National Libraries' Use of Facebook and Twitter and User Engagement

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Declaration

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Signed: Jennifer Hamilton

Date: 22nd August 2023

Acknowledgements

Abstract

This research investigated national libraries' use of Facebook and Twitter and the user responses to those activities. Data was collected directly from the Facebook and Twitter pages of three national libraries (Library of Congress between 30.01.18 and 24.04.18, National Library of Australia and National Library of Scotland both between 10.06.19 and 1.09.19) including the posts and user comments. Content and thematic analysis was performed on the posts to determine library behaviour and a developed toolkit utilising thematic discourse analysis was used to understand user responses.

Libraries were found to post about library-centric topics such as collections, events and resources, and linked users to library controlled webspaces such as their websites or other social media. Images were used to either complement or enhance the information contained in posts, though no overall patterns emerged as the libraries varied slightly in their posting patterns. Two major differences were responses to other social media on Twitter that were not available on Facebook, and the NLS using more personable themes. The libraries also responded to users differently with LoC barely responding, and NLA and NLS liking and responding to comments.

Users mostly responded to the content of posts, as well as having conversations in the NLA and NLS datasets. Common motivations for responding including liking the content, sharing the content with others, sharing relevant memories or content as well as gratitude and answering a question, with most motivations and comments positive. Response rates varied, with the NLS receiving the most comments on Twitter despite the smallest library size.

The results aligned with existing research in other areas, and beyond the advice for practitioners to respond to users and use informal language, one of the main outputs of the research is a toolkit that can be used by others to gain deeper understanding of user engagements.

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Chapter 1: Introduction

1.1 Introduction

This chapter introduces the research and explains the research context and rationale including definitions important to the research. The objectives and research questions are then defined, as is the conceptual model used to underpin the research and the methodology used to answer the research questions. Finally, the chapter will outline the rest of the thesis.

1.2 Research context and rationale

National libraries provide a different range of services from public and academic libraries, as well as differing in their responsibilities, sizes and funding. The International Federation of Library Associations (IFLA) defines a national library as having specific responsibilities separate from a standard library, which are often defined in the laws of the country the library represents. The responsibilities of a national library include but are not limited to: maintaining a legal deposit collection; providing reference and lending services to users and library services; creating and maintaining a national bibliography; preserving and promoting the nation's cultural heritage; and often providing information services to legislature (IFLA, 2017). The full operational definition of national library in this research is: a countrywide library with the responsibilities to maintain a national bibliography, preserve and promote the cultural heritage of the country, and provide reference services to individual users of all ages and abilities and other library services within the country.

National libraries have a legal responsibility to maintain, preserve and provide access to the literary and cultural heritage of a nation. Most national libraries are publicly financed and have a duty to help promote the cultural heritage they have preserved and champion literacy for their population, with this reflected in their mission statements and strategic plans such as National Library of Scotland (2015) and British Library (2010). National libraries by their nature are rarer and larger than most other types of libraries which give different sets of challenges. With their size and scale, collections are large and can often be

overwhelming, as can be seen by the fact that the National library of Scotland has 24 million items in its collection, requiring over 120 miles of shelving and behind the scenes tours of the stacks are intimidating to even trained librarians. The size also means that there are very few locations in any country for the national library, making it harder for much of the population to access, as well as being hard to reach for interested parties outside the country who may have interest in some of the collections. As noted in Cleeve and Stephens (2008), national libraries cannot be easily visited by large parts of a country's population meaning that websites and online presences have become vital long-distance gateways and are essential in ensuring that as many people as possible, including those internationally, are made aware of the resources and given access. Further differentiating national libraries from other types of library is that most public libraries do not have marketing departments as reported by Cavanagh (2016) whilst interviews with staff at the National Library of Scotland reveal that national libraries do.

Social media is a term that can have flexible meanings and cover a wide variety of web and mobile technologies. Therefore, this research will use the term social media to mean "highly interactive public platforms on mobile and web-based technologies that enable individuals and communities to create, share, discuss and modify user generated content" (adapted from Kietzmann et al. (2011)).

Since social media platforms are used increasingly in peoples' everyday lives, with 4.55 billion users worldwide (DataReportal, 2022), they provide national libraries with new opportunities for reaching out to people who cannot make it to the libraries' physical location, are intimidated by its size, or even those who may not think the national library is relevant to them. Social media typically uses lower bandwidth than material on websites meaning those with no permanent or high bandwidth internet connections can more easily access information. The shorter form of content on social media also has the potential to reduce information overload by highlighting small sections of the collection at a time rather than immersing the user in a full website, especially those with interactive exhibits and complicated sitemaps. This all forms an argument for why social media is vital to national libraries and a worthwhile endeavour for them to undertake, adding to the rationale that this research on how national libraries use social media is warranted.

User engagement in social media is the term used for users' interaction with content and it can be used to assess the success of social media activities, such as in Brettel et al. (2015), Ha et al. (2016), and Peruta and Shields (2017). Again, user engagement can be a flexible term, so the definition of user engagement used in this research is: a user performing an action beyond viewing or reading, such as liking, sharing, commenting on, or another form of interaction to a post (Paine, 2011).

There is an established body of work into the social media practices of public and academic libraries, such as Anttiroiko and Savolainen (2011), Joo et al. (2018) and Collins and Karami (2018). The research on national libraries lags behind, which is understandable when there are approximately 352 national libraries worldwide compared to 3,889 public libraries, 523 academic libraries and 824 community libraries in the United Kingdom alone (IFLA, 2022). Much of the current research into national libraries focuses on their websites with studies analysing the websites content (Haneefa and Venugopal, 2010, Nowkarizi et al., 2012) or the visibility or the websites (Zeinolabedini et al., 2006).

There exist a few studies of web 2.0 tools, which include social media, used by national libraries (Buigues-García and Giménez-Chornet, 2012, Walia and Gupta, 2012a) but both are limited to discovering what tools are used by which library and for what purpose. Given some of the platforms mentioned in the research are obsolete, this is less than ideal, especially as the research shows no indication of how national libraries social media accounts are actually used or how users respond to the posts. This lack of research is acknowledged by Chowdhury (2015) in that more research is needed to understand who is accessing and using social media in the wider cultural heritage environment such as museums and galleries. This lack of understanding means that despite the argument earlier that it is worthwhile in theory for national libraries to use social media to engage with a wider variety of users, it is currently impossible to tell whether the current practices by national libraries on social media are worthwhile, and if the efforts of the libraries are worth the returns they get from users. This includes not just what content users are responding to, but also how users are responding, for example are the learning new information, forming connections with the objects in the library connection or other users. This research will

answer these questions and provide insight into whether the national libraries' social media work is worthwhile or changes need to be made.

The main account pages of national libraries on Twitter and Facebook, and social media users' behaviours in response to posts made by those accounts will be the focus of this research. As stated above, little is known about the behaviours of national libraries on social media beyond what platforms they use, in particular there is no knowledge about how they and their followers interact, meaning no fact-based strategies can be created to increase interactions, the visibility of national library accounts or the relevance of material being posted to the accounts. With the public funding comes an increased pressure for showing value for money and ensuring that national libraries are doing all they can to reach their populations and users, especially in this time of austerity, shrinking budgets and closures due to global pandemics, with social media providing an excellent avenue for this.

This research will help inform national libraries how users interact with their social media content and show what material is engaging and therefore more likely to be shared amongst non-followers. Media or marketing managers of national libraries would be able to use the results to formulate successful strategies for interacting and engaging with users and possibly increase their reach, while librarians and curators can see the areas in which social media users are interested in or where they need to fill any gaps in their services or information and gain direct feedback. Also, popular content can give indications where to direct limited digitisation resources so as to satisfy demand or create new exhibitions or outreach programmes.

Whilst the research will mainly benefit national libraries due to the specific context of the research, other large cultural heritage institutions, such as the British Museum, will benefit as their social media presence exists in a very similar context, and this research will add to the existing research such as that by Culture24 (2011) which looked at how cultural institutions evaluated online success, found that they needed to more effectively market online offerings and developed key findings such as standardising metrics, focusing investments and be clear about what and what they were trying to do. This research differs in that it focuses on the interactions themselves and the factors that influence them, as well as what content is being posted and responded to. Anyone interested in the status of

cultural heritage, be they government bodies or charities, will also find the research interesting as an indicator of how people interact with cultural heritage institutions on social media and what they are interacting with. Furthermore, the toolkit created to analyse user comments as part of this research will also be of use to any social media personnel.

1.3 Research aims, objective and questions

National libraries have been shown in the previous section to serve as repositories for the literary and cultural heritage of a nation and have responsibilities enshrined in law to provide reference services to users, to preserve and promote cultural heritage as well as champion literacy. Furthermore, the social media pages of national libraries provide a more widely accessible platform than visiting the library physically, however to date, there is no research on how users interact with and behave on the social media pages of national libraries. This research aims to fill this gap, and information from this study would inform national libraries as to how to increase their social media interactions and allow further opportunities to interact with those who would not normally use national libraries.

Therefore, the objectives of this research are:

1. To understand national library behaviours on social media
2. To understand how users respond to national libraries on social media

To achieve these objectives, four research questions were therefore identified:

1. In what ways do national libraries use Facebook and Twitter?
2. How can user engagement be analysed beyond response numbers?
3. In what ways do social media users respond to national libraries posts?
4. How do national libraries respond to user engagements?

1.4 Conceptual model

Given the possibilities for the activities of the national libraries social media accounts to influence user behaviour around their accounts, information behaviour research will be

used to underpin the research as understanding how people interact with posts is a vital part of understanding how to increase these interactions.

Information behaviour in general is a large area of research, and the literature review was used to narrow down the focus to information encountering due to the social and browsing aspects of checking social media feeds, rather than the deliberate decision being made by users to go to national libraries websites. Information encountering models include the aspects of information behaviour that users come across information while undertaking other activities, in this case information from national libraries while browsing or socialising on social media.

Jiang et al. (2015) builds on existing research into information encountering to develop a model of online information encountering that including phases of encountering and factors influencing the encountering process.

Image 1 An integrated model of online information encountering by Jiang et al (2015)
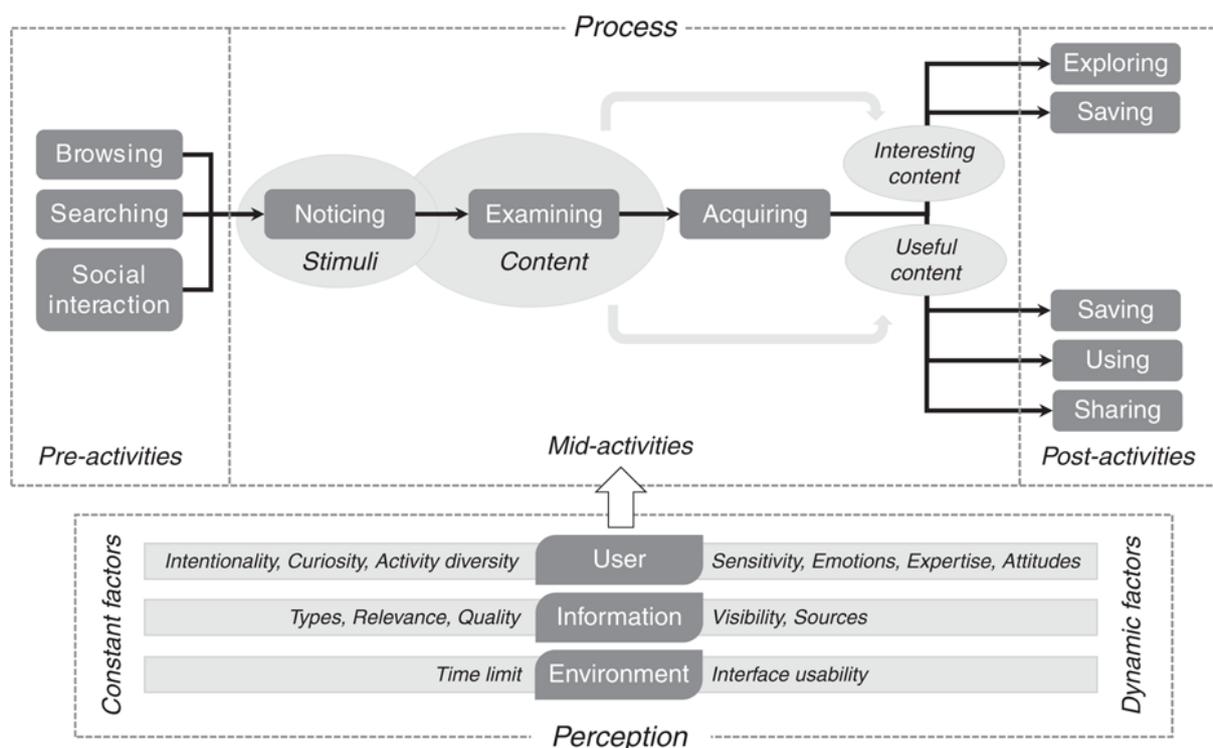
The model accounts for multiple reasons for being on social media and possibly encountering information in the pre-activities phase of the model. The mid-activities phase

of the model accounts for noticing and examining the content as separate actions before the user makes a determination whether the information is worthwhile to acquire, interact with and finish the encounter, or simply move on if they deem it not relevant. Factors that affect users' ability or willingness to examine the information are shown to be an important part of the encountering process, and the model details different types of factors that can influence users. This includes user factors, such as their attitudes and emotions, as well as information factors, such as type and visibility which are factors that can be affected by the libraries. Some of these factors, such as user emotions and attitudes, types, and visibility of information as well as the environmental factor of interface usability, and the influence they have on users encountering information from the national libraries' social media pages are shown in the research by analysing what users are responding to and the emotions apparent in their comments. The last phase of the model, post-activities, gives suggestions for what users do with the information they have encountered including sharing and using. Analysis of the comments and traditional metrics will provide understanding of what activities the users are partaking in after encountering the information, and if any of the previous factors affects the choice of activity.

1.5 Methodology

The research will answer the research questions using multiple methods including content and thematic analysis of library posts and thematic discourse analysis of user comments in response to library posts.

Data was collected directly from the Facebook and Twitter accounts of three national libraries: Library of Congress (LoC), National Library of Australia (NLA) and National Library of Scotland (NLS). The libraries were chosen as they were part of the MSc research this project continues, with the NLS being the researchers' home institution and the LoC and NLA chosen as they are also active on social media and share enough similarities to allow for comparisons.

The data was gathered from the main library accounts to get a full overview of behaviour as these are generally the most prominent library accounts, with the LoC data collected first to test collection methods between 30th January and 24th April 2018. The data collected

collection period for the NLA and NLS was 10th June to 1st September 2019. These accounts also covered all service areas provided by the libraries with a large variety of content, which allows for a fuller understanding of what content users are engaging with in comparison to the narrower focus of departmental accounts such as maps or rare books.

Content analyses were used to determine what links and image-text relationships were contained in the library posts, while thematic analysis was used to determine the theme of posts. These analyses both answered RQ1 by allowing understanding of the ways the national libraries were using Facebook and Twitter. To answer RQ2 and analyse engagement beyond response numbers, different methods were trialled on a sampling of user comments to posts, with a thematic discourse analysis toolkit developed to understand what users were responding to, their motivations and any context to comments. This toolkit using thematic analysis discourse was then used to analyse user and library comments to answer RQ3 and RQ4.

All analyses were open coded, with the content analysis of the links quantitative while the others were qualitative. The exact procedures for the data collection and analysis are shown in Chapter 3: Methodology of the thesis.

After careful consideration, ethics approval for the research was not sought due to the public nature of the data. This decision is fully explained in 3.1.5 Ethical considerations.

Scope and limitations

The research focuses on the main social media account on Facebook and Twitter of each national library included in the study, not departmental accounts. This is partially due to the time limitations as the national libraries have numerous departmental accounts that cover service areas such as rare books, maps, and copyright, and partially due to the fact that these departmental accounts vary across the libraries making comparisons difficult. Furthermore, the main accounts, which not only highlight all service areas of the national libraries and often share the departmental accounts, are the most visible of the accounts on the platform, appearing first in platform searches. This means the accounts studied are often the first account users come across if they are search for the library on the platform,

and the wide coverage of areas means these accounts have the broadest appeal to attract a wide variety of users. This provides a rich dataset for analysing user responses as well as a larger number of post themes.

The research focuses on users who currently interact with the three national libraries on Twitter and Facebook to understand their behaviour. Due to the time constraints imposed by the funding period of this research, social media users who don't interact with the national libraries, or national library users not on social media will not be studied. While the actual behaviour of national libraries will be studied through analysis of the posts, due to the time limitations, no further research with staff members will occur. All accounts studied are in English due to language limitations of the researcher.

Currency

Both platforms in the research still exists and are in wide use by both libraries and users. A small sampling of data analysed in July 2022 revealed that libraries and users were behaving similarly to their behaviour in the initial time period, meaning the findings and advice in this research is still timely and relevant.

1.6 Thesis Outline

Chapter two of the thesis will cover the review of relevant literature including research on national libraries web presences, other cultural heritage institutions, information behaviour and social media research.

Chapter three will cover the methodology and methods involved in the research including the analysis of posts and the development of the method to analyse comments.

Chapter four will cover the analysis and findings of the data collected from social media pages, with sections for statistical analysis, content analysis and thematic analysis.

