in Table 8.1. Reliability refers to '*the extent to which your data collection techniques or analysis procedures will yield consistent findings*' (Easterby-Smith et al., 2002), while validity refers to the issue of whether the set of indicators *'devised to gauge a concept really measures that concept'* (Bryman & Bell, 2007).

Quality Criteria	Criteria assessed in this research	Criteria fulfilled (Yes / No)
Reliability	*Survey*: adaption and use of survey instrument from previous research *Interviews*: use of interview protocol, transcription and qualitative analysis	Yes
Construct Validity	Use of multiple sources of	Yes

	evidence: survey and interviews	
Content Validity	Used the literature to design the questionnaire and interview questions, incorporating experts' comments to revise instrument	Yes
Contribution to theory	Novelty of research and 'value-addition' to what is already known in the literature	Yes
Contribution to practice	The implications and conclusions from the research that can be used by other researchers, policy makers, or practitioners to make decisions for their processes, business or other social issues	Yes

Table 8.1: Quality Criteria for this Doctoral Research

Reliability Analysis was conducted for the survey (Cronbach's Alpha) and was ensured for the interviews through adaption from previous research and the development of an interview-protocol so that data collection procedures can be repeated with similar results when another investigator repeats the study (Yin, 2003; Easterby-Smith et al., 2002).

Construct Validity measures whether the set of items constituting a measure is an appropriate operational definition of the theoretical construct measured (Flynn et al., 1990). Construct validity is not required to be tested when the survey instrument does not use multiple-item measurement scales (Rungtusanatham et al., 2003), but it was achieved in this research through use of multiple sources of evidence using semi-structured interviews and survey.

Content Validity measures the extent to which the content of the items in a summated scale truly measures the concept it intends to measure (Malhotra & Grover, 1998). This was achieved by reference to the literature and experts well

versed in the domain. The author used the literature to design the questionnaire and incorporated experts' comments to ensure content validity.

Carrying out a quality research process depends on appropriate research methodology and following research quality criteria. The author participated in various international conferences (see Appendix VI for full list) and used these opportunities to discuss his research methodology with experts in the Operations Management discipline to get their input and feedback on the chosen methodology.

8.1.2 Contribution to Theory /Knowledge

This research has made a contribution to knowledge by answering the two RQs established at the outset of the thesis and developing a better understanding of the impact leadership has on Lean Six Sigma.

The research developed a better understanding of how different leadership traits impacted Lean Six Sigma deployment and suggested a new Leadership style to support Lean Six Sigma deployments (**RQ1**): this is among very few instances when research has linked the literature on Leadership to Lean Six Sigma practices, also illustrating the Leadership traits more important based on employees' size and industry sector of the organization. Although leadership is often mentioned as an important factor for the deployment of continuous improvement programmes (Hahn, Hill, Hoerl, & Zinkgraf, 1999; Achanga, Shehab, Roy, & Nelder, 2006; Pande, 2007; Laureani & Antony, 2012), the specific traits needed to lead a continuous improvement programme have not been defined. This research went further than previous studies, determining the leadership traits that are more conducive to successful deployment of Lean Six Sigma in organisations, and describing which

ones are more important for different organization sizes and industry sectors. Although some of the Leadership traits are not fundamentally new, what is new is their unique arrangement to form a new Leadership style, needed to successfully guide an organisation through a Lean Six Sigma deployment journey. This new leadership style integrates some of the traits of pre-existing styles, plus a few additional ones, in a new blend of leadership, deemed the most conducive to successful deployment of Lean Six Sigma in an organization.

More generally in leadership theory, Suddaby (2010) stressed the need for construct clarity in management research and the need to 'create precise and parsimonious categorical distinctions between concepts' and to 'show their *semantic relationship* to other related constructs' (Suddaby 2010, p.347). This is evident in the extensive literature on leadership styles: the 'dominant conceptualization of leadership in organizational behavior' is the charismatic/transformational style (Judge et al., 2008, p. 335), a style often contrasted with a transactional style, while other different styles have been introduced recently (Anderson & Sun, 2015). Leadership scholars have long bemoaned the lack of integration in the field, and calls for integration have been growing recently (Avolio 2007; DeRue et al., 2011; Piccolo et al., 2012). The overlap between the many leadership styles currently being researched is highly problematic and represents 'construct proliferation' (DeRue et al., 2011) and probably 'concept redundancy' (Morrow, 1983). Leadership has for a long time been a topic grabbing the attention of both academics and practitioners; despite extensive literature on leadership, and very little literature on leadership in Lean Six Sigma, there is a void in explaining how and what traits are needed for a successful implementation of Lean Six Sigma. This research has attempted to fill this

void, introducing a new arrangement of Leadership traits, more suited to support Lean Six Sigma deployments.