Chapter five will cover discussion of the results in respect to answering the research questions, discuss the framework developed to analyse comments, the implications for practitioners, and cover possibilities for future research.

Chapter six will summarise the research, including key findings from the research, contributions to research, advice for practitioners and final conclusions.

1.7 Conclusion

This chapter discussed the context of the research problem and the rationale for the research. The objective and research questions were presented alongside the conceptual framework and methodology used to answer the questions. Finally, the chapter outlined the structure of the rest of the thesis.

The next chapter will look more in depth at the existing literature around national libraries and social media, as well as that of the conceptual model underpinning the research.

Chapter 2: Literature review

2.1 Introduction

This chapter will first look at the research that exists for national libraries from a starting point of general research and then narrowing down to their social media use. This section will also look at the cultural, social and legal context for the national libraries involved in the study as well as publicly available social media policy information and information gained from a visit to staff at the NLS. The chapter then expands out to researching the Facebook and Twitter use of other types of libraries due to the lack of research found on national libraries. This includes research into how libraries are using the platforms, the content and themes of their posts and a small amount of research that measures user engagement and user motivations. The chapter then widens out further to social media research in other fields such as marketing, education, and governmental use to gain insight into understanding factors that affect user engagement and user motivations for interacting with social media. Lastly, this chapter will look to information behaviour, more specifically information encountering behaviour, to identify theory used as a conceptual model to ground the research because of its exploratory nature.

2.2 National Libraries

For this section, the search for literature focused on research specifically on or by national or state libraries. More general research that covered case studies of library use, e-deposit or other aspects of collection or building management were excluded, as were the small number of items that focused on more specialised national libraries such as medicine and music. Given the lack of research on social media in general, research on national libraries websites or other web 2.0 activities were included to gain fuller understanding of national libraries' digital presences.

2.2.1 Background

According to the International Federation of Library Associations, IFLA (2022), there are approximately 352 national libraries around the world. This is a much smaller number than the numbers of public and academic libraries, which was last reported by IFLA (2022) to be 3,889 public libraries, 523 academic libraries and 824 community libraries in the United Kingdom alone.

National libraries are distinct from other types of libraries. Whilst national libraries have similar funding sources and responsibilities as public libraries, national libraries are much bigger in terms of the funding received, the collection size and variety as well as serving a much larger number of people. In comparison to academic and special collections libraries, national libraries also serve a much larger and wider audience as well as not having a particular focus depending on the subject area of the departments or archives. National libraries serve a far wider audience than other types of libraries, with Brindley (2006) identifying different user groups of national libraries: business users, researchers of all levels, library and information services, schools and learners, and the general public. Sroka (2002) has also noted that national libraries also serve virtual users from both within the country the libraries serve and external countries. This more varied set of users means that a national library must pitch its access to reflect this and enable all groups to access the library and its collections. There is no one standard definition of national libraries but Stephens (2016) discovered that many national libraries have the requirement, often defined in law, to collect every publication published in a country, from pamphlets, through newspapers and journals to the more traditional book format. Other responsibilities include providing reference services to users and other library services within the country, preserving and promoting the cultural heritage of a nation as well as ensuring that international projects have a forum, and many provide leadership in national literacy campaigns and some providing support to legislators. These responsibilities far outweigh the scales of public or academic libraries, and often means that research performed in those areas does not always translate over to national libraries.

Hamilton (2015) found that the exact size of national libraries, from the collection size, the amount of funding to the number of people they serve, varies dramatically between

countries, as well as the age and origins of the institution. However, all of the institutions receive visitors from around the globe, both physically and digitally, and most received a significant amount of their funding from their government. With the advent of communications technologies such as websites, social media networks and smartphones, national libraries are increasingly being able to expand their audiences globally and reach people who would not normally use the national library.

Given that national libraries are stores of a country's cultural heritage, with their responsibilities to literacy, and their positions of authoritative information providers in a rapidly changing information landscape, the study of national libraries is an important area of research.

2.2.2 National libraries in the study

The three national libraries in the study are the Library of Congress (LoC) in the United States of America, the National Library of Australia (NLA), and the National Library of Scotland (NLS).

2.2.2.1 Socio-legal context

All three libraries in the study are based in countries that are considered industrialised and have English as both the most commonly used language and as the language used in legislation and official documents. Further similarities include the libraries gaining significant amounts of the budgets from the government of the country as well as the responsibilities of the libraries encoded in law. Differences start to emerge when considering the populations and sizes of the countries the libraries represent as well as the sizes and ages of the libraries themselves and the comparative sizes of the budgets.

Table 1 shows the differences between the libraries and the countries they serve.

Table 1 Comparing national libraries in the study

Country/Library	USA/LoC	Australia/NLA	Scotland/NLS
Population size	334 million	25.69 million	5.45 million
Landmass	9.1 million sq. km	7.7 million sq. km	78,800 sq. km
Created in law	1800	1960	1925
Physical collection size	173 million items	10.25 million items	29 million items
Budget/Amount from government	$802 million/$757 million (approx. £645 million/£609 million) (Library of Congress, 2022)	$84 million/$61 million (approx. £45 million/ £32 million)(National Library of Australia, 2022a)	£18 million/£16 million (National Library of Scotland, 2021)
Number of public facing buildings	Three	One	Three

The creation of the libraries by law does not reveal the full age of the collections in all three libraries. The NLS collection started from the Advocate's Library in the 1680's with legal deposit established in 1710 while the LoC collection started in 1800 through an act of Congress though setbacks such as burning down, civil war and lack of funding meant it did not begin to resemble a national library until 1870. The NLA began in 1901 as the Commonwealth Parliamentary Library before being separated into just the national library in 1960. The age of the original collections may account for the larger than expected collection size for the NLS given its funding and country size.

Collection size is also affected by the fact of the LoC's larger remit, as it not only maintains the legal deposit for the United States of America (USA), but is also the research library for Congress, the country's legislative body, as well as contains subdivisions such as the US Copyright Office, a separate Law Library, National library for the Blind and Print Disabled as well as overseeing the Office of the Inspector General (Library of Congress, 2023a). However, all three libraries share similar remits otherwise, mainly to preserve and maintain access to knowledge, especially of the country's culture and history.

The number of public facing buildings can also can be disingenuous as the LoC has three public facing buildings based in the same city but many other storage and preservations facilities throughout the USA, while the NLS has three public facing buildings, two in one city alongside the separate administration building, and another 60 miles away in another city. Meanwhile, the NLA has one public facing building alongside 3 storage facilities as well as an office in an embassy in the Indonesian capital, Jakarta, due to the strong links with the country.

The population size and density of the countries varies, but all three countries have connections to others in the forms of various diaspora, both from and in other countries, meaning that interest in collections is not just limited to internal populations.

Comparing the libraries and countries shows that the LoC is the largest in terms of funding, collection and population served, as well as having the largest remit, but reinforces the similarities between the three libraries such as funding sources, language, legal standing, and main goals, that allow for comparisons to be made between the social media activities of the libraries.

2.2.2.2 Public policy documents

All three libraries in the study have publicly available expectations of user behaviour on social media as well as information in their public strategy documents about the importance of social media to their long-term plans.

The NLS has a public social media policy stating what they expect from users such as what behaviour will be moderated as well as when accounts are monitored, as well as a page on their website stating what platforms they are on and what sort of content they post on each platform. This material is easily found on the social media page under the about us section of the library website (National Library of Scotland, 2022, National Library of Scotland, 2023). Social media is also mentioned in the library's strategic plan for 2020-25 (National Library of Scotland, 2020). Two of the main priorities are improving access and engaging audiences. Improving access covers delivering outstanding digital engagement, with the example given of a YouTube premiere, indicating the importance of social media to improve

access. The engaging audiences does not explicitly mention social media but does mention using the latest technology, innovative online content and an audience-based approach, which implicitly describes the user-based focus and online content and technology of social media.

The NLA also describes acceptable behaviour and when the accounts are monitored on a social media page under the about the site page on the library website (National Library of Australia, 2023c). The NLA also states they uses a third party tool to track social media platforms analytics to help track digital visits, more specifically the number of engagement on Facebook, Twitter and Instagram (National Library of Australia, 2023a). The NLA corporate plan for 2022-23 states that the library wants to use social media to help gather more information from Australians (National Library of Australia, 2022b), again indicating that the library sees social media use and engagement as a worthwhile pursuit and keeps track of engagements.

The LoC also describes a commenting and posting policy that is linked to from the connect page that lists all the library's social media accounts (Library of Congress, 2021, Library of Congress, 2023b). The policy describes what the library considers appropriate behaviour and what content it may remove, however, there is no mention of when accounts are monitored. The LoC also does not explicitly mention social media in its strategic plan (Library of Congress, 2018c), however, some of the goals of the plan mention using new and existing technology to elevate digital experiences, develop more user-centred content, use available data to better understand users, as well as expanding access and increasing discoverability, all of which social media, when done correctly, can do.

Overall, the publicly available documents indicate that the national libraries in this study see social media as a valuable tool for gaining more information from their users as well as a way of increasing engagements and access to the collections.

2.2.2.3 NLS visit with staff

The researcher spent the day on 15th December 2016 at the NLS and met with several staff members of the NLS.

The meeting with the marketing officer Stewart Hardy was most informative as his department, the External Relations and Governance department, was in charge of the main library accounts, with the smaller departmental accounts covered by the departments themselves. This meeting revealed how content was planned, performance was monitored, and some of the decisions behind the social media use.

The use of a specialist department and marketing specialist to control the main accounts meant that consistent coverage from all the departments in the NLS could be maintained, even from those departments whose specialists were not comfortable with social media. The marketing officer was clear that part of the buy in from staff was that ideas for social media posts came from both himself and staff members across the library, and that while he was the expert at communication, the staff were the subject experts and their ideas were heard even if they weren't enacted.

The department was clear on using content from all the library's resources, including database, events, digital objects database as well as using relevant material from other social media or websites. Content calendars were used to ensure consistent coverage from all departments, with two examples given. The first covered generic content as well as recurring or one-off posts or events, with examples for weekly hashtags such as #mondaymotivation, #behindthescenes and #onthisday. Content for these posts was curated from all the library's resources and differed across the different platforms both to take advantage of the different platforms posting abilities and so that users who follow on multiple platforms were not bored by the repetition with exceptions for important updates such as closures or changes to operations. The other content calendar covered specific campaigns such as for the current exhibitions or online events. Again, the exact material and posting times varied across the platforms for the same reasons, and these posts often used hashtags created by the NLS specifically for the exhibition or events to highlight and link the posts together. As well as these planned posts, part of the daily monitoring of social media including reposting relevant content or otherwise responding to content or user posts, comments or questions, thus ensuring that content was up to date and users responded to.

More discussion on how the NLS fully monitored and measured the social media use and engagement was also had. In addition to the monitoring mentioned above, post

engagement and sentiment of responses were measured daily, while on a weekly basis, the aggravated engagement and follower numbers, as well as their klout score and other organisations were measured to check for variations as well as relevant content or competition. Monthly and quarterly measurements included period and year on year comparisons and trends as well as understanding audience segmentation. Yearly measurements compared platforms trends and studied resource allocations, and sometimes included commissioned research.

While exact measures were not mentioned, tools such as google analytics, Klout and the platform analytics were used to monitor social media engagements. The Klout score (a third party measurement) was generated from aggravated multiple factors including use, size of network and activity of network), while some of the platform analytics monitored included average engagement, post frequency and followers. Both increases and drops in these measurements are assessed, mostly monthly, to try and understand the reasons behind the change. If the scores dropped, changes were made to the strategies to try and course correct the engagement while if numbers increased then successes were noted and changes to targets were considered.

The decision not to enable comments on blog posts was taken because of the lack of time for staff moderation, with the lack of staff time acknowledged by the team as being one of their limitations on social media.

Meeting with John Scally, at the time National Librarian, reinforced the importance of social media to the national library as a way of making it both more welcoming and more accessible to more users, as the NLS is aware of how intimidating the big old building can be, especially when the security barriers used to be right at the door. The meeting also highlighted that the NLS is open to changing their social media strategy, with such changes noticed by the researcher in the time period from the MSc research this project is based on to the time of this visit, for example the consolidation of many blogs into one. The meeting also reinforced the importance of social media use and outreach to the NLS, with the library keen to try new platforms and keep up with users but in a controlled way and not just being on a platform for the sake of it.

The general collections manager, Graeme Hawley, offered a behind the scenes tour of the collection as well as a walkthrough of some of the current displays and exhibitions. This gave a good idea of the scale of the collections, including how intimidating they can be, as well as how they use some of the small exhibits in the building to post on social media so that users who cannot visit in person do not miss out. Furthermore, the meeting highlighted that social media was seen as another spotlight or discovery tool for the large collection as well as gave an overview that front line staff members also considered social media use by the library beneficial to everyone.

Meeting with the head of digital, Stuart Lewis, and intellectual property specialist, Fred Saunderson, helped to inform about the availability of material to be published on social media, as well as one of the NLS departments outlook on social media. More specifically, the meeting helped to understand more about the NLS's digitisation process, especially how items are prioritised, as well as the consideration of items coming out of copyright. At the time, potential social media usage was not considered in the decision-making process for prioritising digitisation, but this may have changed since then due to global events. Items coming out of copyright were often considered for displays or small exhibits, which included being displayed on the NLS's social media pages.

Overall, the visit gave good insight into the decisions and process behind the NLS's social media use as well as acknowledging the library's long term aims in continuing to use social media to engage with other libraries, other media and ultimately add value to users' lives.

2.2.3 General research

Possibly due to their relative scarcity, the literature surrounding national libraries is much smaller than that of other types of libraries (Robinson, 2016). Most of the current research focuses on important day-to-day running issues of national libraries such as the legal deposit of electronic books and sources, descriptions and details of collections and exhibitions, individual histories of national libraries, and general library activities and processes that were unique only because they were a case study of a national library. Whilst Robinson (2016) is self-admittedly neither comprehensive or systemic, and covers a limited timescale, the results reflect what research was found during this search of the literature, alongside an

increase in 2020 and 2021 of literature relating to how national libraries coped with the Covid-19 global pandemic. There are however pieces of relevant research into how national libraries use websites and web 2.0 tools, including social media.

2.2.4 Websites and Web 2.0 tools

The majority of research into national libraries online activities focuses on their websites. Pisanski and Žumer (2005) argue that the internet has made national library collections much more accessible, and that the internet is an ideal way for national libraries to widen their reach. They combine this with national libraries' positions as authoritative sources of information with unique, reliable, and high-quality information, and advise that this gives the libraries distinct advantages over competitors. The research also warns that this advantage is wasted if national libraries do not keep up to date with technology and users. Pisanski and Žumer (2005) conclude that the most important factor of a national library's website is its usability which is they acknowledge can be an expensive undertaking. Whilst the research focuses on the libraries' websites, this research suggests the same arguments of authority and advantages apply to national libraries social media presences as well. Furthermore, the expense and problems associated with usability could be seen as an argument for the use of social media by national libraries as it allows those familiar with social media platforms in other areas of their lives to more fully participate, with possibilities for libraries to highlight sections from their collections, helping people navigate their websites and helping to reduce information overload and well as not requiring as much data bandwidth to load sections of the catalogue or exhibition.

Sroka (2002) showed how widely national library websites could vary with content, navigation, and usability key criteria for variation. They also noted that these variations can greatly increase or decrease interest in the libraries' websites.

Alshaheen (2018) tested the usability of certain national library websites and found that usability varied according to the gender and education level of the user. The study also tested user satisfaction with these websites and found correlations between user satisfaction and the content, design, and structure of the website, which led to recommendations of factors for websites to focus on to increase user satisfaction such as

aesthetics and structure of the website, the quality of information, the trustworthiness of content, and the credibility of the content providers. Social media use to enhance national libraries would allow the libraries to focus more on the content and quality of the material as the structures and aesthetics of social media sites are what users are already used to.

Cleeve and Stephens (2008) focused more on the marketing principles of national library websites and reiterate the fact that national libraries cannot be easily visited for a large section of a country's population and therefore the websites form a long-distance portal for people to use, as well as the fact that the libraries cannot afford to ignore the needs of the so-called 'net generation'. The criteria used for assessing marketing efforts were primarily from IFLA's recommended guidelines with extra criteria added from the authors' personal marketing experience. Most of the criteria were too specific to be relevant to social media accounts but criteria such as consistent branding, clear indications of the intended audiences, and highlighting presentations by staff are extremely relevant to social media accounts, especially as Hamilton (2015) noted that there was often a lack of consistency of branding across multiple national libraries accounts. Cleeve and Stephens (2008) provided evidence through their content analysis of the websites that national libraries websites used marketing to a considerable extent and concluded that therefore national libraries websites are not just to enable access to the library's considerable collections but also to explain the library's vision, aims, opportunities and achievements. Since social media accounts can also provide online space to explain and demonstrate the library values in a much more interactive way, it can be argued that social media accounts are an ideal platform to further spread these messages, especially as they may reach different audiences.

Haneefa and Venugopal (2010) analysed the contents of national libraries in Asia's websites. No mention is made of how the checklist used to analyse the websites was developed, but Haneefa and Venugopal (2010) state that it includes general information, the nature of links, news and events, services provided and collection details. They found varying levels of content on each library, with the most common content being details of the collections, the working hours of the libraries and histories of the libraries. Few of the libraries used web 2.0 tools, and when used they were limited to the creation of RSS feeds. The research also noted that few of the websites had the opportunity for users to leave feedback, a problem

that the use of social media platforms could easily remedy. Walia and Gupta (2013) similarly used a content analysis of national library websites in Asia, this time as a measure of the web pages usability. Whilst this research did detail where the checklist was derived from and ranked the libraries according to which library had the better homepage, the research was focused on features of the websites such as clearly labelled links and alt-text for non-text material with no mention or analysis of web 2.0 tools if any were present on the homepages. Haneefa and Jiji (2019) updated their previous research and widened the scope, looking at national library websites globally. More libraries were discovered to have details of e-collections and resources on their website, but more notably increased usage and linking to web 2.0 tools such as Twitter and Facebook, with 52 percent of the libraries linking to Facebook, indicating an increase in the use of social media platforms.

Nowkarizi et al. (2012) is a similar study to Haneefa and Venugopal (2010), though with a smaller sample size. Additionally, the study uses the presence or lack of content on the website as a way of ranking the libraries involved in the study, with the Library of Congress top in the American and European sample, and most of the libraries in the Asian sample of a similar ranking. Many of the findings about the presence of content echo Haneefa and Venugopal (2010), indicating not much changed in the intervening years but given the rapid uptake of social media this may no longer be the case.

Zarei and Abazari (2011) also used content analysis of websites, with a focus on web-based services offered by the national libraries in Asia. A checklist was developed using both ISO standards and previous research, and then websites were ranked according to the number of services found. The study found that all but one of the websites contained fewer than 50% of the services on the checklist and that information about the services of the libraries for users was the most common service. The study acknowledges its own limitations in that it was the English language variant of websites that was studied, and that in many cases the version of the website in the country's formal language often provided more services. This is a fundamental problem in all international research though, and this limitation is widely acknowledged in many of the studies. The authors suggest that an increased use of web-based services could help national libraries to meet their aims and goals, and this research argues that this includes social media services, especially with resources that do not need to

be translated, and strengthens the argument for the increased use of social media by national libraries.

Walia and Gupta (2012b) aimed to find the web impact factor of national libraries' websites. The web impact factor is a form of quantitative impact indicator, calculated by dividing the number of links to a website from other websites, by the number of pages on the website indexed by search engines. The factor is used to determine the relative position of a website against other websites. It is generally perceived to be an indicator of reputation, with the higher the factor the higher the reputation and the visibility of a website. In common with much of the other research, the sample size was small, and libraries were chosen because their websites were available in English. The study ranked the Library of Congress and the British Library as the top websites but was purely investigatory in nature and no attempts were made to understand the results for example if the population size or funding of a national library correlated with the results. Zeinolabedini et al. (2006) is an earlier and smaller version of Walia and Gupta (2012b) which shows much the same ranking but at least attempts to consider why the Library of Congress is so highly rated. Gupta and Walia (2016) conducted further research focusing on African national libraries, concluding that the National Library of South Africa had the highest ranking but also that the webometric measure was biased towards sites with fewer pages. Gupta (2017) conducted the same research on national libraries in Asia and noted the same bias, while Gupta and Walia (2017) conducted the same research on European national libraries and indicated that all the libraries were similarly placed and noticed less bias due to more similarities in the websites. Verma and Brahma (2017) conducted webometric analysis more recently but focused on national libraries in South Asia, finding the National Library of India had the highest-ranking website but again not going further into the results. Combined, the research suggests that countries with more resources have higher ranking websites, indicating a strong argument for the use of social media by national libraries as a low-cost platform that can provide a more level playing field for those smaller or less resourced libraries.

There is also a small amount of research focusing on the web 2.0 tools used by national libraries which includes those on the websites. Buigues-García and Giménez-Chornet (2012) identified which national libraries used web 2.0 tools and what tools were used. The study

managed a larger sample size by just identifying the tools each national library used rather than performing any kind of analysis which allowed the inclusion of libraries who used a language other than English. The study gave a thorough description of the tools considered to be web 2.0, even if some of the tools are now obsolete. The number of tools used by each library were counted and a library was considered to be a library 2.0 (a service that encourages and enables users to participate in the service and management) if more than three web 2.0 tools were used, however no explanation was given for why this limit was chosen. Of the 105 libraries studied, 27 used at least three web 2.0 tools with Europe and America having the highest proportion of these libraries. The most common tools were found to be Facebook, Twitter, RSS feeds, blogs, and digital libraries. However, no further study of the tools, such as how they were used or even if the accounts or tools were active, was performed which indicates the study is more of a starting point for further research.

Walia and Gupta (2012a) is a similar study to Buigues-García and Giménez-Chornet (2012), but is more in-depth and gives a good overview of the literature that shows web 2.0 is a positive thing for libraries as it allows users to decide the service they get and help constantly improve the service. The results confirm Buigues-García and Giménez-Chornet (2012) findings that RSS feeds and social networking sites such as Facebook and Twitter are the most commonly used tools. This study goes into detail what the libraries use these tools for: Facebook was used to share news and event as well as photographs and relevant links; RSS feeds were mainly used for news pages and blog feeds; blogs themselves were varied in that some libraries had one whilst other libraries had more than 10; and Twitter was usually used for spreading general information and blog links. Photograph sharing sites were utilised the least but given the increased availability of smart phones and photosharing apps in the time since this study, this may no longer be the case. The paper acknowledges that at the time of writing the usage of web 2.0 tools by libraries was still in its infancy, and recommended that the tools should be used more often but with guidelines in place and considerations for bandwidth limitations. Walia and Gupta (2012a) also provides the clearest rationale yet seen for using web 2.0 tools in that they can be used to share and illuminate parts of the collections, services and websites that may get overlooked.

In the previously mentioned Haneefa and Jiji (2019), increased use of web 2.0 tools and interactive activities were noted, both a greater variety of tools, such as YouTube and Instagram, and the numbers of libraries using them and linking them to their website. Facebook and Twitter were the most widely used by the national libraries', with 53 and 43 percent of the libraries linking to their account from their websites. 30 percent of the libraries' linked to YouTube, while 21 and 35 percent linked to their blogs and RSS feeds. Photosharing apps were indeed more common, with 14 percent of libraries linking to Instagram, 10 percent to Flickr and 12 percent to Pinterest. Again, the research does not dig deeper into the usage of the tools, merely the presence or absence of the tools or accounts.

Whilst these studies have their limitations, they are useful in identifying what social media is used by national libraries and form an important first step in the research.

2.2.5 Social Media Research

More specific research into the social media activities of national libraries is less common than for other types of libraries and accounts for only a small portion of research into national libraries, but research does still exist. Stuart (2010) analysed what activities libraries undertake on twitter and included some national libraries in the sample. The research is primarily descriptive and investigatory in nature but shows that libraries were using their twitter accounts to broadcast their news and information about services and new collections.

Canty (2012) focused on select national libraries social media activities through a descriptive discussion of what platforms the national libraries were active on and what sort of activity the libraries did on each individual platform. Canty (2012) reiterates Pisanski and Žumer (2005) assertion that library staff are seen as more authoritative than other sources of information and adds that many people are already using the same social media tools in their work and social lives. Canty (2012) found that national libraries tended to use Facebook for sharing a mixture of news and information about library resources, projects, and exhibitions. Twitter showed more variation in uses but often highlighted operational issues and cross-promoted blogs or other information posts. The use of blogs was again found to vary widely, with a mixture of voices and responses. These finding echo some of

the previously mentioned research into web 2.0 tools. The study also looked at material posted on YouTube, noting that it was an increasingly used channel which had the advantage of being indexed by search engines and lead to higher view counts. Overall, national libraries were using multiple channels on social media, and this gave them a good position to harness the opportunities that social media provides and increase access to their digital collections.

The research upon which this project follows on from and expands, Hamilton (2015), went slightly further, with a focus on Facebook and Twitter and performed statistical analysis over a select period to determine, what, if any, actions had an impact on the number of responses social media posts received, with five national libraries with active English language accounts analysed over a period of nine weeks. Most of the statistically significant correlations were weak or moderate, with the presence of a link and the presence of a photograph both showing an increase in the number of responses received. The time of day a post was posted showed a weak negative correlation, showing that the later in the day something was posted it was less likely to receive the same number of responses as posts posted earlier. However, many of the correlations varied across libraries and it was too small a sample size to properly generalise. In keeping with previous research, the Library of Congress and British Library had the most active and responded to accounts, which could be due to both having the largest number of followers out of all the libraries studied.

Stvilia and Jörgensen (2010) analysed user activities in response to photographs posted by the Library of Congress on Flickr. The research used a form of content analysis on sampled comments on photographs to analyse the types of activities that users were undertaking around the photographs. Whilst the authors admit the small number of images and associated comments analysed were purely a convenience sample, there were enough comments in the dataset to show trends in user behaviour. Seven types of user activity were reported; linking and grouping relevant resources, thinking, or reminiscing about the images, discussing issues related to the image, evaluating aspects of the image such as technique and metadata, noticing and solving any uncertainties about the image such as events or people, suggesting and talking about the images' metadata, and asking and answering questions both about the image and Flickr tools. The authors acknowledge that

they excluded images from the sample where they comments were mainly controversial metadata or content such as debates around racist titles or politicians where personal beliefs dominated the comments. This does lead to a bias in the findings and leaves out valuable information around some user activities but nonetheless provides a valuable starting point for understanding users' actions in response to a national library's social media.

User motivations for interacting with the Flickr photographs of a national library were studied by Kipp et al. (2017). Users identified from interacting with a subset of Library of Congress photographs posted to Flickr were surveyed to discover their motivations for interacting with the photographs. Whilst the responses were primarily from Europe and the United States of America, the survey had a good response rate and had a large sample size with a mix of respondents which allowed for generalisation of the results. Three broad categories of motivation were uncovered using open coded content analysis: personal, affective, and social, which subdivide into 11 narrower categories including emotional reactions, opinions on the photograph, knowledge sharing, personal relationship, and social network. The coded motivations broadly aligned with motivations found in previous research on more general online and social media (Ames and Naaman, 2007, Oh and Syn, 2015). When analysed by occupation of user, it was found that the mix of motivations for users to interact with the photograph varied by occupation, with librarians and cataloguers more likely to report affect based motivations and artists more likely to report social based motivations. Whilst the study was limited to one national library, it provides valuable information and context to this area of research.

Outside of research, some marketing based blogs have remarked on the success of some national library Twitter accounts, with Rane (2019) praising the National Library of Scotland's Twitter account for finding a balance of humour with information and acknowledging the accounts success.

2.2.6 Conclusions

Overall, national library research shows a lack both how national libraries are using social media beyond which platforms are being used, as well as no research into how users

actually interact with national libraries' social media presence, a gap which this research intends to start filling.

2.3 Libraries and Museums

Due to the information gap identified in national libraries research, the search wa expanded to national museums, who often have a very similar remit to national libraries though their collections do vary from published materials, and other types of libraries, more specifically public and academic libraries, as their responsibilities do overlap somewhat and can give a starting point for this exploratory research.

Research on library, archive, museum, and gallery presences on social media were searched for, more specifically Facebook and Twitter. Explicitly excluded were descriptive case studies which excluded the majority of archive, museum and gallery literature and some public and academic library literature found. Of the remaining literature, a focus was kept on actual social media usage such as themes and content of posts, as well as research that tried to compare engagement and determine user motivations for responding.

2.3.1 Museums

The Smithsonian Museum's venture into the use of Flickr Commons as a means of highlighting photographs in their collection has successfully shown that putting images up vastly increases the awareness and visibility of collections, and allows those who wouldn't normally think of going to the Smithsonian website to look or search for images to find them on a platform that is more normally associated with photographs (Kalfatovic and Kapsalis, 2009), with the research noting that this assumption applies to the Library of Congress, meaning that this research has valuable implications for other national libraries.

Facebook and Twitter were found to be the most commonly used social media platforms by museum practitioners (Fletcher and Lee, 2012), with most of the use at that time being one way communication, such as posting event listings and reminders, online promotions, and announcements, with only a small number of posts for that called for or encouraged conversations. However, one participant library shared an example of the power that this

one-way communication can have for capturing new audiences, sharing the example of a barely attended regular event that when advertised on Facebook saw a 20-fold increase in the number of attendees, highlighting the power of social media to increase reach.

Additionally, Terras (2015) shows several examples of social media, especially Flickr, being investigated as a relatively low cost way of spreading digital material, which while not evaluating the use, shows institutions are aware of the benefits that social media usage can bring to increase the awareness of their collections.

2.3.2 Libraries

Use of Facebook and Twitter

Milstein (2009) was an early advocate for Twitter use by libraries, stating that Twitter is important for libraries to use, and provided some early best practice guidance. Since then, the use of Facebook and Twitter by libraries as social media platforms has become widespread, with Chu and Du (2012) finding Facebook and Twitter the most commonly used social networking tool in academic libraries, with Boateng and Quan Liu (2014) replicating this result with their analysis of 100 academic libraries in the USA use of web 2.0 tools, which found all 100 libraries in the study used Facebook and Twitter, creating a starting point for the platforms to be analysed in this research.

Similarly, Burgert et al. (2014) asked what platforms undergraduates used and recommended what academic libraries should do. Whilst the sample was small, Facebook and Twitter were again the main platforms used though others were starting to emerge. Students surveyed wanted to see event information, leisure content and resource links on the social media platforms. These results were similar to Jones and Harvey (2016) and Stvilia and Gibradze (2017) where students responded they followed the library for easier and speedier updates, for gaining access to library information such as opening hours and holiday announcements, as well as improved communication with the library.

A new study, Williams et al. (2021) revealed that students felt the use of Facebook and Twitter by university libraries could facilitate use of the libraries' digital platforms and allow

information to be shared in real time, indicating that the platforms are still relevant to libraries and users.

What libraries are using Facebook and Twitter for

Several studies establish that academic, public and health libraries use Facebook and Twitter for several reasons. One of the most common usages is to answer enquiries from users in an environment they are already familiar with (Mack et al., 2007, Del Bosque et al., 2012), as well as to communicate with users both to quickly find and address problems they may be having (Cuddy et al., 2010) and in general, with social media found to enable faster, easier, and less formal communication between libraries and their users (Anttiroiko and Savolainen, 2011). Witte (2014) found libraries were using Facebook to engage patrons and Del Bosque et al. (2012) also found that half of academic libraries in the USA were using Twitter to interact with their followers by mentioning users, or using a hashtag that others were using. Cavanagh (2016) and Anttiroiko and Savolainen (2011) similarly found that public libraries were using Twitter to extend their existing presence and become more involved in the community by reaching out to both their existing community users and new users, with this use found to expand the libraries' overall audience and participation by increasing conversations and connections. Sharing news, resources and general library content was also found to be a common use for social media with additional using including crowdsourcing book reviews and tags from users (Anttiroiko and Savolainen, 2011, Cuddy et al., 2010).

Several studies analysed larger sample sizes of library social media posts to broadly categorise the reasons for use. Chen et al. (2012) established four categories of use based on whether the posts were disseminating information, sharing knowledge, communicating with users or gathering knowledge from users. Collins and Quan-Haase (2014) and Huang et al. (2017) found the same categories in different samples of libraries showing the strength of the categorisation. Chen et al. (2012) found knowledge gathering were least used, while half of posts in the study were disseminating information. The study also measured the engagement of posts by number of comments and shares a post received to determine which category was most interacted with. In public libraries, knowledge sharing were the most interacted with posts while in academic libraries, communication posts were most

interacted with. Facebook was noted for more responses to knowledge sharing while Twitter had more responses to communication. Collins and Quan-Haase (2014) found slight differences in the patterns of usage between Facebook and Twitter, with Facebook used more to disseminate information such as news, display photographs, information about resources and services, which the authors noted at the time was mainly physical resources not digital services. Twitter on the other hand was more used to communicate directly with users such as responding to comments and questions, with smaller numbers of tweets sharing news, announcements and highlighting library resources.

Huang et al. (2017) used the same four categories to characterise posts by academic libraries on Twitter but went further by generating sub-categories for each of the main categories and assigning a type of librarian-user interaction to each one. Information dissemination, coded as a one-to-many interaction type covering content such as events, facilities, services, library hours, lectures, position opportunities and others. Knowledge sharing, again a one-to-many interaction covered content such as online resources, collections, and librarian's personal knowledge sharing. Communication, one to one interaction type covered posts that replied to user questions, comments, complaints, retweets, discussion initiated by librarian and discussion initiated by user. The study again found that half the posts were disseminating information with knowledge gathering barely represented and the remaining categories account for approximately a quarter each of the posts.

Libraries were also found to be using Facebook and Twitter for marketing purposes. Jacobson (2011) showed academic libraries in the US were using Facebook for marketing and announcements, which is in line with other research by Sachs et al. (2011), and Wan (2011) which mentions specifically marketing library events.

Content and themes of social media posts

Some research stated what libraries were posting on Twitter and Facebook but either did not explicitly mention how these categories where generated, or the results were generated from surveying library staff. These results still proved a useful starting point, especially as many of the content types and themes matched later results.