Another contribution to theory and knowledge is the development of criteria, based on empirical research and literature review, to assess the dependency on leadership when embarking on a Lean Six Sigma journey (**RQ2**). Existing literature on the success and failure of Lean Six Sigma implementation have a general approach on what the CSFs and reasons for failure are. This research showed a higher dependency on leadership amongst service driven companies (such as internet providers, retailers and health services) and smaller companies (defined as less than one thousand employees). The more people-centred and service-centred the sector and the smaller the company, the greater the need for strong leadership to successfully implement Lean Six Sigma in participating organisations.

8.1.3 Contribution to Practice

Contribution to practice is defined as the set of implications and conclusions from the research, that can be used by other researchers, policy makers, business leaders or other practitioners in the research domain. Contributions include frameworks, models, guidelines, roadmaps, policies or suggestions for changes/improvements related to the business or social issues at the centre of the research. Publications advocating different elements of Lean and/or Six Sigma implementation, illustrating case studies and showing financial results abound. However, many of these publications focus on managing specific Lean Six Sigma projects, but fail to provide information on business practices that support the effectiveness and sustainability of the implementation. The present research has

showed some tangible leadership traits that might guide those responsible for implementing Lean Six Sigma in organisations.

The practical contributions made by this research include the following:

- Identification of the arrangement of leadership traits more conducive to successful Lean Six Sigma deployment: this allows organisations that are about to embark on a Lean Six Sigma journey to evaluate whether their leadership team has the needed traits to support and sustain the deployment;
- Identification of leadership traits by employees' size and industry sector: this would help anyone in a Leadership position, about to embark on a Lean Six Sigma deployment, showing what type of traits are needed to support such deployment in a practical way, based on the organization size and industry sector;
- Development of a leadership dependency model for Lean Six Sigma, outlining sectors and company size where it is even more critical to have a strong leadership in place: this would help organisations that are about to embark on a Lean Six Sigma journey to self-assess their preparedness for it. Service organizations are more dependent on Leadership, while manufacturing organizations are more dependent on processes for a successful deployment; also, the smaller the organization, the more need for a strong visible Leadership. This would help organizations about to embark on a Lean Six Sigma deployment journey to determine where to invest more resources, either on up-skilling their Leadership team or on more stable processes.

This research indicates that leadership commitment and support are the starting points for implementation success. Effective leadership can provide support and involvement from the start of the deployment to the projects' execution.

It has to be the right type of leadership, with the appropriate traits to ignite the successful deployment of Lean Six Sigma practices. Leadership should be visible, at the fore front of the change management initiative, consistently communicating the change message, inspiring employees to follow a vision, can engage with employees at a personal level, defines clear roles and responsibilities, and is consistent in its message and targets the areas of the organisation more resistant to change.

For the Lean Six Sigma deployment to be successful, it is important for the organisation to perceive Lean Six Sigma not just as a toolkit for fixing problems, but as the way of doing things, following the example set from the leadership. For an organisation embarking on the Lean Six Sigma journey it is critical to have the right leader(s) in place, that can embody these attributes and lead the rest of the organisation along the journey.

Overall, the key contributions of this research that makes it different from previous research work or literature are summarised in Table 8.2:

Research Questions	**Novel Contributions**

RQ1: What leadership traits are more conducive to a successful Lean Six Sigma deployment?	• Identified the top 10 leadership traits to foster Lean Six Sigma as:
	  • Visibility
	  • Excellent communicator
	  • Inspirational
	  • Three R's (Roles, Responsibilities, Relations) clearly defined
	  • Consistent
	  • Targeted

	• Building a philosophy, a way of working • Leading by example • Flexibility • Three C's (Connection, Competence, Character)

RQ2: To what extent do different types of organizations rely on Leadership for a successful Lean Six Sigma deployment?	• Developed Leadership dependency model, showing that the more people-centred and service-centred the sector and the smaller the company, the greater the need for strong leadership to successfully implement Lean Six Sigma in participating organisations
	• Shown how organizations of different employees' size and industry sector rely on different leadership traits from RQ1:
	  • Small Service organizations rely more on Leadership being visible, inspirational and able to connect with employees;
	  • Large Manufacturing organizations rely more on Leadership being targeted, flexible and able to build a philosophy of working around Lean Six Sigma

Table 8.2: The Novel Contributions of this Doctoral Research

8.2 Agenda for Future Research

8.2.1 Limitations of the Research

Certain limitations inherent to the research design and implementation should be considered in the interpretation of the research conclusions and related methodological observations. The research was a mixed-methods study, with a quantitative and a qualitative part. In the quantitative study, a survey was run, with 124 responses (approximately 35% response rate), while in the qualitative study 21 semi-structured interviews were conducted. A relatively small sample of interviews may limit the generalisability of the qualitative research, however sample sizes are typically smaller in qualitative research because, as they study goes on, acquiring more data does not necessarily lead to more information, as one occurrence of a piece of data is all that is necessary to ensure it becomes part of the analysis

framework, and sample sizes that are too large do not permit the deep and inductive analysis that defines qualitative inquiry (Huberman et al., 1994). Interviews with practitioners from different industry sectors have given the researcher the opportunity to dig deeply into each one of the interviews to get cross-industries insights. Another limitation is that the research did not examine the different types of companies that participated, but focused more on the experience of the subject matter experts that took place into the research. In the future, the author would like to differentiate and tailor the research in broad industrial areas, such as manufacturing and services, different cultural aspects and would like also to differentiate between leadership styles required of Senior Management and Middle Management. Particularly in large organisations, where the more Senior Management may be very remote from a large number of employees, it is possible different leadership styles would be required at different levels of seniority.