Burgert et al. (2014) revealed academic library posts on both Facebook and Twitter were highlighting library content, today in literary history, and pertinent campus events. Tan et al. (2012), Alkindi and Al-Suqri (2013), and Harrison et al. (2017) researched academic and public libraries and found similar categories of content posted, such as promotion of collections, archives and events, announcements covering new services or materials, material that fed into user interests such as book or film reviews and recommendations, general news, community information and activities hosted by the library or other institution. Interaction with users was also apparent with posts dealing with user enquiries or soliciting user feedback. Alkindi and Al-Suqri (2013) also noted that most of the interactions received on the posts were likes, with only 17 percent of the total interactions coming from comments. General and library news were found to be the most commonly posted across all types of social networking sites, with feedback and announcements about new library services the least commonly used. Importantly, all libraries used social media to connect back to their website at least once.

Similarly, Loudon and Hall (2010), Chu and Du (2012), and Xie and Stevenson (2014) all found that found Facebook and Twitter were most commonly used for marketing and publicity, such as sharing library news and events, sharing online resources, providing general library information as well as answering user enquiries and generally interacting with users. Chu and Du (2012) additionally noted some advantages of social media such as being quick to spread information, easy steps for library staff to use and post material, and increased interactions with the libraries. However, challenges were also noted, such as that limited time for monitoring responses, limited staff time to learn new platforms or strategies, and not all staff had the same willingness to use social media.

Studies that explicitly mentioned content or thematic analysis was used to understand post types on Twitter or Facebook, and in many cases agree with the categories mentioned above, but often provide a little more detail about the usage of codes. The following table gives an overview of the main category types in existing research:

Table 2 Themes in public and academic libraries' social media

Content type/code	Twitter	Facebook
Library in general	Aharony (2010) Alsuhaibani (2018), Collins and Karami (2018), Shiri and Rathi (2013), Stvilia and Gibradze (2014), VanScoy et al. (2018)	Aharony (2012)
Information about	Aharony (2010), Al-Daihani and AlAwadhi (2015), Collins and Karami (2018), Shiri and Rathi (2013)	Aharony (2012), Joo et al. (2018)
Miscellaneous/other	Aharony (2010), Collins and Karami (2018), Neilson (2016), Shiri and Rathi (2013)	Aharony (2012), Joo et al. (2018)
Technology	Aharony (2010) Al-Daihani and AlAwadhi (2015), Neilson (2016)	Aharony (2012)
General recommendations	Aharony (2010), Collins and Karami (2018), Karami and Collins (2018), Shiri and Rathi (2013), VanScoy et al. (2018)	
Promotion of services and events/events	Alsuhaibani (2018), Al-Daihani and Abrahams (2016), Collins and Karami (2018), Del Bosque et al. (2012), Neilson (2016) Shiri and Rathi (2013), Stvilia and Gibradze (2014)	Joo et al. (2018)
News and announcements	Alsuhaibani (2018), Al-Daihani and AlAwadhi (2015), Shiri and Rathi (2013)	Joo et al. (2018)
Library collections or resources	Alsuhaibani (2018), Al-Daihani and Abrahams (2016), Collins and Karami (2018), Del Bosque et al. (2012), Karami and Collins (2018) Stvilia and Gibradze (2014), VanScoy et al. (2018)	

Content type/code	Twitter	Facebook
Communication	Alsuhaibani (2018), Karami and Collins (2018), Shiri and Rathi (2013), VanScoy et al. (2018)	
Surveys	Al-Daihani and Abrahams (2016), Shiri and Rathi (2013), Stvilia and Gibradze (2014)	
Q and A	Al-Daihani and Abrahams (2016), Stvilia and Gibradze (2014), VanScoy et al. (2018)	
Community building/ social good	Al-Daihani and Abrahams (2016), Collins and Karami (2018), Karami and Collins (2018), Neilson (2016), Stvilia and Gibradze (2014), VanScoy et al. (2018)	
Study support	Al-Daihani and Abrahams (2016), Karami and Collins (2018), Stvilia and Gibradze (2014)	
Operational updates	Al-Daihani and Abrahams (2016), Del Bosque et al. (2012), Shiri and Rathi (2013), Stvilia and Gibradze (2014)	

Some further sub-categories emerged from the research, for example local events as a subset of events, and communication sometimes broken down to responses and soliciting participation, but these sub-categories were less aligned with others across the studies.

Whilst studies for Twitter were much more common, the Facebook studies shared many of the more general categories with the Twitter studies, which in turn aligned with the content categories mentioned earlier.

The most commonly used categories in the studies were libraries in general, collections or resources, communication, and events.

Of the studies that compared public and academic libraries on Twitter, Aharony (2010) found that the largest categories in both were 'library in general' and 'information about' although the rates vary with both categories a bigger percentage in public libraries' posts. Some differences in subcategories were also noted between the libraries, for example the academic libraries had lectures, classes, and courses under information about while public libraries had blogs, lectures, and different events. The same research also found that academic libraries used more formal language in their tweets while public libraries used a mixture of formal and informal language. Alsuhaibani (2018) also found differences in that while the promotion of services and events was the most common theme across both libraries, the public library posted more of its own events, while the academic library posted more national and international events. The research also found the public library had a higher rate of communication with users, and variations in the subcategories emerged such as academic libraries having more posts about databases while public libraries had more about special collections.

Similarly to their Twitter research, Aharony (2012) found that on Facebook, posts about the library were most common category of posts in both types of libraries. However, the number of posts in this category was higher in public libraries, and again the subcategories varied, with public libraries' posting more about their own events and activities while academic libraries posted more about their collections. Aharony (2012) contrasted the Facebook study against their earlier 2010 Twitter study and noted that libraries used Facebook more as a means of delivering information, rather than a method for discussion, with more conversations occurring on Twitter.

Overall, content by libraries on social media generally covered announcements about library events, library resources, library news, community and local news, courses for educational purposes, and communication. Whilst the exact name of content codes varied between research, many of libraries were posting similar content though the exact numbers did vary between the different types of libraries and the platforms. This provides further evidence that national libraries may post similar content, further analysis is warranted to see if the levels differ from the other libraries and possibly the effect of the social media platform.

User engagement

Some research has been performed on the users who retweet library posts, with Kim et al. (2012) finding that in academic libraries while the majority of users retweeting were affiliated with the university in some way, others users such as local organisations and hobbyists were also retweeting, indicating that social media can widen libraries' audiences.

Research in the library field has measured engagement using the traditional numbers-based approach. The most common method is just counting the number of likes and shares/retweets a post received, e.g. Glazer (2012), Stvilia and Gibradze (2014), VanScoy et al. (2018), Alsuhaibani (2018), Gruss et al. (2020), and Joo et al. (2020), while some research counted the total numbers of the entire sample (Joo et al., 2018) or used an average of counts for each content types as seen in Winn et al. (2017) to enable the contrast of two libraries with different response rates. However, some qualitative evidence of engagement and impact was given in Glazer (2012) whereby a policy change only announced on Facebook was picked up and reported on by the university news. All the studies agreed that likes were the most common form of engagement followed by shares/retweets with replies occurring least of all, with often a Zipfian distribution in the number of replies with smaller numbers of responses more common than larger numbers, however, none of the studies suggested a level of responses that constituted a good level of engagement.

Some research has revealed which topics by libraries were more engaged with by users, for example: study support services (Stvilia and Gibradze, 2014), user interactions (Stvilia and Gibradze (2014), (Winn et al., 2017, Joo et al., 2018), (however, in contrast, VanScoy et al. (2018) found that user interaction were less likely to be liked or retweeted), library spaces and news including events or resources (VanScoy et al. (2018), (Joo et al., 2018, Joo et al., 2020) (with some slight disagreement from Winn et al. (2017) finding that posts promoting events were least engaged with on Facebook) and community events (Joo et al., 2020). Many of the studies agreed that outlier posts of that received larger numbers of responses than the others existed in the samples, but no common theme or content were found to be present in those posts.

There were few direct comparisons between different types of libraries, but Alsuhaibani (2018) found that the public library in the study had a slightly higher rate of engagement than the academic library but this sample size is too small to generalise the finding.

Additionally, Stvilia and Gibradze (2014) found that the presence of a URL in a tweet also increased the number of retweets a post received while Joo et al. (2018) and Joo et al. (2020) found an image or video in the post also increased response numbers. Gruss et al. (2020) also noted that using community-oriented language increased the response numbers to posts, aligning with Jones and Harvey (2016) who suggest a lack of engagement was due to the lack of encouraging language in posts.

Recommendations for success

Some of the research has recommendations based on their research for success with social media. Burgert et al. (2014) recommends creating a committee from all library departments to ensure good coverage of library events and resources, reiterated by Young and Rossmann (2015); posting on a regular schedule (reinforced by Jacobson (2011) with recommendation to post at least once a week); and promoting library events and services. Interacting with the campus community and online users is recommended by many. Yep et al. (2017) advises that cultivating reciprocal relationships with social media users allows library information to reach a broader community, suggesting that libraries need to engage with users, not just treat social media as a bulletin board. Similarly, Fletcher and Lee (2012) state the need to use calls to action or talk in posts and create a tone that encourages engagement, and Witte (2014) advises libraries to create engagement and advertise their profiles by actively interacting with other users by liking, commenting on or sharing the content of others. Young and Rossmann (2015) noted that creating personality rich content that invites two way engagement helped grow online library communities. Peacemaker et al. (2016) recommends creating a content strategy that is regularly evaluated to ensure content is relevant and reaching users. Chatten and Roughley (2016) combines many of these points and stated that well maintained social media promotes the library social media profile and builds good relationships with different users.

2.3.3 Conclusion

Literature around museum and libraries' use of social media sets a precedent of the use of content and thematic analysis to determine institutions use of Facebook and Twitter, with the results indicating that while categories are consistent across different types of libraries, the exact usages varied between them. The use of response numbers to measure engagement was also seen as an established practice, with varied levels of engagement across different types of libraries and platforms, and some impact of content type on the number of responses received. Some user motivations for interacting with posted material was given, suggesting a starting point for trying to determine a way of analysing user engagement beyond response numbers.

2.4 Social Media

The literature search is then widened into the more general social media research field. This uncovers factors that may affect social media users' behaviour as well as establishing a rationale for why social media use is important, and as well as understanding other public or charitable organisations use social media that may have an impact on the research to be conducted.

This section focused on research on Facebook and Twitter specifically, though some research on Sina Wiebo, a similar platform to Twitter, was also included. Initial research on user reasons for using social media as well as benefits of social media and user engagement were included in this section to strengthen the rationale for studying social media usage of national libraries. Factors affecting user engagement with posts and user motivations for interaction with social media were included in the literature search while research that focused on the users themselves or the network of users was excluded.

2.4.1 Background

Social media usage is on the increase, with 4.55 billion users in 2021, compared to 1.48 billion users in 2011 (DataReportal, 2022), and social media is increasingly involved in all aspects of life, including public organisations and infrastructure (Burgess et al., 2017). Users

are spread over a multitude of different platforms, with some language or use specific such as the predominately Chinese language Sina Weibo or the image-centric Instagram, however this section will focus on research conducted on the platforms of Facebook and Twitter as those are the platforms involved in the study.

Facebook is the most widely used platform with over 2.9 billion users who are active at least once every 30 days (Statista, 2022b). Facebook, established in 2004 and open to anyone in 2006, allows users to post entries to their own Facebook page as well as follow other users, respond to their posts via reactions or comments, share posts and check in at locations. Text, photographs, videos, and links can all be posted, and posts have no character limits which means a wide variety of material can be posted without having to consider a limit. Users can see posts by users they follow in their feed, but Facebook uses an algorithm to determine which content is displayed in which order. The exact parameters for the algorithm are unknown, meaning it can be difficult for users to posts are seen by followers, and is a variable that must be considered when basing research on Facebook data.

Twitter, established in 2006, lags behind Facebook in terms of number of active users with approximately 330 million users active every month in 2019 (Statista, 2022c) Users can tweet (the Twitter term for post) text, photographs, videos, and links, but unlike Facebook, tweets have a character limit of 240 characters (for most languages), meaning users must be more considerate of the material they are posting. The character limit doubled from 140 in November 2017, and it is unclear so far exactly how this has impacted usage, however, threading, that is the posting of multiple linked tweets to an initial tweet where the conversation carries over all tweets, is still common, and can distort the conversations and sometimes artificially inflate the number of replies depending on the method used to collect the data. Users can respond to other users' tweets by replying, 'liking' or sharing the tweet, known on twitter as retweeting, if the original user allows it, and users can follow other users. Users have the option to view posts via two feeds: the default home feed which Twitter displays according to an algorithm, or a chronological latest tweets feed if users wish.

Both platforms have the option to embed links in posts, whereby the platforms generate a preview that can be either be difficult to alter by most users, or the platform does not allow

it. These previews usually contain an image, title, and description that the social media platform extracts from the page being linked to, and Stivala and Pellegrino (2020) states that these previews are useful to users to help decide whether to click on a link or not.

The differences between the platforms is apparent in that different factors affect the usage of each platform (Kwon et al., 2014), indicating that results may differ on the platform and that strategies many need to be different for each platform. Twitter was shown to be more valued for its mobility and ease of use on smartphones whilst Facebook users valued the perceived privacy the platform offers, though this research did take place before data related scandals such as Cambridge Analytica became known, though Facebook has made numerous alterations to data access since.

2.4.2 Rationale

In the wider area of social media research, there exist several rationales for studying the social media use of national libraries and reactions to them. Firstly, social media usage by government organisations is found to be highly accepted by the general public (Mergel, 2016), meaning understanding more about the social media use of national libraries is a valid area of research.

Additionally, user behaviour on social media shows the benefits to organisations of using social media. In the United Kingdom, Ofcom (2017) showed that over 70 % of social media users use social media to respond to other posts, with nearly a quarter of users using social media to interact on a public group with people they do not know, meaning there is an audience willing to participate in social media discussions and posts, and that users are likely to share links to things they have read. Furthermore, the report established that even those who are new to the internet or do not use it much tend to check social media as one of the activities they do when they go online. Whilst this research may only be specific to the United Kingdom, research from both Statista (2022a) and Kemp (2022) shows that globally users are using social media for similar reasons.

Social media has also been shown to help users find new information, including news, with Fletcher and Nielsen (2017) finding that users of social media are incidentally more exposed

to news than non-social media users, with this incidental exposure higher for younger users and those who do not normally search for news. This provides a positive indicator that people are accidentally exposed to items they were not searching for, meaning national libraries could produce content that could reach those not following their accounts. Similarly, social media has also been shown to act as an electronic form of word of mouth advertisement, with Okazaki et al. (2015) finding that satisfied customers carry out information sharing by posting about the organisation on social media, and Taehyun et al. (2017) finding that users respond to being tagged by friends in the comments of posts, often by responding to the comment tagging them or to the post more generally, indicating that social media can further expand national libraries reach by increasing awareness of both the national library and their social media accounts.

Understanding user responses to social media is also important as Kim and Syn (2016) found the presence of reviews and comments has been shown to influence users' behaviour towards information, such as mark it as trustworthy. This can have positive effects on the sharing of and interacting with information, so understanding the responses national libraries already have can allow national libraries to adjust their behaviour on social media. Furthermore, the effect of online interactions and likes has been shown to have offline impacts, with Brettel et al. (2015) showing that people liking pages or posts can lead to a long term increase in sales, theorising this is because those liking the posts are actively engaging with the company's social media platform, giving the company more opportunities to interact with users and inspire repeat purchases. Additionally, Beukeboom et al. (2015) research showed that liking and following a brand's Facebook page for a month increased users' positive evaluations of the brand, thus increasing the brands' exposure and opportunities, with the caveat that more interactive brands have larger increases than those less interactive brands. Researching the national libraries' level of interactivity on social media and the resulting user engagements will demonstrate if this also applies to organisations as well as brands.

2.4.3 Engagement

User engagement with a post is typically measured by the number of replies a post receives, both comments and likes as demonstrated by Newberry (2022), a social media company,

and research previously mentioned in the libraries section. The numbers generated by user engagement can then be used to measure success of social media activities, such as in the previous libraries research, the already mentioned Brettel et al. (2015) and in Ha et al. (2016) and Peruta and Shields (2017). While exact numbers and levels of success can vary by organisation, Ibrahim et al. (2017) found on Twitter that one comment was low engagement, with two to three comments medium engagement and over four comments a high level of engagement. Peruta and Shields (2017) describe the differing levels of effort the different types of engagement require, with like only involving one click, and displaying limited reach to other users, sharing requires two clicks and shares the post with other users, while commenting requires the most effort and on Facebook, unlike Twitter, does not share the comment or the content with users outside of the post. Accordingly, the levels of each engagement type vary, with the lower effort types of like and share more common than comments.

User engagement is noted as being a critical factor in the success of social media activities by Brodie et al. (2013) Ha et al. (2016) and Ibrahim et al. (2017), and, as noted above by Beukeboom et al. (2015), user engagement can give users good impressions of organisations.

2.4.4 Research

More general research into Facebook and Twitter furthers the importance of the use of social media for national libraries to both communicate with users and spread information.