Finally, the design of the leadership dependency model was based on the key findings from a small sample of interviews and matching it with the literature, but it was not tested in a real industrial setting yet. Even though the coding, causal mapping and pattern searching during the qualitative analysis of the interview transcripts is peer reviewed, the interpretations still remain subjective to the researcher. The author tried to overcome this by adopting a robust interview protocol design, writing up objective interviews' transcripts and triangulating data from multiple sources. On a theoretical level, therefore, the results can be generalised beyond the context of the study. The researcher believes that his findings are objective because he used survey research and qualitative interviews rigorously as

much as possible, taking all necessary steps required during the research design, data collection, analysis and interpretation, aimed at ensuring the quality of the research.

8.2.2 Future Research Directions

The author believes that until you sail through an arduous task, you cannot comment on how you could have done the work differently or how you could improve this work in future. Just as Lean Six Sigma is a continuous improvement journey, the whole PhD process and outputs produced also require further refinements or improvements. The previous paragraph introduced some of the limitations of this research, which could be improved in the future to make the findings more generalisable. Some of the directions for the future include the following:

- Increase the scope of the research to take into account organisational culture: several studies have identified the significant influence culture has on successful quality initiatives (Rad, 2006). Carnell (2004) showed that without considering culture and without creating an organisation-wide empowerment atmosphere combined with accountability, Lean Six Sigma will struggle to keep momentum and will wane out. Organisation culture can be defined as the assumptions and beliefs shared by organisation members, which influence how staff perceive, think and act (Schein, 2010). The impact of organisational culture has been often overlooked by managers and leaders when implementing an organisational initiative (Knapp, 2015). Further studies in this area would focus on how altering reward systems, work procedures, objectives and

work teams can influence changes in behaviour and how Lean Six Sigma is perceived.

- Increase the scope of the research to take into account society's culture impact on an organisation: is a different type of leadership needed in different countries? According to Schein (2010) and Gagliardi (1986), all artefact-level issues in organisations, such as tools, approaches and man-made physical items are responded to by groups of people based on their social, shared values. A style or behaviour that works well in the USA may not work well in Japan, for example, and this can also be in contrast with the organisational culture, particularly for multinational companies operating in different countries, which needs to keep in touch with different national cultures. The use of case studies and ethnographic research, embedding the researcher into different organisations in different countries, will be needed to investigate the impact of national culture.
- Differentiate Senior and Middle Management Leadership style: is a different type of leadership required from these groups? This can be of particular importance in large organisations, where inevitably the senior leadership is more remote from the employees' base. It would be possible to probe this point further through the use of differentiated surveys and interviews to determine whether different leadership styles are needed at different levels of seniority.
- Investigate the effect of social constructs: the effects of working environment, employee well-being, unionised workforce and social

sustainability on the types of leadership required for a successful Lean Six Sigma deployment would be an interesting research stream.

The research can also act as a base to conduct further exploratory research to statistically establish the casual relationship between leadership and Lean Six Sigma results, for example comparing results of publicly trading companies with their leadership styles and determine through quantitative analysis (e.g. structural equation modelling) whether there is a causal link between certain leadership styles and certain results, whether positive or negative.

8.3 Personal Reflection

In the past decades, Lean Six Sigma has been proven to not be a passing fad, or just another quality initiative, but a business strategy here to stay for the long run. It is a business strategy based on data driven decision making and problem solving, relying on rigorous analysis of root cause(s) of defects, and thus suggesting ways to eliminate the gap between existing performances and the desired level of performances. No other quality improvement methodology covers all features of Lean Six Sigma: focus on customer requirements, quantitative comparison of processes across industries, data driven decisions, specially trained members of staff to lead improvement projects, evaluation of the business impact of each project.

Although not the only initiative that can enhance business performance, the author is of the view that Lean Six Sigma indeed contributes to business improvement. Originally started in manufacturing, the application of Lean Six Sigma

is now common in sectors such as finance, healthcare, government, education, banking and tourism, drawing the attention of both practitioners and academics.

The challenge for organisations is to integrate Lean Six Sigma into their core business processes, not to manage it as a standalone initiative. In the author's opinion, Lean Six Sigma will continue to be a powerful management initiative for achieving and sustaining operational and service excellence: it may evolve over time to a different 'package' and branding, but its core principles and key concepts will stay with it for many years to come (Snee, 2004, Antony, 2008).

Some of the research trends emerging in the future include:

- development of new application areas such as software engineering, human resources, sales, marketing;
- more prominence for Design for Six Sigma (DFSS) vs. traditional DMAIC Six Sigma, as more organisations want to redesign their products, services or processes from scratch;
- expansion of Lean Six Sigma to small and medium enterprises (SMEs): literature on this topic has increased in the past few years (Antony, Kumar & Labib, 2008) and clearly Lean Six Sigma is now considered outside the boundaries of large multinational organisations;
- relationship between Lean Six Sigma and organisation culture and learning;
- relationship between Lean Six Sigma and national cultures: can it move out from a largely US and Japan focus and reach out to organisations in other parts of the world?
- integration of Lean Six Sigma with other quality improvement initiatives, such as EFQM Excellence Model and ISO 9001:2008;

- relationship between Lean Six Sigma and innovation: does Lean Six Sigma's structured and disciplined approach facilitate or hinder innovation in organisations?

From a research and personal perspective, the author enjoyed his PhD journey: doing research is a process of its own, with its challenges, frustrations and rewards, not that different from any other process that needs to transform an input (ideas, data, etc..) into an output (knowledge). The author had to adjust his writing and presentation style to be more in tune with the demand of academic work, and had had the opportunity to meet many colleagues in various conferences across the world and to learn about different approaches to research in the operations management field: from the more positivist approach taken from colleagues in the US, to the more phenomenological stance taken by colleagues in Europe.

The author came to note that often the choice of research paradigm is driven by the researcher's upbringing and familiarity, as also confirmed in the literature (Meredith, 1998; Boyer & Swink, 2008). It seems that, like most people, researchers do not want to leave their comfort zone, following in the path outlined from their education system. However, the author chose a mixed-methods approach to address his research questions, so to minimise the limitations of individual approaches.

Finally, the author hopes this research will be useful for Lean Six Sigma practitioners, both in academia and in the business world, to continue investigating this powerful management initiative.

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Appendices

Appendix I: Systematic Literature Review - data tables

Appendix II: Systematic Literature Review – articles database reference listing

Appendix III: Survey questions

Appendix IV: Semi-structured Interview questions

Appendix V: NVivo Interview Analysis - Coding

APPENDIX I

Systematic Literature Review - data tables

Summary of references by Journal

Journal	Total
Quality Progress	20
International Journal of Quality & Reliability Management	11
International Journal of Six Sigma and Competitive Advantage	10
Harvard Business Review	9
Total Quality Management & Business Excellence	4
International Journal of Lean Six Sigma	4
Management Services	4
Leadership and Organization Development Journal	3
Journal of Manufacturing Technology Management	3
Total Quality Management	3
International Journal of Operations & Production Management	3
Quality and Reliability Engineering International	3
Management Decision	2
The TQM Journal	2
Technovation	2
International Journal of Production Economics	2
Leadership Quarterly	2
Managing Service Quality	2
Strategic Finance	2
Manufacturing Engineering	2
The Quality Management Journal	2
International Journal of Quality and Reliability Management	2
The TQM Magazine	2
Quality Engineering	2
ASQ Six Sigma Forum Magazine	2
Quality Management Journal	2
International Journal of Productivity and Performance Management	2
Measuring Business Excellence	2
Health Care Management Review	1
Journal of Modeling in Management	1
Tooling & Production	1
Business Strategy Review	1
Quality in Primary Care	1
International Journal of Workplace Health Management	1
International Journal of Knowledge and Learning	1
International Statistical Review	1
International Journal of Health Care Quality Assurance	1
Journal for Quality and Participation	1
Machine Design	1
Journal of American Academy of Business	1
Procedia CIRP	1

Journal of Housing and Community Development	1
International Journal of Applied Management Science	1
Chemical Engineering Progress	1
International Journal of Process Management and Benchmarking	1
Journal of Operations Management	1
International Journal of Productivity and Quality management	1
Journal of Organizational Behavior	1
Quality Progress	1
Journal of Workplace Learning	1
Journal of Quality Technology	1
College and Research Libraries	1
International Journal of Procurement Management	1
Cost Management	1
Quality technology & quantitative measurement	1
Engineering Management Journal	1
Journal of health organization and management	1
Executive Excellence	1
Siliconindia	1
Frontiers of Health Service Management	1
Team Performance Management	1
Total Quality Management	1
Academy of Management Executive	1
Industrial Management	1
Action Learning: Research & Practice	1
TQM Journal	1
American Printer	1
IEEE Engineering Management Review	1
Work	1
BMC Health Services Research	1
Journal of Business and Economic Studies	1
Operations Management Research	1
The Journal for Quality and Participation	1
Production Planning and Control	1
International Journal of Business Excellence	1
Products Finishing	1
Journal of Operations Management	1
Project Management Journal	1
Home Healthcare Nurse	1
Quality	1
Healthcare Quarterly	1
Industrial Engineer	1
Quality World	1
Quality Digest	1
Procedia-Social and Behavioral Sciences	1

Industrial Engineer – Norcross	1
Journal of Manufacturin Technology Management	1
Industrial Engineering	1
International Journal of Human Resources Development and Management	1
Internation Journal of Quality & Reliability Management"	1
Assembly Automation	1
Robotics and Computer Integrated Manufacturing	1
Diabetes	1
Metalworking Production	1
Applied Mechanics and Materials	1
MIT Sloan Management Review	1
International Journal of Six Sigma and competitive advantage	1
Nursing Management	1
Grand Total	179