While social media platforms regularly change, much of the advice on the benefits and drawbacks of social media and tips for using such as Kaplan and Haenlein (2010) remain the same, with the tips the same as currently espoused by marketing professionals, indicating that the research is still valuable and that social media research does not necessarily age as much as may be expected. Similarly, Kietzmann et al. (2011) created a model of the functionalities of social media that contains seven components; presence, relationships, conversations, sharing, groups identities and reputation. These functionalities are independent of platform and are still found in the current social media platforms, with the research confirming that the functionalities have different prominences on different

platforms which affect how individual platforms are used and should therefore be managed. The research also provides advice that still stands up, mainly be aware or cognizant of the organisation's social media presence as well as the wider social media landscape, develop strategies and policies that are suited to both the organisation and the functionalities of the platforms being used, curate their social media presence by posting appropriate content as well as knowing when to step into conversations, and be aware of their own engagement and gauge how others are responding.

Twitter has been shown to be used by users for a multitude of reasons, such as daily chatter, conversations, sharing information and reporting news (Java et al., 2007). Furthermore, research from multiple sources such as Chen (2011), Aladwani (2015), Dindar and Dulkadir (2018) have repeatedly shown that interaction with others and engaging are primary motives for using Twitter, and that these interactions can have a positive impact on relationships between users as well as increasing users' levels of knowledge. This agrees with the research in the previous section that calls social media a form of word of mouth and shows that interacting on social media with users can be beneficial for both users and national libraries. Java et al. (2007) also found that users fall into three broad categories; information source, friends, and information seekers. While the research acknowledges that users may fall into different categories in different communities or have multiple motivations, national libraries would most often fall into the information source category, posting valuable updates to their followers, suggesting the power of national libraries to share their collections with users.

The use of third party platforms offers a conundrum in that the platforms are capable of making decisions outwith the organisations control. Mergel (2016) acknowledges this and offers advice to organisations. This advice, such as making sure the social media use aligns with the mission of the organisation, fits a need the organisation has, as well as ensuring organisations have standard operating practices and are willing to update these procedures as the platforms and user expectations evolve, is similar to some of the advice in the libraries' research section and is also relevant to national libraries.

Also similarly to the previous libraries section, content, and thematic analysis of posts on social media are common, often used to understand what organisations are posting and

what information is shared online. Ure et al. (2019) studied cancer charities posts on Twitter and used content and thematic analysis to identify the types of support offered by the organisations and the methods of support. Three types of support were found; informational, instrumental, and emotional support, and three methods of support were offered; raising awareness, focusing on the future, and sharing stories.

Peruta and Shields (2017) and (2018) performed content analysis on college and university Facebook posts to uncover what the institutions were posting. Peruta and Shields (2017) focused more on the type of content, such as links, text updates, images, and videos, discovering that image posts were more frequent with video or text only updates uncommon, with some variances in exact levels between the different types of universities. Peruta and Shields (2018) analysed the content category of posts, finding such topics as promotion, overall info, admin and staff, athletics, campus events and school achievements as the most common with entertainment, development, and student organisations the least common.

Factors affecting user engagement

Research into specific factors that can affect the number of responses exist, with Suh et al. (2010) analysing a very large number of Twitter posts and determining that the presence of an URL link or hashtag had a positive effect on the number of retweets a post received. Zhao et al. (2013) performed a similar analysis on Sina Weibo, a Chinese microblogging service similar to Twitter, and also found that URLs increased the number of retweets a post received and that additionally the presence of multimedia such as images or videos also increased the numbers of retweets, with both increasing the time that a post was visible on the platform.

Certain topics were found to have higher levels on engagement by Peruta and Shields (2018), with categories such as athletics, news, and promotions increasing levels of engagement, while topics such as events and performances, general information and administrative and staff content had lower levels of engagement. Additionally, Cho et al. (2014) found that user engagement levels were highest on posts that were communicating with users rather than simply sharing information, agreeing with the previously mentioned

Beukeboom et al. (2015) that found that brands that were more interactive with users and used a conversational tone had more positive impressions from users. These provide proof that that national libraries must communicate with social media users to be successful, and lead to the conclusion that national libraries that are more interactive on social media will be more successful in regard to engagement, exposure and positive associations than those that are less interactive.

Motivations for interacting with social media

Research has suggested motivations for users responding to and interacting with social media posts, providing insight into why users might respond to national libraries' posts.

Ames and Naaman (2007), Brodie et al. (2013), Oh and Syn (2015), and Gintova (2018) all researched user interactions on social media platforms to determine user motivations for the interactions such as commenting or tagging or annotating images. The researchers use different terms and subdivisions but generally the motivations broadly align with each other. Ames and Naaman categorise the motivations into two main types, self motivated and socially motivated. These align with the distinctions in Brodie and Oh and Syn, with motivations such as learning (both Brodie and Oh and Syn), enjoyments, self-efficacy, personal gain (Oh and Syn), expressing gratitude and thanking (Gintova) falling into the self-motivations category while sharing (separated into sharing opinions, information and feedback in Gintova), advocating, socialising and co-developing (Brodie), altruism, empathy, social engagement, community interest, reciprocation (responding to others in Gintova) and reputation (Oh and Syn) fall into the social category. Ames and Naaman subdivided their two main categories in organisation and communication-based focuses, with organisation often based on making items easier to search and retrieve with personal gain aligning with the self aspect and co-developing and altruism aligning with the social aspect. The communication aspect of Ames and Naaman can cover both communication with oneself to provide memory and context for the item (aligning with learning from both Brodie and Oh and Syn) and communicating with others to generate content and signal others (social engagement, reciprocations, community interest from Oh and Syn and co-developing from Brodie).

In addition to determining user motivations for interacting, Oh and Syn found that the proportions of the motivations varied between different platforms, not unsurprising as the platforms all served information differently and had different purposes, but all motivations were present on five different social media platforms. Gintova also found a difference between platforms, in this case just two platforms, with Twitter users more likely to ask questions and Facebook users more likely to share opinions, with some of the differences attributed to the platforms but also to the unresponsiveness of the Facebook page owners in the study.

The alignment of the motivations across different studies and platforms mean the motivations found give a good starting point for analysing the motivations for users responding to national libraries' social media posts.

Hood and Reid (2018) took a slightly different approach, not only classifying comments by motivation but also by whether the comment interacts with the material on the page. The motivations found also align with the above research, with commenting on the material, conversing with others, requesting information and tagging other users the main motivations found, with commenting the most common motivation followed by conversation and tagging. Comments were then coded as to how connected to the topic the comments were: direct content, about something in the image in the context of the image; indirect content, about something in the image but outside the context of the image; and associated content, a general comment about something associated with the image. The majority of the comments were directly interacting with the image, with 29 percent indirectly interacting and no comments categorised as associated content. As to be expected with a page sharing local heritage archival images, the predominant theme underpinning comments was that of users sharing family and personal connections to the images and providing personal context to the image or sharing it with others, with the research finding that the comments added value to the images and that users were connecting with their families' pasts. Actual engagement numbers varied on the images, but on several images the importance of the tagging feature was evident as the posts reached more unique users than followed the heritage centre's Facebook page. This research suggests that national libraries' sharing of objects from their collections would be well

received by social media users and would expand the libraries' reach through the tagging function of comments.

2.4.5 Conclusions

This section covered the background of the platforms involved in the study, including the usage statistics, the differences in the platform abilities as well as the differing uses valued by users for each platform.

The benefits to using social media were laid out in the rationale section, with social media established as functioning as a form of electronic word of mouth and expanding users' exposure to new content as well as being accepted by the public. Additionally, users were shown to other users tagging them in the comments of posts, suggesting that the study of comments on national library posts can help identify what content users are tagging to help the libraries understand how to increase their reach. It was also established that online interactions and likes can have offline effects, with organisations that were more interactive shown to have larger returns as well as increase positive emotions about the organisation. This gives further weight to the argument it is worthwhile for national libraries to use social media, as well as to study their use to see how interactive with users they are and if their effort is worth their returns.

The section further investigated engagement on social media, found again to be typically regarded as the number of replies a post receives, and also noted as a critical factor in the success of social media activities. The exact level of engagement labelled successful varies by organisation, but it was noted that engagement such as likes and shares required less effort on the part of users meaning those numbers are generally higher than the number of comments received.

More general research into social media found advice on good practise on social media had not changed over the years despite the platform changes that have occurred, as well as advice to organisations to help performance on the third party platforms such as to have a standard operating practise and ensure that the social media use fits a need the organisation has. The section also found that users use social media to interact and engage

with others and that social media can be beneficial for users as well as acting as a source of information and support.

Factors affecting engagement levels were uncovered such as posts with links, images or hashtags generally being more shared and engaged with, as well as posts that were communicating with users often having the highest levels of engagement. Some topics were also found to have slightly higher engagement levels, often news, promotions, and popular events such as sports, underpinning the need to understand if the content national libraries are posting affects their engagement levels.

The section also uncovered user motivations for interacting with social media. These were broadly categorised into self motivations and social motivations with learning, sharing, communicating all common motivations, with comments often talking directly about the content in posts. Additionally, some differences were noted in the motivations of users on Facebook and Twitter, with Twitter users more likely to ask questions and Facebook users share their opinions, with the differences due to both the difference in platforms as well as unresponsive Facebook page owners.

These common motivations for responding are commonly investigated as part of the field of information behaviour therefore that field was studied further to determine a conceptual framework to underpin the study as well as uncover other aspects of user motivations that may affect their interactions with national libraries' social media pages.

2.5 Information Behaviour

In this section, the selection criteria was quickly whittled down to information encountering models of information behaviour after researching the most common models. Since information encountering is a small area of research, all relevant research is discussed with no research excluded.

2.5.1 Background

There have been many definitions and names for information behaviour over the years, including the Ingwersen and Järvelin (2006) definition of information behaviour as the

"generation, acquisition, management, use and communication of information, and information seeking" (p. 259), the Pettigrew et al. (2001) definition "the study of how people need, seek, give, and use information in different contexts, including the workplace and everyday living" (p. 44), as well as the Wilson (2000) definition "the totality of human behaviour in relation to sources and channels of information, including both active and passive information seeking, and information use" (p.49). For the purposes of this research, the definition by Wilson (2000) will be used as it encompasses all behaviour including two-way communication between people as well as the passive behaviours such as reading or watching without intention to use the information, which suits the behaviours of social media behaviour as users both communicate and scroll passively.

2.5.2 Information seeking models

Many models of information behaviour focus on information seeking (see the entirety of Case and Given (2016)). Models such as Kuhlthau (2004) and Wilson (1999) were developed in work focused environments, and as such have very formal and distinct stages, although Wilson does introduce the idea of passive attentions where information is acquired without seeking. Other research has looked at everyday life information seeking, such as Savolainen (1995) and Williamson (1998) who introduced incidental information acquisition, and while this does fit in with the more social and general purpose aspect of behaviour on social media, it still assumes that the initial behaviour is searching for information. Therefore, it was decided to investigate the research around passive or accidental information behaviour for a conceptual framework.

2.5.3 Information Encountering

Passive information behaviour, serendipitous information acquisition, and accidental information discovery have all been terms used to cover the process of information encountering. This research will use the term information encountering with the definition "the experience of an unexpected discovery of useful or interesting information in the context of both information related and non-information-related activities" (Erdelez, 1995).

Models that include some aspect of information encountering include Krikelas (1983) with casual information gathering, Wilson (1997) with passive attention as an awareness, Choo (1999) with undirected viewing, Bates (2002) with being aware, and McKenzie (2003) with non-directed monitoring.

Other research studies aspects of behaviour that affect information encountering.

Erdelez (1997) initial research into information encountering grouped information users into four groups depending on the level of information they encountered. Categories ranged from 'superencounterers' who said information encountering was vital to their information behaviour, to 'non-encounterers' who said they did not encounter information. The research also indicated that information systems should be more browsable and flexible to encourage encountering, and that information encountering could occur in all aspects of everyday life. Erdelez (2005) further added to the categories of encounters with the understanding that occurrences of encountering are dependent on both the individual involved and the context of the situation. The research also included the internet in general as an information encountering environment rather than limiting the research to databases or search systems.

Foster and Ford (2003)'s research into serendipity similarly uncovered that the process of serendipity is facilitated by people if they are also open and receptive to chance encounters while seeking other information. The research also uncovered that serendipity was a widely experienced phenomenon and reiterated that it could have an impact on people's activities. Heinström (2006) built on this to explore the psychosocial factors that affect people's behaviour towards encountering information and could influence the likelihood of incidental acquisition. People who were energetic, had positive emotions, or had high motivation were found to have increased instances of acquiring information incidentally. The research also agreed with Foster and Ford that information encountering often occurred in the process of seeking other information.

The actual processes involved in serendipitous encountering were researched by McBirnie (2008) with two aspects found that were required for encountering to occur. The first aspect is the process, that is the doing of something whether it be browsing social media, reading

the newspaper, or listening to the radio, while the second aspect is perception such as being aware of occurrences of serendipity happened or "the trying to observe" (p. 608). Chance has an impact on the process, such as different environments and who people come into contact with, while a person's personality can affect whether they are willing to notice or change direction when something unexpected is encountered, similarly to the research above. McBirnie (2008) also introduces the concept of a 'serendipity filter', that is pressures that affect perception of serendipity such as time, a person' needs, their current environment, and their responsibilities.

The idea of a serendipity filter is built on in McCay-Peet and Toms (2010)'s analysis of previous data to understand environments and conditions that facilitate serendipity, with the research determining that serendipitously encountering information often takes place during social networking, especially during exploration. Social networking and social media as an environment for facilitating information encountering was also found in Dantonio (2010)'s research, as well as that users of social media also shared found information to others, including those they do not immediately know.

Information encountering on social media was further researched by Rubin et al. (2011), with the results aligning with previous research that noticing the information in the encounter is dependent on the user, that chance still plays a part in encountering occurring, and that beneficial outcomes can occur as a result of the encounter. Additionally, Panahi et al. (2016) found that social media supported and encouraged information encountering, with the study listing six main ways that information encountering was increased on social media. The participants stated that social media increased encountering by; broadcasting and publishing information to a wider audience, spread information faster, provided users with a personalised and filtered feed, supplied the ability to keep up to date, provided documentation of knowledge and experiences, and helped the retrievability of information. These factors were stated as helping knowledge and information become more widely available and increased the chances of creating and sharing new knowledge.

The above research provides insight into different factors that affect information encountering, especially online, and serves as a starting point for understanding the ways in which national libraries social media activities can affect how users engage with the posts,

as well as providing an understanding of the differing levels of user engagement. Jiang et al. (2015), discussed in more detail in the following section, synthesises this research with the addition of user interviews to create a model of online information encountering that is detailed and considers multiple user factors that can affect the encountering and can provide a theoretical underpinning for answering the research questions. This is a relatively new model, however, the authors have conducted further research, and Jiang et al. (2019b) found that visual stimuli, excluding text, and understandable or humorous stimuli were more likely to increase engagement and encountering. Jiang et al. (2019a) adjusted the model using secondary data to provide some more descriptive aspects of stimuli and more detailed pre-encountering activities. However, the adjusted model does not distinguish post-activities as much or consider as many users' perception issues but overall is mostly similar. Furthermore, Jiang et al. (2020) used the model as a descriptive framework for their diary studies of information encountering, showing the viability of the model as a framework for research.

2.5.3.1 Conceptual model

The Jiang, Liu and Chi (2015) model of online information encountering synthesises the previous research and adds empirical research from user interviews to create a model of online information encountering that details each stage of the process as well as identifying major factors that influence the chances of information encountering occurring. The model, as seen in Image 1 An integrated model of online information encountering by Jiang et al (2015), accounts for multiple reasons for engaging in social media use in the pre-activities part of the process, with browsing, searching and social interaction all accounted for. The mid-activities in the model; noticing, examining, and acquiring, are influenced by factors that affect the perception of the user, with both dynamic factors and constant factors. These factors then influence what post-activities the user undertakes if they finish examining and acquiring the information, such as saving or exploring interesting content, or saving, using, and sharing useful content.

The factors affecting perception are split into three broad categories: user, information, and environment.

User factors are the personal influence of the user searching, with the constant factors of intentionality and curiosity based on whether users directly go looking for things or are willing to browse (intentionality), or their willingness to follow interesting information that has nothing to do with the reason why they are doing the activities in the first place (curiosity). Activity diversity is the user looking at different sources or platforms, with more sources or platforms increasing the likelihood of encountering.

Dynamic factors that can be changeable and vary within users include sensitivity, emotions, expertise, and attitudes, with many similarities to factors found by Heinström (2006). Sensitivity as coined by the researchers is similar to Erdelez (1997) different types of encounterers and is the ability of the user to respond to the information stimuli effectively, such as more sensitive people would encounter information more often while less sensitive individuals would encounter information less often. Emotions is the mood of the user, with positive emotions including relaxation found to be favouring encountering with negative emotions having a detrimental effect. Expertise is the ability of the user to use the correct systems and queries to identify relevant results, with the research suggesting that those that lack expertise could be more reliant on encountering as an information source. However, this does not include users who have the ability to search but passively encounter information anyway while undertaking other pre-activities than searching. Attitudes is similar to the McBirnie (2008) notion of serendipity filter, that is whether the user has the tendency to pursue information even if it is not relevant or useful, or does not go looking for anything and dismisses even information that may crop up when they are socially interacting or searching for something else.