Summary of references by year

Year	Total
Pre 92	3
92-95	5
96-99	14
00-03	17
04-07	46
08-11	64
12-15	30
Total	179

Summary of references by type of paper

Type	Total
Conceptual Paper	146
Empirical Study	14
Literature Review	12
Exploratory Study	7
Grand Total	179

Summary of references by sector

Sector	Total
No Specific	124
Service	22
Manufacturing	20
Healthcare	11
Public Sector	2
Grand Total	179

APPENDIX II

Systematic Literature Review – articles database reference listing

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APPENDIX III

Survey Questions

PART I: Background of the Company

1. Please indicate your position in the organization:
    - Green Belt or Yellow Belt
    - Black Belt
    - Master Black Belt
    - Six Sigma Deployment Champion
    - Functional Leader / Manager
    - Director
    - CEO

2. Please indicate the sector your organization belongs to:
    - Accounting
    - Advertise & Marketing
    - Aerospace & Defence
    - Agriculture
    - Automotive
    - Chemicals
    - Computers & Software
    - Electronics & Semiconductors
    - Energy & Environment
    - Financial Services
    - Food & Beverage
    - Government & Trade
    - Health Care
    - Human Resources
    - Industrial Goods & Services
    - Internet & Online
    - Law
    - Management
    - Media & Entertainment
    - Pharmaceuticals & Biotechnology
    - Real Estate & Construction
    - Retail & Consumer Services
    - Small Business
    - Telecommunications
    - Transportation & Logistics

3. Please indicate the location of your company headquarter:
    - Continental Europe
    - UK / Ireland
    - USA

- Japan
- Asia (not Japan)
- Latin America
- Others:_____

4. How many employees your organization has:
    - < 250
    - 250 - 500
    - 501 – 1,000
    - > 1,000

5. Which methodology does your company use most?
    - Six Sigma
    - Lean
    - Lean and Six Sigma together but separate
    - Lean and Six Sigma together in tandem

6. How many Black Belts, Green Belts and Yellow Belts does your company have as % of the total employee population?

	0% - 20%	21% - 40%	41% - 60%	61% - 80%	81% - 100%
Yellow Belt					
Green Belt					
Black Belt					

7. Is Lean Six Sigma applied to all the business units of your organizations?

    - Applied to all business units
    - Applied to some business units
    - Applied to one business unit

PART II: Criteria for successful implementation of LSS in your organization

8. Please indicate the areas where Lean Six Sigma is applied in your organizations (mark all that apply):
    - Finance
    - Sales
    - Marketing
    - Human Resources
    - Customer Service
    - Operation / Production
    - Logistic
    - Supply Chain
    - Procurement
    - Other: _____

9. How many **Six Sigma** projects are completed in a year in your organization?

    - 0 - 10
    - 11 - 50
    - 51 – 100
    - > 100

10. How many **Lean** projects are completed in a year in your organization?

    - 0 - 10
    - 11 - 50
    - 51 – 100
    - > 100

11. How many **Lean Six Sigma** projects are completed in a year in your organization?

    - 0 - 10
    - 11 - 50
    - 51 – 100
    - > 100

12. Please indicate the approximate % of Lean Six Sigma projects in your organization that fall within the following functional areas *(indicate "N/A" if a function doesn't exist in your organization, or "0%" if the function exists but it doesn't apply Lean Six Sigma at all)*:

	0% - 20%	21% - 40%	41% - 60%	61% - 80%	81% - 100%
Finance					
Sales					
Marketing					
Human Resources					
Customer Service					
Operation / Production					
Logistic					
Supply Chain					
Procurement					
Other (Please explain): _____ _____					

13. What is the primary measure for the success of Lean Six Sigma in your organization?

- Cost Savings or Cost avoidance (less waste, inventory levels)
- Employees' satisfaction
- Customers' satisfaction
- Reduce defects / Improve quality
- Leadership development / Culture change
- Profit / Bottom-line
- Operating Income/Sales
- Productivity Increase
- Cost of Poor Quality
- DPMO / Process Capability
- Processing times
- Others: please specify_____

14. How would you consider the results of Lean Six Sigma in your organization so far:

- Extremely successful

- Successful
- Not Significant
- Negative
- Extremely negative

PART III: Critical success factors of LSS in Service Industries

Please first rank each factor (1=most important, 2=second most important, etc….) and then mark its importance as appropriate (1=Not Very Important; 2=Not Important; 3=Important; 4=Very Important; 5=Critical)

Cultural Change	1	2	3	4	5
Rank =					
Leadership Style	1	2	3	4	5
Rank =					
Management Commitment	1	2	3	4	5
Rank =					
LSS Training	1	2	3	4	5
Rank =					
Organization infrastructure	1	2	3	4	5
Rank =					
Communication	1	2	3	4	5
Rank =					
Linking LSS to business strategy	1	2	3	4	5
Rank =					
Linking LSS to customer	1	2	3	4	5
Rank =					
Linking LSS to HR rewards	1	2	3	4	5
Rank =					
Extending LSS to supply chain	1	2	3	4	5
Rank =					
LSS Projects prioritization	1	2	3	4	5
Rank =					
Project Management Skills	1	2	3	4	5
Rank =					