Whilst these user factors are similar to Erdelez's concept of the different types of encounterer, these factors drill down into the user characteristics much more and acknowledge that these factors can vary for the same user at different times and are more nuanced than Erdelez's types of encounterers.

The three constant factors for information are types, relevance, and quality. Types refers to the type of information, such as news, gossip, adverts, and could also be the theme of the post.

Relevance and quality are dependent on users' judgement about the information. Relevance refers to whether or not the fits a need a user had, with the effect of this partially dependent on user attributes such as attitudes as some people are open to irrelevant information. Quality is judged by its accuracy, timeliness, authenticity, and the authors note that these factors were mainly assessed superficially. Whilst the user judgement can affect these factors, they can also be influenced by the creator of the information so it seems ideal that there are not user factors – such as authors can release things when other things are going on such as the timeliness of news or times of year when things might be relevant such as seasonal events or hashtags such as today in history

The dynamic information factors are visibility and source. Visibility is the extent to which the information can attract attention, with more visible information able to attract more attention and therefore have a higher chance of encountering. Visibility of information can be increased by attaching it to more visually attracting objects such as image. Sources are the individuals who create or provide information such as share it with users, with participants in the model research often saying they get their information from posts shared by friends or those they follow on social media.

The environment factors affecting users' perception are time limit and interface usability. The authors deem time limit a constant factor as more task-oriented behaviours such as browsing or searching for certain information was found to have tight limits that left little leeway for users to encounter other information. In contrast, more leisure orientated activities including social interaction and some browsing or searching for pleasure were generally found to have looser time limits, with users more likely to encounter information and go through the process of examining and acquiring any information they notice. Interface usability is deemed a dynamic factor as the interfaces of different online locations vary between locations as well as change over time, but also how well the interface works for users can vary between users.

Mid-activities include noticing stimuli such as links, images, and keywords in sections of text, then examining that content to determine if it is worth going further. The information is then acquired, with the following behaviour depending on whether the user deems the information interesting or useful.

The post-activities of information deemed interesting are exploring the information or saving it for later consumption. Saving the information is also a post activity for information deemed useful, as well as using the information and sharing it with others.

This model provides the ideal theoretical underpinning for this research as it considers multiple aspects of user reasons for being on social media (pre-activities), considers aspects of the users (perception factors) that can affect the behaviours and responses to social media posts (post activities) as asked in research question three. The model can also help understand what stimuli controlled by the libraries (such as links and images, determined through answering research question one) can influence user responses, and then help understand what users do with the information they encounter on the national libraries Facebook and Twitter accounts.

While this research will not manage to account for all perceptions factors due to the analysis of interactions and posts rather than interviewing users, some of the factors that affect users such as emotions and attitudes can be suggested from analysing comments.

2.6 Conclusion

The chapter revealed that little is known about national libraries' behaviour on Facebook and Twitter, or social media in general, therefore the literature search was widened out to other types of libraries. This established the content and themes of posts by libraries on social media as well as the use of response numbers, such as the number of likes or shares, as a measure or user engagement. The literature also included some exploratory research to determine if the themes of posts impacted engagement levels and the motivations for user engagement. This provided an understanding of what to analyse on national libraries' social media posts as well as a baseline to see if national libraries social media usage differed from other types of libraries.

The literature review was then widened out to general social media research to ensure relevant research that may impact the analysis or comparisons of national libraries social media use was not missed. This search uncovered that social media is used by users for a multitude of reasons and that users share content with other users, thereby expanding the

reach of an organisation. The level of interactivity by brands and organisations was found to impact the level of engagement by users as well as influence offline returns and positive evaluations of the organisation, with more interactive organisations have higher engagement numbers, better offline returns, and happier users. This furthered the rational for the research by showing that social media usage can help organisations, in this case national libraries, reach new users and improve user access and opinions. The section also uncovered further reflection on engagement, with the different types of responses shown to have different levels of effort involved on the part of users leading to lower effort engagements such as likes or shares being more common than comments. Further research also gave more detail on factors that affect engagement levels, such as posts containing images or links receiving more shares. More detailed user motivations for responding and engaging with the social media posts were also found, such as learning, sharing information, and communicating with other users, with differences noted on platforms and depending on the interactivity of the organisation.

These common user motivations for engaging with social media lead to the field of information behaviour to find a conceptual framework that would underpin this exploratory research, with the Jiang et al. (2015) model of online information encountering used to provide a framework of factors and stimuli that can be altered by national libraries to affect user engagement with their social media posts.

Furthermore, the chapter literature showed a variety of research methods suitable for this research. Content and thematic analysis were commonly performed on social media posts to determine what public and academic libraries were posting therefore proving ideal methods for determining what national libraries are posting. As well as the theme of a post, an image or link was shown to affect the traditional engagement levels posts received, suggesting the components of a post that should be analysed in this research to answer research question one, in what ways do national libraries use Facebook and Twitter. Motivations for responding to posts were shown to be analysed with either content or discourse analysis, giving an ideal starting point to answer research questions two, three and four, how can user engagement be analysed beyond response numbers and in what

ways do social media users respond to national libraries posts, and how do the national libraries respond to user engagements.

The next chapter will detail how the methods chosen will be performed, with detailed protocols for the data collection and analysis. The development of a toolkit to answer research question two will also be detailed.

Chapter 3: Methodology

3.1 Introduction

The previous chapter showed little research existed on how national libraries use social media, especially how the libraries use Twitter and Facebook, nor how users interact with these posts. The previous chapter then expanded to other library fields as well as social media research to investigate the knowledge gap identified and identity methods that could be used to answer the research questions. The chapter also detailed the information encountering model used to ground this exploratory research in theory.

This chapter will show the methods used to answer the research questions:

1. In what ways do national libraries use Twitter and Facebook?
2. How can user engagement be analysed beyond response numbers?
3. In what ways how do social media users respond to posts by national libraries?
4. How do national libraries respond to user engagements?

As well as detailing the steps involved in data collection and the protocols used to analyse the data.

The methods used in this research are: content analysis of the links and images to determine where national libraries are linking to and what type of image-text relationships they have and thematic analysis to determine overall themes of posts and answer RQ1; trialling different methods to determine best fit method to analyse user comments and answer RQ2; thematic discourse analysis to categorise user engagement, motivation, context as well as library responses to answer RQ3 and RQ4.

3.1.1 Research statement

National libraries serve as repositories for the literary and cultural heritage of a nation, and many have responsibilities enshrined in law to provide reference services to users, to preserve and promote cultural heritage as well as champion literacy. The social media pages of national libraries provide a more widely accessible platform than visiting the library

physically, however to date, there is no research on how users engage with and behave on the social media pages of national libraries. Information from this study can help inform national libraries as to what current practices are effective so as to increase their social media engagement and allow further opportunities to interact with those who would not normally use national libraries.

3.1.2 Research approach

The research took an objectivist ontology and a postpositivist epistemology because it aligned with how the researcher saw the world.

Objectivism is based on the belief that there is an objective reality that exists separately from people and their thoughts, and research is designed to uncover this reality. Bryman (2016) states that this can be seen in the way that organisation and cultures have rules and customs that constrain people and affect their behaviour, therefore the organisation or culture are external factors to people and can be considered tangible objects that can be analysed. In the case of this research, this means that the rules and customs of both the social media platforms and the national libraries, especially their social media policies, affect users' behaviour and these differences can be studied as an object alongside user reactions.

The postpositivist theoretical position holds the belief that there is an independent reality that can be studied, but that since observations are fallible and researchers are interpreters of the research data, the absolute truth can only be approximated, and often understanding is the goal of the research rather than fully explaining the topic of research (Creswell and Poth, 2018, Fox, 2008). Postpositivism also allows for multiple perspectives from the people involved in the research (Creswell and Poth, 2018). This means that if one person reacts to an image or post differently from another, then both reactions can still be truthful reflections of reality even though they differ. This flexibility while still being rigorous is ideal as this scenario occurs frequently in this research, with people reacting differently to images and posts, or to different aspects of the images or posts.

3.1.3 Limitations

The research focused on only three English as a first language libraries which limited the scope though the differing population dynamics of each country could allow for some generalisation. The research focused on those users who already use some form of social media and did not consider how to get non-users to engage. The research did not consider whether users responding already followed the national library's social media page, only that they are responding to a specific post.

The research did not collect any personal or demographic information meaning no trends in user responses could be analysed.

The research was conducted with manual coding of posts and comments which therefore limited the sample size and therefore the general applicability of the results to all national libraries.

3.1.4 Participants and Recruitment

The national libraries involved in the research will be English speaking and active on Facebook and Twitter to ensure there is data to analyse. Three national libraries will be studied: Library of Congress (LoC), National Library of Australia (NLA), and National Library of Scotland (NLS). National libraries will not need to be recruited for this stage as the data is publicly available.

The three libraries in the study were chosen because they were part of the MSc research this project is based on and thus allowed a continuity between projects. The National Library of Scotland was chosen for both the initial study and this study as it is the researchers home institution. The locality allowed meetings to be held in person with library staff to understand some of the background processes involved in running a national library social media account, factors which could influence these processes, as well as understanding the breadth and depth of the collections held and work involved. The Library of Congress and National Library of Australia were chosen for inclusion for both studies because they were active on Facebook and Twitter and shared similarities with the NLS such

as being long established institutions, in industrialised countries with English as an official language, publicly funded, legally defined responsibilities and with well-established national strategies and initiatives in place. These factors, and similar cultural attitudes between Scotland, USA and Australia allows for some comparisons between the libraries, while the differences in populations, population dynamics, funding and staff levels in the libraries can provide insight into how these factors impact the social media usage, as the LoC has to serve a much larger population than either the NLA or NLS, with budgets and staffing reflecting this.

3.1.5 Ethical considerations

There are several frameworks and reports discussing the ethical needs of social media data (Markham and Buchanan, 2012, Townsend and Wallace, 2016) with a consensus that as long as the data is public, and no identifying information or identifiable quotes are given then ethical approval is not needed. After careful consideration, it was determined that the research data fell under these parameters therefore ethics approval was not sought but care was still taken with the data during collection, analysing and storage, ensuring that no names or personal information was recorded, and the resulting dataset was securely stored.

3.2 Social Media Data Collection

Analysing the evidence of user actions and interactions from written documents is an accepted research practice and gives indications of how users actually behave rather than how they report they behave (Pickard, 2013). This is especially applicable to social media where the data is comparatively easy to acquire from public accounts and allows more user interactions to be studied than a more resource intensive data collection methods such as user interviews.

3.2.1 Data Collection

Data was collected directly from the Facebook and Twitter accounts of the chosen national libraries using the Application Programming Interface (API) access from R applications. API's are highly dynamic interfaces that enable different computer systems to interact (Janetzko,

2017) and gather data in a different format than appears on the website. In this case, the data from Facebook and Twitter was accessed in a more accessible format using code in the R programming language in using the Rstudio interface on a desktop computer. This change is most highlighted by contrasting a post on Facebook:

Image 2 NLS Facebook post screenshot (National Library of Scotland, 2019m)
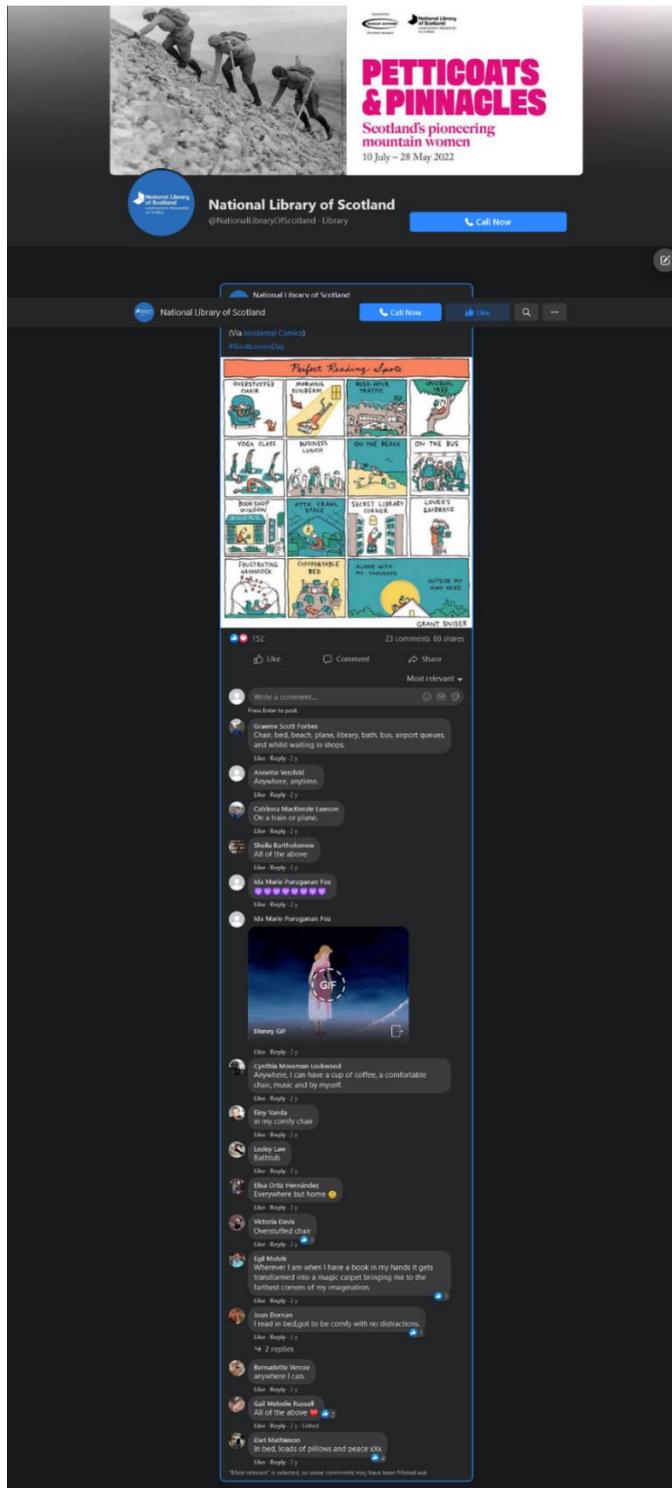
Against the spreadsheet generated by accessing the API which contains the data from multiple posts:

Image 3 LoC Facebook API spreadsheet

Where the data is much more compact, and it is easier to see the data as a whole rather than individual posts.

Initially, data was gathered from the LoC main Facebook page, Facebook's API was accessed using the Rfacebook package in RStudio (Barbera et al., 2017) and the NVivo plugin, NCapture (QSR International, 2020). RStudio is a desktop computer interface for the computing language R which is commonly used to access data from websites using API access. Using standard settings to install the Rfacebook package in RStudio, this provided readymade functionality to access the Facebook data. After logging in to Facebook, API access was then created as in the documentation for Rfacebook then the code for collecting page information (see Appendix 1: R code) was run using the name of the account being collected. This resulted in a dataset containing information about the posts: the text itself, the number of comments, likes, and shares, the time posted and any links in the posts and assigned numbers to the posts. This created a workable dataset that was easy to differentiate between the posts and allow for sampling. The NCapture method involved installing the plugin to the Chrome browser, navigating to the page to be captured and

asking the plugin interface to capture the page as a dataset which first required being logged in to the platform. This method captured the same data (aside from assigning post numbers) plus all the individual comments to all the posts and comment information such as comment text, time posted and number of likes for that comment. This resulted in a large dataset that was unwieldy and unsortable as comments were not linked to the posts by any other method than appearing in a row immediately after the post information such as:

Image 4 LoC NCapture dataset

The two datasets were manually merged after sampling to create a leaner more workable dataset, with comments carefully copied over to match the correct post. This was done by using the post numbers in the initial API spreadsheet (see Image 3 LoC Facebook API spreadsheet) to select the posts being sampled (described in 3.2.3 Sampling data) then creating a new spreadsheet where the comments to those posts were manually copied over, resulting in a dataset that contained only the posts and comments being analysed that was much smaller and easier to navigate such as:

Image 5 Final LoC Facebook Dataset

Neither method captured usernames or details of commenters, nor the comments by users whose accounts were set to private therefore avoiding privacy concerns. Both methods also required a Facebook account to gather the data, with the API access requiring an access token to be generated on the Facebook developer platform.

Changes to the Facebook API access during the timeframe of the research meant that subsequent data collection from Facebook could not be gathered using the above methods as the researcher could not create a business verified account which was needed to gain permission to the relevant part of the API. However, a tool developed by the Social Media Lab in Toronto was approved for access by Facebook and this app was used to gain access to the API without the need for coding. The research tool Netlytic (Gruzd and Mai, 2019) gathered the same information however the timeframe did not extend as far back historically meaning a different time period had to be considered for analysis for the collection of data from the NLA and NLS Facebook pages. Upon rechecking, further changes to the API meant that the Facebook retrieval aspect of Netlytic no longer works making this part of the research only replicable using a more time-consuming manual method of collection.

Data from Twitter was collected using the twitteR package for R with API access (Gentry, 2015). At the time of collection, Twitter had two types of API that could be used depending on the needs of the research. The streaming API was designed to access Twitter constantly and enabled access to more historical tweets, but Twitter imposes sampling limitations with only one percent of tweets randomly returned using API. The rest API (also called the search API) had no sampling limitations but only retrieved tweets from the last seven days unless the call was for tweets from a specific user. For this research, the rest API was used due to the lack of restrictions in collecting tweets from the specified accounts. To access this, the twitteR package was installed in RStudio using the standard set up as in the documentation. A token to access the API first had to be created using a developer account on Twitter token to access the API, then the code as seen in Appendix 1: R code was run to retrieve the tweets by the accounts. This brought back the text of the tweet, time and date metadata, the number of likes and retweets as well as hashtags and mentions included and any links in the text but no responses to the tweets. This time the NCapture plugin (used in the same way as for Facebook collection) captured exactly the same information meaning no replies were collected at all. Both methods required a Twitter account to enable access, with a further application for a developer account needed to access the API. This resulted in this dataset as seen in Image 6 LoC Twitter collection.

Image 6 LoC Twitter collection

An attempt to capture replies was made using a piece of Python code and API access but this was only partially successful as only a small number of replies on very recent entries were returned and with a cut off limit on the number of characters returned. Further investigation showed that any method to collect replies via the API had limitations or was outdated, and that there was no real way to automate the process. Therefore, replies were collected manually with only the text of the response and any reactions to it recorded. Response numbers sometimes varied from the official number of responses as only tweets by users with accounts set to public were visible to the researcher.

3.2.2 Time frame

Data for the initial analysis of the LoC pages was collected on the 24th April 2018 dating back to the date of creation of the library accounts. Due to the sheer number of posts, only posts created on or after the 30th January 2018 (a period of 12 weeks) were chosen to be analysed with numbers of posts in this timeframe in the table below. The 12-week period ensured there was enough data to be analysed and allowed for changes in behaviour around certain events to not to unduly skew the results. For both the NLA and the NLS, the data collection timeframe changed due to the changes mentioned in 3.2.1 Data Collection with the 12-week collection period running from 10th June to 1st September 2019.

Table 3 total posts in timeframe

Library	Facebook		Twitter	
	Number of Posts	Account Name	Number of Posts	Account Name
Library of Congress (LoC)	211	libraryofcongress	415	librarycongress
National Library of Australia	134	National.Library.of.Australia	197	nlagovau
National Library of Scotland	65	NationalLibraryofScotland	465	natlibscot

3.2.3 Sampling data

The resulting datasets were too large to adequately perform manual content and thematic analysis on the posts and comments therefore sampling was used to reduce the datasets to a more manageable size. To ensure that the sample could statistically represent the whole dataset, sample sizes that would ensure statistical validity were calculated. These sample sizes were calculated using online sample size calculators and used the confidence level of 95% (aiming for a p number of 0.05), and for the LoC Facebook calculation, population in study (211) and population size (the total number of posts - 3513). For this sample that gave a total of 109 posts that would ensure that results would statistically represent the whole sample. The same calculation was performed for each library on each platform and allowed for the samples to be compared against each other.

Multiple methods were considered to determine which posts to analyse. Initially, purposive sampling with cut off points for comments, or number of responses were all considered before deciding that this would not give a full picture of the data (especially as posts with no comments or few responses would provide valuable knowledge as to what users were not finding interesting enough to interact with) and that cut offs would be too restrictive and cause things to be missed as no knowledge of the dataset was currently known. Therefore, a random sampling approach was determined to be the most appropriate. A random number generator was used to determine which posts were going to be analysed.

This resulting in the following datasets:

Table 4 Final sampled dataset sizes

Library	Facebook	Twitter
Library of Congress	109 posts with 808 comments	258 with 689 comments
National Library of Australia	72 posts with 389 comments	100 posts with 119 comments
National Library of Scotland	37 posts with 254 comments	235 posts with 785 comments

3.2.4 Cleaning data

A new spreadsheet for the analysis was created. This was populated with a separate page for each post to make analysis easier as some of the posts had large numbers of comments and made analysing on the same page awkward. Information from the created dataset was added to each post's page, with the post text, time and any links copied over. Additional columns for link or image descriptions, as well as columns for content and thematic analysis and the analysis of comments and reaction counts were added after this data, with Image 7 Blank analysis spreadsheet showing a blank template of the spreadsheet.

Image 7 Blank analysis spreadsheet
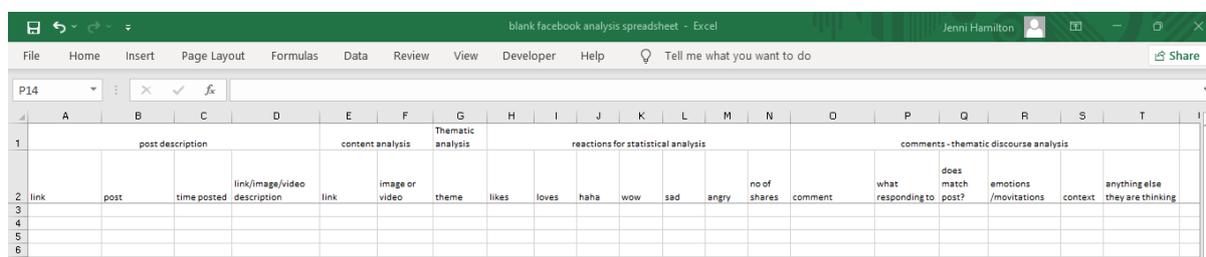
For Facebook posts, comments from the NCapture database were copied over. Comments were found by searching for the time the post was posted and manually ensuring post content matched.

Since links to the posts themselves were not included in either dataset, these were manually gathered from Facebook. The post was searched for, and links collected from the timestamps of posts. Further reactions such as wows and loves were also collected at this point, and a screenshot of the post (but not the comments due to the presence of usernames which would remove anonymity in the dataset) was taken in the case of future data loss. Comments were checked against the comments on the Facebook post as emojis or gifs were not always properly captured, and any nesting of comments or reactions numbers to comments was noted.

For Twitter, the procedure varied slightly. The API access brought back the text of the tweet, a link If the tweet had an image and the number of retweets and likes. Any other links had to be collected manually, and comments were manually copied over from the webpage

which negated the need to double check the matching and the appearance of emojis or gifs but was a time-consuming process. Screenshots of the post but not the comments were again taken in case of data loss. One difference from Facebook is that Twitter counts retweets (the equivalent of shares) that the user has added commentary to (quoted tweets) separate from retweets without commentary (retweets). To address this, the figures for quoted tweets (if any existed and numbers were usually low) were added to the retweet count to ensure consistency with the Facebook share counts.

Columns for analysis of comments were added after the comments to ensure that every comment was analysed consistently within the framework that was subsequently developed.

One issue noticed during the cleaning of the data was that Facebook and Twitter handled shared/retweeted posts differently when in the account's timeline. On Facebook, when the account being studied shared a post from another account, this generated a separate post on the timeline meaning comments and interactions unique to the copy of the shared post could be analysed. However, on Twitter when the account studied retweeted a post, the timeline linked to the original post meaning that any responses or interactions that came from the posting to the timeline being studied could not be isolated. This could occasionally lead to larger comment and interaction counts in the Twitter dataset if someone with a large Twitter following had been retweeted, but these instances were few and it was decided that despite this limitation, retweets would still be included in the datasets as they were still part of what the libraries were tweeting. However, it did mean that direct comparisons between the platforms for comment and interaction counts was not possible.

3.3 Data Analysis and Framework development

Several types of analysis were performed on the posts and their responses. The unit of analysis for the analyses was determined to be each post as this allowed for the analysis of the responses to the post in relation to the post, as well as allowing the comparison of posts against others in the same dataset.

To answer research question one, content and thematic analysis of the posts (established in chapter two as well used methods in the LIS and social media fields for determining what libraries and other organisations were posting to social media) were used to analyse where national libraries were linking to, what relationships the images in posts had to the post, and the themes national libraries were posting thereby understanding how national libraries were using Facebook and Twitter. The collection of response numbers to posts allowed statistical analysis such as chi-square to be performed against themes and content codes generated to gain a basic understanding of any trends in user responses. The exact procedures used in this research are described in sections 3.3.1 Content analysis, 3.3.2 Thematic analysis and 3.3.3 Statistical analysis.

Using the data to answer research questions three and four first required answering research question two. To better understand user engagement using the comments themselves rather than just the number of responses as normally used, multiple methods for analysing the comments were considered including discussion analysis, multimodal analysis and content and thematic analysis again. Conversation analysis (Bryman, 2016) was rejected as very few replies formed part of a discussion or conversation and there were cases where the structure of the replies meant it was difficult to easily understand what responses were linked to other responses. Multimodal analysis (Jewitt, 2014) was trialled though it became apparent that the shortness and primarily text based nature of the responses did not fit well with the methods or capture the interactions between users and the content. Content and thematic analysis (as described in the following sections) were also trialled but these clashed with the unit of analysis being the post itself and ultimately proved to be too simplistic to capture the full interaction. Thematic discourse analysis (Potter and Wetherell, 1987) was trialled and found to be suitable as three main aspects of the theory (see 3.3.4 Thematic discourse analysis for full details) allowed for analyse of whether users were relating to the content, their motivations for posting as well as allowing flexibility for context. This enabled a framework to be developed which answered RQ2 and then allowed RQ3 and RQ4 to be answered by using it on the datasets. The method of discourse analysis developed by Potter and Wetherell (1987) is an established practise in the field of library and information science, with examples of use including McKenzie (2003) where the method was used to analyse interviews to model everyday life information

seeking behaviours, and Hicks (2016) where the method was used to analyse journal articles, online forum posts and replies, and interviews to understand how librarians advocate for their services. Further examples include Savolainen (2004), Golden and Pomerantz (2015), Mikkonen (2018) and Nortio et al. (2020).

The exact protocol for this analysis is detailed in 3.3.4 Thematic discourse analysis.

These methods have the advantage of using data directly from the posts and comments of national libraries and users and therefore allowing the analyse of the actual behaviour rather than possibly slightly biased data from studying self-reported behaviour. However, the data analysis is performed manually which restricts the size of samples that can be analysed, therefore the research cannot be easily generalised to cover other national libraries' behaviour.

3.3.1 Content analysis

Images or videos also formed a large part of the posts and gave a quick visual representation of what the post was discussing and its content and were deemed an important component to analyse. One other element that stood out when looking at the posts was the number of links. It was decided that where the libraries were directing users from their posts was an important behaviour to analyse and see if it affected responses on the social media platforms.

Quantitative content analysis was performed on the links contained in the posts using the open coding approach as described by Neuendorf (2017), with codes generated using the text from the link address. This provided an exploratory look at what links the library were including in their posts, and as more posts were analysed, recurrent content types started to emerge, and a list of codes were generated. Previous reading of research gave some ideas of types of links that could be coded, such as news, internal or external links (Chew and Eysenbach, 2010) but these were used as starting points for codes not as codes themselves. External links were straightforward to classify as links to non-national library-based websites, however thought was required for those links to social media accounts on other platforms run by the same national library. It was decided that although they linked to other

platforms, the exact pages being linked to were controlled and monitored by the national library so these were deemed to be a subsection of internal links, especially as those links often contained the username the Library of Congress was using on that platform. Links in posts were sometimes clicked through to provide context (as done in Humphreys et al. (2014)) especially as link shortening services were sometimes used or the full link not shown when it was embedded. The full list of codes generated can be seen in Appendix 2: Content analysis codes and these codes were then used on the following datasets.

Whilst content analysis was fairly straightforward for the links contained within posts as the text-based nature meant quantitative content analyse was easy to perform, the images and videos were slightly more complicated as they were non-text data. It is possible to analyse non-text data such as images and videos using methods normally associated with text data (Pennington, 2017), albeit with considerations such as will any accompanying text be incorporated into the analysis and what will be considered the unit of analysis (van Leeuwen and Jewitt, 2001) with the methods considered as being most appropriate for this research being either quantitative or qualitative content analysis, Rose (2016) outlined a procedure of using quantitative content analysis that applied firstly to videos and then images. Whilst the types of codes differ from text content analysis, codes are generated and applied in the same way, such as the method described by Neuendorf (2017). A few posts not in the main sample were trialled to determine the most suitable method for answering the research questions. Quantitative content analysis quickly generated a large number of possible codes due to the wide variety of images in the posts with little information gained by studying the frequency of these codes. Qualitive content analysis, while similar in approach to quantitative content analysis, can answer not just what is present but why it is present alongside analysing any subtler implications communicated by the image (Julien, 2008) and can also be performed in a systematic way to ensure rigor (Mayring, 2000, Neuendorf, 2017). However, the broad nature of images posted again generated a large number of codes that did little to answer the research question which matches Mayring (2000) assertion that qualitative content analysis is not the most suitable method for exploratory research.

Since the trial analysis of the images generated large numbers of codes, the decision was taken to analyse the relationship between the text and the image instead. This analysis would reveal how images were used to enhance the post, with possible findings being able to be investigated further later if necessary. Analysing this relationship fit in with the unit of analysis being posts with the image as a component part rather than treating each image as a separate unit of analysis as other methods such as thematic analysis would imply.

The relationship between images and text were analysed using qualitative content analysis with a pre-existing coding scheme. The relationships were studied by the researcher and manually assigned to one of the codes in the Martinec and Salway (2005) system. The Martinec and Salway (2005) system categorised the relationships between text and images using two stages. The first stage determined whether the image had equal or unequal status with the text i.e. whether the text or the image was more important to the post. If the image had equal status with the text then the relationship was categorised as either the 'text and image complementary', or the 'image and text independent' if they were capable of being understood independently of each other. If the relationship was unequal, then the relationship was categorised as either image or text subordinate to the other depending on which element was more predominant. The second stage then categorised the relationship using two types of logico-sematic relations, expansion and projection. This classification focused on how the image and text related to each other such as did one element expand (expansion) on the other or was one presenting the same information in a different way (projection). The expansion and projection were then each subdivided into more exact terms to refine the relationship further. Expansion was subdivided into three categories, elaboration (itself further subdivided into 'exposition', 'text more general' and 'image more general'), 'extension', and 'enhancement', based on the level of expansion and which element added more information. Projection was subdivided into 'locution' and 'idea' dependent on whether exact wording is replicated across both image and text (locution) or if the idea is conveyed in different terms (idea). These categorisations were then combined to create a two-fold code, e.g. 'image and text independent, text more general' used for when the image gave examples of the text but could be understood separate from the text. This code could be seen where the text asked a question and the image gave examples of answers, such as in Image 8 Example of 'image and text independent, text more general'

from post 18 of the NLS Facebook where the post asked what were users' favourite reading spots and the image was an illustration stating 'perfect reading spots' with drawings such as overstuffed chair and bookshop window.

Image 8 Example of 'image and text independent, text more general' (National Library of Scotland, 2019m)

Another example is that of 'image and text complementary, enhancement' often used in posts where the text and image complemented each other as the text qualified or explained the image, such as in Image 9 Example of 'image and text complementary, enhancement' from the NLA Facebook dataset where the text gave more details about the livestream video.

This coding scheme allowed the full relationship between the images and text to be specified and help understand the purpose of the images in the posts, with the coding scheme listed in Appendix 2: Content analysis codes.

3.3.2 Thematic analysis

To further answer RQ1 and show what national libraries were actually posting about, qualitative thematic analysis using an inductive open approach as described by Braun and Clarke (2008) was performed on the posts. The six phases of thematic analysis were initially performed on the LoC Facebook dataset; familiarising self with the data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the report. Familiarising myself with the data occurred naturally while cleaning and

formatting the data as well as when looking over the completed dataset as a whole. This familiarisation gave indication that many themes were similar to those seen in the research mentioned in the literature review such as 'collection', 'events', and 'news' which were considered as initial codes. Further initial codes generated included specific events the library was posting for such as 'national library week', 'copyright', 'supply issues', 'article related to project', 'subdivision of library business'. In the searching for and reviewing themes stages, some of these initial codes were amalgamated with others and some codes were split into more specific codes to better reflect the dataset. This included individual events such as 'national library week' being amalgamated into 'library event' as though the individual codes were varied, they fell under the same theme. Similarly, initial codes such as 'copyright' or 'supply issues' were reviewed and amalgamated into 'issues relevant to library', while 'library publishing' and 'literacy awards' were amalgamated to 'library project', and 'subdivision of library business' was absorbed into the more general 'library business'. The 'news' code was split into more specific codes: 'collection news', 'event news', 'exhibition news', and 'library news' to better reflect the wide range of news posts in the dataset. The 'event' code was split into 'library event' and 'library exhibition' to reflect the substantial differences in the events, with library events one off events such as specific talks or sessions and library exhibitions being longer term projects that often included displayed part of the libraries collections as a curated sub-collection. 'Article related to project' was split into 'article by library' and 'media coverage of library' to reflect the fact that there were two different sources of articles that often focused on different aspects, with 'article by library' usually providing more information about the subject or items in an event, while 'media coverage of library' often focused on a new event or collection to inform non-library users.

This process allowed for themes of what was posted by the library to be determined, with themes such as 'library news', 'library events', 'collection news' and 'responding to other social media' emerging. The full list of themes generated by following the steps specified by Braun and Clarke can be seen in Appendix 3: Thematic analysis codes. This completed coding scheme was then used on the other datasets.

3.3.3 Statistical analysis

Statistical analysis of the codes generated by the content and thematic analyses versus the number of interactions were performed using SPSS to see if any statistical trends emerged. The datapoints in both the codes in the content and thematic analyses and the reaction counts were not normally distributed so this affected the types of statistical tests that could be performed.