LSS financial accountability Rank =	1	2	3	4	5
LSS Projects tracking and review Rank =	1	2	3	4	5
LSS tools & techniques Rank =	1	2	3	4	5
Data based approach Rank =	1	2	3	4	5
Communication/awareness Rank =	1	2	3	4	5
Selection of LSS staff Rank =	1	2	3	4	5
Resources to LSS staff Rank =	1	2	3	4	5
Others: please specify Rank = _____	1	2	3	4	5

_____

_____

Thank you for taking the time to complete this survey.

If you are interested in receiving the consolidated results, please leave your email address:

_____

If you are interested in taking part into next steps of the research, consisting in semi-structured interviews and company's visit, please leave your email address:

_____

APPENDIX IV

Semi-Structured Interview Questions

INTRODUCTORY PROTOCOL

To facilitate our note-taking, we would like to audiotape our conversations today. For your information, only researchers on the project will be privy to the tapes, which will be eventually destroyed after they are transcribed. All information will be held confidentially; your participation is voluntary and you may stop at any time if you feel uncomfortable. Thank you for agreeing to participate.

We have planned this interview to last no longer than one hour. During this time, we have several questions that we would like to cover.

INTRODUCTION

You have been selected to speak with us today because you have been identified as someone who has a great deal to share about the deployment of Lean Six Sigma (LSS) in your organisation, you have already filled a preliminary online survey on Critical Success Factors (CSFs) for LSS deployment and indicated your willingness to be interviewed. Our research project as a whole focuses on the impact of leadership on LSS deployment, the impact different leadership styles and traits have on the success of Lean Six Sigma in an organisation. Our study does not aim to evaluate your company success or your personal techniques or experiences; rather, we are trying to develop best-in class practices for leadership which helps those organisations who are embarking on Lean or Six Sigma or LSS.

INTERVIEWEE BACKGROUND: ***first reconfirm the answers on the online survey. Is there anything that needs to be changed?***

How long has LSS been implemented in your organisation?

Did your organisation implement first Lean, then Six Sigma, or the other way around, or did it go straight into Lean Six Sigma?

In the survey, you mentioned LSS is being applied to Business Units X, Y, Z (*this depends on what the person answered to the survey*): what do you think made those business units start using LSS, while others did not?

In which particular business function has the company started to apply Lean or Six Sigma? Why?

In what parts of the business are your company not utilising LSS and why do they not employ LSS in that business function?

How is the success (or lack of success) of the LSS programme being measured? Which metrics are being tracked?

If non-financial metrics are used, which ones? For example, employee satisfaction, customer satisfaction, etc.

If the measure is financial, do you track the financial impact of LSS projects as hard savings on the bottom line?

In the survey, you assessed your organisation's LSS programme as being successful/unsuccessful (*this depends on the person's survey response*): what exactly prompted you to answer that way?

LEADERSHIP STYLE

In the survey, you mentioned leadership as CSF number X (*this depends on the person's survey response*): what was your interpretation of leadership in that regard?

What prompted you to assign that ranking to leadership?

How would you describe the leadership style of the senior management team in your organisation?

Did the leaders of the business units that implemented LSS display a different leadership style from the others?

How does leadership style influence innovation in your firm?

How does leadership style influence operational excellence in your firm?

Do you think the LSS programme in your organisation would have reached the same results with a different leadership? If YES, why? If NO, why?

If you were the leader of your organisation, what would you have done differently?

Which leadership style is more conducive to a successful LSS deployment? For example, transactional, transformational, etc.

MANAGEMENT COMMITMENT

Would you consider the top management in your organisation as being supportive of LSS? In what ways have they been (or not been) supportive, and how did they demonstrate their commitment?

In your experience, what percentage of top management were not believers in the LSS programme at the beginning? Was there any difference in the mindset of such people after the execution of LSS projects and the results LSS has brought to the organisation? Has the overall attitude of the top management towards LSS changed during the implementation? If YES, in what way has it changed?

Would you consider middle management in your organisation as being supportive of LSS? In what way have they have been (or not been) supportive and how did they demonstrate the commitment?

Would you consider middle management in your organisation as being supportive of LSS? Has its attitude toward LSS changed during the implementation? If YES, in what way has it changed?

COMMUNICATION/AWARENESS

How did the top management communicate the need for LSS to employees at the outset of the journey? Was that communication a success? If yes, how did you measure the success? If not, why not? How do you know it was not successful?

How is the ongoing status of the LSS programme being communicated to employees?

How is the status of the LSS programme being communicated to customers and/or suppliers?

Is the communication continuous or only on ad hoc occasions?

How would you communicate the success of LSS projects in the business? Do you host any annual conferences to increase the awareness of the initiative across the company? If yes, how does that look? Has it been a successful event?

EMPLOYEES' MOTIVATION/TEAMWORK

How you feel LSS is perceived by employees in your firm?

How do you engage employees with this initiative? How do you get employees onboard for this programme? How do you win their hearts and minds?

How does your company motivate its employees along the LSS journey?

Do you have intrinsic types of motivational instruments (e.g. career advancement, education)? If so, what is their impact on the LSS implementation?

Do you have extrinsic types of motivational instruments (e.g. bonuses, cash awards)? If so, what is their impact on the LSS implementation?

What is the role of a leader in motivating their employees for the sustainability of a LSS initiative? How can they make sure that the employees are motivated to deliver the projects and engage well with the rest of the company?

TRAINING

Is LSS something most employees are involved with or is it restricted to a cohort of specialists?

What percentage of employees is involved in LSS?

How do you select the people for the training? Do you use any criteria for selecting people such as YBs? GBs? BBs? If so, can you share the criteria?

What are the roles and responsibilities of GBs, YBs, BBs, MBBs and LSS deployment champions?

What percentage of their time do yellow/green belts spend in their role?

Is the black belt role full-time? If so, how long before they are expected to move to a new role?

What percentage of MBBs take up the leadership role during their employment period?

What level of training is provided to employees at different levels?

What types of training are provided to employees and how would you certify them as YBs, GBs, BBs and MBBs?

How do you measure the effectiveness of training? How do you measure the success of training? What are the key leading indicators of successful training?

Do you think the training offering in your firm is having an impact on the level of engagement and/or awareness of LSS among the employees?

What is the annual investment on training for the LSS? At the beginning, how much did you have invested for the training? What was the ratio of investment against the benefits? Can you share its current ROI?

Can you elaborate on the training offerings: do they take place in classrooms, online, or a combination of both?

APPENDIX V

Nvivo Interview Analasys – Coding

Phase 2 - Generating Initial Codes	Code Definitions for Coding Consistency (rules for inclusion)	Interviews Coded	Citations Coded
Opinions - Behaviours for Successful, Less Successful Deployment	Opinions - Behaviours for Successful, Less Successful Deployment	18	66
Opinions - Roles, Relations, Management Levels	Opinions on roles of different management levels and relationship between them.	20	62
Trends Noticed - Training Approaches + Selection Criteria	Trends noticed in approaches to training (i.e. classroom-based, on site, online, blended)	15	60
Cultural Issues	References to role of culture in improvement processes	18	53
Trends Noticed - Site, Sequence of Deployment	Contains trends participants have noticed in sequence of deployment (i.e. first L, then SS, other way around, in tandem)., and whereabouts in the company it operates.	20	44
Trends Noticed - Leadership Approaches	References to leadership approaches witnessed by respondents.	18	38
Trends Noticed - Relationship between Mgmt Commitment & Results	Trends noticed in relationship between management commitment and outcome (i.e. senior, middle, line Mgmt and Individual / team success or failure	17	36
Opinions, Trends - Selection Criteria for Training	Opinions on best criteria for selecting employees for training in LSS	13	33
Opinions - Training Approaches	Opinions on most effective training methodologies (i.e. classroom-based, on site, online, blended)	12	29
Opinions - Approaches for Achieving Buy-in to Programme	Opinions on how to best communicate the LSS message and win ideological buy-in for the programme.	14	26
Opinions - Demonstrating Commitment	Opinions on best practice for demonstrating management commitment	12	26
Trends Noticed - Practices for Engaging the Workforce	Examples of inclusive practices designed to encourage employees to participate in collective problem-solving and to understand and engage in Lean and Six Sigma. Also general awareness raising	13	25
Opinions - Differing Approaches According to...	Opinions on whether differing approaches are required for Lean and Sigma; also during rollout and sustaining phases; also senior, middle. junior management levels.	13	25
Trends Noticed - Success Factors in Deployments	Comments on critical success factors noticed in successful deployments	14	24
Trends Noticed - Reward Systems	Reward Systems noticed by respondents.	14	21
Opinions - Reward Systems	Opinions on best forms of reward to motivate and engage employees in the programme.	11	15
Trends Noticed - Metrics for Evaluating Success of Programme	Trends in KPI's for measuring success of deployment.	10	12
Trends Noticed - Evaluating Effectiveness of Training	Metrics that respondents have used in evaluating the effectiveness of training.	9	12
Opinions - Optimal Site, Sequence of Deployment	Personal opinions on best sequence for deployment (i.e. first L, then SS, other way around, in tandem) and where in the organisation	4	9
Opinions, Trends - 'Belts' Percentage Levels	Opinions on optimal percentages of B,G,Y Belts	5	9

Trends Noticed - Success Levels	Comments on whether or not deployment(s) have been successful in participant's organisation as opposed to witnessing success as a consultant	4	5
Opinions - Evaluating Effectiveness of Training	Opinions on ways of measuring effectiveness of training.	4	4
Opinions - Metrics for Evaluating Success of Programme	Respondents' opinions on most effective metrics for evaluating success of programme	1	1

Phase 3 - Searching for Themes	Interviews Coded	Citations Coded
Communication, Awareness Raising	**21**	**104**
Cultural Issues	18	53
Opinions - Approaches for Achieving Buy-in to Programme	14	26
Trends Noticed - Practices for Engaging the Workforce	13	25
Employee Motivation - Teamwork	**18**	**36**
Opinions - Reward Systems	11	15
Trends Noticed - Reward Systems	14	21
Leadership Style	**20**	**191**
Opinions - Behaviours for Successful, Less Successful Deployment	18	66
Opinions - Differing Approaches According to...	13	25
Opinions - Roles, Relations, Management Levels	20	62
Trends Noticed - Leadership Approaches	18	38
Management Commitment	**19**	**62**
Opinions - Demonstrating Commitment	12	26
Trends Noticed - Relationship between Mgmt Commitment & Results	17	36
The Programme(s) Deployed	**21**	**95**
Opinions - Metrics for Evaluating Success of Programme	1	1
Opinions - Optimal Site, Sequence of Deployment	4	9
Trends Noticed - Metrics for Evaluating Success of Programme	10	12
Trends Noticed - Site, Sequence of Deployment	20	44
Trends Noticed - Success Factors in Deployments	14	24
Trends Noticed - Success Levels	4	5
Training	**19**	**147**
Opinions - Evaluating Effectiveness of Training	4	4
Opinions - Training Approaches	12	29
Opinions, Trends - 'Belts' Percentage Levels	5	9
Opinions, Trends - Selection Criteria for Training	13	33
Trends Noticed - Evaluating Effectiveness of Training	9	12
Trends Noticed - Training Approaches + Selection Criteria	15	60

Phase 4 - Reviewing Themes	Interviews Coded	Citations Coded
Communication	**20**	**66**
Practices for Engaging Workforce, Achieving Buy-in	20	66
Employee Motivation	**17**	**37**
Reward Systems	17	37
Leadership Style	20	81
Differing Approaches According to...	20	81
The Programme(s) Deployed	**20**	**78**
Language and Terminology	10	13
Metrics for Evaluating Success of Programme	12	16
Success Factors in Deployments	20	49
Training Approaches	**19**	**101**
Evaluating Effectiveness of Training	14	21
Selecting Candidates for Training	19	52
Training Formats	16	28
Z Categories Archived as Content Coded-On in Phase 3	**21**	**425**
Approaches for Achieving Buy-in to Programme	18	60
Behaviours for Successful, Less Successful Deployment	0	0
Cultural Issues	18	53
Leadership Approaches	18	39
Management Commitment	0	0
Opinions - Evaluating Effectiveness of Training	4	4
Opinions - Metrics for Evaluating Success of Programme	1	1
Opinions - Optimal Site, Sequence of Deployment	4	9
Opinions - Reward Systems	11	15
Opinions, Trends - 'Belts' Percentage Levels	5	9
Rewards	18	31
Roles, Responsibilities, Relations - Management Levels	20	63
Trends - Training Approaches + Selection Criteria	16	61
Trends Noticed - Practices for Engaging the Workforce	14	31
Trends Noticed - Site, Sequence of Deployment	20	44
Trends Noticed - Success Levels	4	5

Phase 5 - Defining & Naming Themes	Interviews Coded	Citations Coded
1 - Communication	**20**	**66**
Practices for Engaging Workforce, Achieving Buy-in	20	66
Communication Systems + Structures	15	32
Create Conditions for Employee Mobility	4	6
Events, Conferences, Lunch and Learn	5	7
Widespread Basic Training, Awareness-Raising	14	21
2 - Employee Motivation	**17**	**37**
Reward Systems	17	37
Financial Rewards	7	9
Non-Financial Rewards	16	28
3 - Leadership Style	**20**	**81**
Differing Approaches According to Contextual Factors	20	81
External Forces	1	1
Hierarchical Roles, Responsibilities, Relations	19	37
Leadership Perceptions of Lean Six Sigma	10	19
Organisation Size and Culture	1	3
Programme Option	5	6
Resources Available	2	3
Stage of Programme	9	12
4 - The Programme(s) Deployed	**20**	**78**
Language and Terminology	10	13
Metrics for Evaluating Success of Programme	12	16
Success Factors in Deployments	20	49
Addressing Employee Concerns	5	6
Building Trust	4	5
Culture of Acknowledging problems	4	6
Inclusive Bonus Structure	2	2
Leadership Commitment	16	31
5 - Training Approaches	**19**	**101**
Evaluating Effectiveness of Training	14	21
Selecting Candidates for Training	19	52
Don't Train When No Project	5	5
Generic Traits	14	23
Relative to Project Area	11	16
Specific Skills	7	9
To Meet Coverage Targets	4	6
Track Record	10	13
Training Formats	16	28
Classroom-Based, Instructor Lead	7	8
During + Post Training Support Mechanisms	3	4
Dynamic Combination	6	10