Chi-square testing was performed to see if relationships existed between the codes and the number of responses received (Vaughan, 2001). Nothing of significance was found so no correlation testing was performed.

Difference testing was performed on each set of coding results to see if there were differences between each library's behaviour on Twitter and Facebook, or any differences between the three libraries usages on Twitter and on Facebook. Mann-Whitney testing of each library's code usage on Facebook and Twitter revealed whether each library behaved differently on the different platforms. Kruskal-Wallis testing of both the Twitter code usage and the Facebook code usage revealed whether the three libraries' code usage differed from each other on the same platform.

3.3.4 Thematic discourse analysis

The previous methods allowed for understanding the body of the posts, the content curated by the national libraries. To answer RQ3 and RQ4 and show in what way and potentially why users respond to posts and the libraries respond to engagements, the comments in response to the posts also needed to be analysed as a part of the posts. As mentioned in 3.3 Data Analysis and Framework development, initially thematic analysis was going to be performed on the comments as well. However, this did not capture the contextual information provided by the comments, such as if the responses were responding to the content of the post, and did not show the full picture of responses. Discourse analysis was then determined to be the best method to provide this, with a thematic discourse analysis as described by Potter and Wetherell (1987) settled upon as the most appropriate method due to the flexibility to capture the interactions themselves, and the interplay between the

interactions as well as non-text contextual information, such as emojis and conversational replies and reactions (see section 3.3 Data Analysis and Framework development for more detail on this decision).

The method described by Potter and Wetherell (1987) states the research questions drive what is being analysed, with the three linguistic tools (these are described in more detail in the following paragraphs) used to analyse text. To fully develop a method of analysing user responses, thereby answering RQ2, the dataset was first examined while considering RQ3 and trying to determine what users were responding to and any indications of why they were responding. Examination of a sample post revealed an initial framework of questions to be considered when analysing comments: who or what the comments were responding to, was the response relevant to the post, were there any clear emotions influencing the commenter, were there discernible motivations for responding, was there any context that could colour these responses and was there anything else that they were thinking. Trialling the initial framework of questions on several posts revealed that the emotions and motivations for responding were often hard to separate, leading to the merging of those questions. These refined questions formed a replicable framework that could be used to analyse user engagement, thereby answering RQ2, and allowing the datasets to be analysed and answer RQ3 and RQ4.

The final framework for analysing user engagement resembled a list of five questions to be asked when looking at user comments to the post:

1. What is the comment responding to?
2. Does the comment match the content of the post?
3. What emotions or motivations for responding are present?
4. Is there any context to the comment?
5. Is there anything else that affects how the comment could be interpreted?

A toolkit to allow others to use this framework to analyse their own comments can be seen in Appendix 4: Comment analysis toolkit.

Each question was applied to each comment, with the analysis resembling:

Image 10 Comments on NLS Facebook post 33, a weather update post

comment	what responding to	does match post?	emotions /movitations	context	anything else they are thinking
			comments - thematic discourse analysis		
If it werent for the cars, the street in this picture looks straight out og Outlander or Poldark!	content	yes	thinging about image	1 like by library	
Welcome to Canada, same weather here.	content	yes	responding to content,	1 like by library	
We Texans know that you're joking. LOL	content	yes	like content, making a joke	1 like by library	
It's not the heat, Roberta, it's the humidity :-0	comment above	yes	responding to comment, making a joke	NLS	
National Library of Scotland I can't stand the humidity either and I have lived in Canada 42 yrs. Originally from Grangemouth.	comment above	partially	responding to comment, sharing relevant memory	1 like by library	
Inelegance....perfect word!	content	yes	like content		
crying with laughter face, Quaite!	content	yes	like content		

Answers to these questions showed themes that emerged in terms of if users were responding to content, whether users liked the content and that was why they were engaging, and other responses that showed an array of how users were actually responding to the posts in a deeper way than the traditional measurement of engagement. The codes generated can be seen in

Appendix 4: Comment analysis toolkit

Beyond Response Numbers
A toolkit for analysing user responses
Jennifer Hamilton

BACKGROUND

User engagement with social media posts are often numbers based but this does not always give a full picture of how users are interacting with posts. This toolkit will enable you to analyse user comments to understand what they are really interacting with, such as the content of your posts or other users, and what is motivating users to respond.

WHAT YOU NEED

You'll need the comments in response to the posts, and a spreadsheet for easy analysis.

HOW TO GET COMMENTS

Comments can be retrieved from your social media accounts in two ways. (Ensure that comments are from a public forum and stored securely with no identifying information.)

- API access (search online for further guidance) can be quicker but more difficult to set up especially since platforms change access requirements constantly.
- Copying the comments manually can be more time consuming but allows you to become familiar with the comments and notice conversations and formatting.

HOW TO FORMAT COMMENTS

Give each comment its own row in the spreadsheet or table alongside the columns in the image below. This enables easy analysis. For further ease of use, use a new table or sheet for each set of comments.

comment	what is comment responding to?	does the comment match the post?	what emotions /movitations are visible?	comment context	anything else relevant?

Examples of codes generated by comment analysis:
- responding to organisation
- responding to content
- matches post
- amused by content
- aware of history around content
- like content
- sharing memory of content
- responding to comment
- comment liked by other users

HOW TO ANALYSE COMMENTS

The framework asks five questions of each of the comments:

1. What is the comment responding to? (such as the content or your organisation)
2. Does the comment match the content of the post? (yes, no or partially eg if a conversation started on topic and then wandered)
3. What emotions or motivations for responding are present? (such as liking content, amusement, gratitude, asking a question, making a joke)
4. Is there any context to the comment? (such as replies or likes to the comment, same user as other comments?)
5. Is there anything else that affects how the comment could be interpreted?

HOW TO REPORT RESULTS

Note trends such as whether users are responding to your content or communicating with you. Do they have emotional connections to the content? Are they showing multiple motivations for responding and showing more involved comments? Are they sharing their opinions? Participating in discussions? Are you responding to your users?

Appendix 5: Thematic discourse analysis codes.

The comments themselves were analysed used the three underpinning tools of the Potter and Wetherell (1987) method: interpretative repertoires, ideological dilemmas and subject position. Interpretative repertoires are the language choices that people use to get their thoughts across and can reveal positive or negative associations; ideological dilemmas are the language usage that shows how users can hold seemingly contradictory arguments as equally valid and indicate how people see the world, and subject positions are language that shows how people see themselves including their bias and opinions and can inform the tone of comments or show some motivations.

These tools were especially valuable in determining users' emotions and motivations in comments as the comments were often very short and clearly word choice and any use of emoji or images mattered. Interpretative repertoires were particularly useful for determining emotions as well as who or what they were actually responding to. Ideological dilemmas and subject positions were useful in understanding motivations behind user responses as well as context that influenced their responses.

Again, an open coding technique was used on the first dataset, this time to responses to the above questions. Initially, users were assumed to just be responding to either the content within the post or the library posting, but it soon became clear that there were other possible responses such as users only using comments to tag other users, library accounts responding to general and specific users. Answers to 'Does the comment match the post?' were initially coded with 'Yes', 'No' and 'Not sure' answers however 'Partial' became a response as the analysis proceeded due to some responses being very tangentially related. Emotions and motivations were analysed without an existing coding scheme, and as the analysis proceeded it was noticed through the first dataset that themes were recurring so a code book was generated and used to avoid the proliferation of multiple terms being used to mean the same thing. As the analysis proceeded through the first dataset, new code creation slowed and eventually stopped showing a saturation point was reached, and this coding scheme was used when analysing the remaining datasets with no new codes required. Context looked at if there were responses to the comment such as likes, if the comment was of a user who had been tagged in an earlier comment, did the comment spark conversations. The last column of other things was the least used column but occasionally

provided some extra context or thoughts worth noting such as if a stream of comments was by the same person (no details were kept, it was only noted that it was the same commenter and which other comments were theirs).

Analysing the comments was slightly more challenging compared to the posts due to the wide variety of responses and users, for example some responses were limited to one-word answers and some responses were in a language other than English or less fluent English, reflecting the international readership. However, this challenge was resolved by taking more time over the decisions and making notes over decisions made so that similar comments could be consistently analysed. The use of emojis and gifs in comments further complicated analysis as these often required some further interpretation. For example, according to Emoji Dictionary (Emoji Foundation, 2022), a dictionary of emojis with definitions crowdsourced from users, the shamrock emoji (☘) can be used to indicate wishing luck or that something is considered Irish, while the folded hands emoji (🙏) is primarily considered to indicate praying or giving thanks, it can also be used to represent the high-5 hand motion of agreement. Consistency across interpretation of emojis was ensured by the creation of an emoji codebook that contained the emoji, possible names and meanings used with notes for variations depending on context, for example the shamrock emoji was deemed to be referring to something Irish in posts and comments about St Patrick's Day. The meanings themselves were gathered from two websites, Emojipedia (Emojipedia, 2022), a supporting member of the body that creates emojis, and Emoji Dictionary (Emoji Foundation, 2022) which is a crowd sourced dictionary of emojis. Whilst the definitions there are possibly not complete or biased due to the nature of crowd sourcing dynamics, the multitude of responses gave well-rounded definitions that included slight variations depending on context (such as other emojis or text in the response) which enabled a consistent approach to the interpretation of emojis. The full emoji codebook can be found in Appendix 6: Emoji codebook.

Once the comments were all examined at the post level, the results were compared to see trends and themes started to emerge, thereby answering both RQ3 and RQ4 by showing how users responded to posts and how the national libraries responded to the responses. Answers to these questions will provide valuable insight for national libraries looking to

increase user engagement, better manage their social media presence, or trying to cater to different audiences.

3.4 Further research possibilities

Research that had initially been considered as part of the project but was ultimately cut due to time limitations included interviewing national library staff to understand decisions or strategies behind the results found in social media analysis. These interviews could also discover the impact of the internal links on website activity as such information is not publicly accessible. User based research, such as surveying users who responded to posts, was also considered to further understand user behaviour when interacting with the posts as well as factors that caused them to encounter the posts. Both aspects would provide valuable context and further depth to this research.

3.5 Conclusion

This chapter outlined the methods and justifications used to answer the research questions and identify the ways in which national libraries' use of Twitter and Facebook could be analysed using established techniques such as content and thematic analysis. The chapter also established the development of a method of analysing interactions beyond the traditional metrics of engagement such as number of comments or likes, as well as analysing how users respond to national libraries' posts. This emergent approach was not straightforward to develop, with several hurdles occurring during the collection and analysis stages due to the changing nature of social media platforms and the variety and number of posts and responses. However, the chapter describes how these hurdles were mitigated, and the resulting method combines quantitative and qualitative approaches to create a rich dataset and analysis that provides valuable insight into understanding user engagement on social media.

The next chapter will show the results of these analyses using the Twitter and Facebook accounts of three national libraries: Library of Congress, National Library of Australia and the National Library of Scotland.

Chapter 4: Results

4.1 Introduction

The previous chapter outlined the methods used to answer the research questions as well as the justifications for the use of those methods and how the data collection and analysis was performed.

The research questions:

1. In what ways to national libraries use Facebook and Twitter?
2. How can user engagement be analysed beyond response numbers?
3. In what ways do social media users respond to national libraries posts?
4. How do national libraries respond to user engagements?

were answered using the methods as seen in Table 4.

Table 5 Summary of research methods and outputs

Method	Data analysed	Output	To answer
Content analysis	Links and images in national library Facebook and Twitter posts	Categories of where posts linking to and the type of image-text relationship	RQ1
Thematic analysis	National library Facebook and Twitter posts	Categories of overall themes of posts	RQ1
Trialling different methods to determine best fit	Comments to national library Facebook and Twitter posts	Thematic discourse analysis toolkit to analyse user responses	RQ2
Thematic discourse analysis	Comments to national library Facebook and Twitter posts	Categories for user engagement including what responding to, motivations and context.	RQ3 and RQ4

In this chapter, the results of those analysis methods will be shared, with the first section showing results of the content and thematic analyses for all three libraries on both platforms, thereby answering RQ1. The section after that will look at the frequency of reactions and check for any statistical relationship between the reactions and the codes generated for the content and thematic analyses, partially answering RQ3. The next section will then discuss the toolkit developed in 3.3.4 Thematic discourse analysis to answer RQ2. The final sections will then share the results of comments analysed using the developed toolkit to fully answer both RQ3 and RQ4.

4.2 Content and Thematic Analysis of Posts

4.2.1 Links

Table 6 Libraries' use of links

	Facebook percent of posts			Twitter percent of posts		
code	LoC	NLA	NLS	LoC	NLA	NLS
external – other library/archive	0	0	0	0.4	0	2.6
external – other library/archive - embedded	0.9	0	0	0	0	0
external - event	0	1.4	0	0.4	1	0
external - government	0	0	0	0	1	0.4
external - news	0.9	0	0	4.3	2	2.1
external - news - embedded	4.6	0	2.7	0	2	0.4
external - social media	2.8	0	10.8	0.8	2	0.4
external - social media - embedded	0	1.4	2.7	0.4	0	0
internal - blog	8.3	1.4	2.7	8.9	5	1.3
internal - blog - embedded	4.6	6.8	0	0	0	0
internal - collection	3.7	13.5	8.1	16.7	7	8.9
internal - collection - embedded	5.5	0	0	0.8	0	0
internal - project	0.9	5.4	2.7	0.8	1	0
internal - project - embedded	0	1.4	0	0	0	0
internal - shop	0	10.8	0	0.8	8	0.4

	Facebook percent of posts			Twitter percent of posts		
code	LoC	NLA	NLS	LoC	NLA	NLS
internal - shop - embedded	1.8	1.4	0	0	0	0
internal - social media	3.7	1.4	5.4	5.8	3	1.3
internal - social media - embedded	8.3	0	0	3.1	2	0.9
internal - website	15.6	31.1	32.4	49.6	37	15.7
internal - website - embedded	33	12.2	0	3.1	3	0
none	5.5	12.2	32.4	4.3	26	65.5

Table 5 showed that overall there was no one particular type of link that was most common in posts across all the libraries on both platforms. However, when generalising the codes into broader categories such as internal and external links, the majority of links from all three libraries on both platforms were to internal links, that is to places controlled by the libraries.

Statistical testing using the Mann-Whitney test revealed that both the LoC and NLS had different code usages on Facebook than on Twitter (p values of .018 and <.001), whereas the NLA has a similar code usage on the two platforms (p value of .208). This meant that the LoC and NLS were using different links on Facebook and Twitter while the NLA was using similar links on both platforms. However, this could be the result of the LoC and NLS Twitter datasets containing much more posts and therefore links than the Facebook datasets while the NLA Twitter dataset did not contain too many more posts and links than the Facebook dataset.

The Kruskal-Wallis test revealed that the libraries have a statistically similar use of codes and therefore links with each other on Facebook (p values.614) but different usages from each other on Twitter (p value <.001). This meant the libraries were using similar links to each other on Facebook but not on Twitter, which could be attributed to the starkly different number of posts in each dataset that do not contain links.

A more descriptive approach gives a clearer idea of how each code was used by the libraries on both platforms.

The embedding of links, thereby losing control of the image in the post, varied by library and platform. The LoC embedded over half their links on Facebook but barely any on Twitter, which is consistent with the other libraries on Twitter. The NLS had a similarly low rate of embedding links on Facebook, but the NLA embedded nearly a quarter of links on Facebook.

The LoC and NLA were fairly consistent across both platforms about linking to their websites, with roughly half and 40 percent respectively. The NLS had lower rates, with 32 percent on Facebook and 15 percent on Twitter.

Linking specifically to items or pages in the collections varied between libraries and with the exception of the NLS, across platforms as well. The LoC linked nearly double the rate on Twitter than it did on Facebook, 17 percent to 9 percent, while the NLA had the opposite pattern, with a higher rate on Facebook rather than Twitter with 13 percent of links on Facebook versus 7 percent on Twitter. The NLS linked to their collection approximately eight percent on both platforms.

Linking to blogs varied by library, with Facebook showing a slightly higher percentage of links than Twitter. The NLS linked to their blogs the least with the LoC linking the most although the percentages only varied by about 10 percent.

Rates of linking to the libraries' other social media were generally quite low across both platforms, with both the NLA and NLS linking less than in six percent of posts. The LoC percentages were slightly higher, more so on Facebook. Social media included sites like YouTube, Flickr, and EventBrite.

Linking to the library shop was a rare occurrence for the LoC and NLS, with the LoC posting links to the shop in nearly two percent and one percent of posts on Facebook and Twitter respectively. The NLS did not post a link to their shop on Facebook and only 0.4 percent of their posts on Twitter linked to their shop.

Linking to library projects was also a rare occurrence for the LoC and NLS on both platforms, while the NLA linked rarely to their projects on Twitter but nearly seven percent of their Facebooks posts did. Library projects included publishing news from the libraries' publishing arm or linking to a user survey.

The LoC had the lowest percentage of posts without links, consistent across both platforms. The NLA had a slightly higher percentage, with approximately double the percentage on Twitter than on Facebook. The NLS has the highest number of posts without links, with nearly a third on Facebook and nearly two thirds without a link on Twitter.

Of the external links, other social media and news links were the most commonly used. NLS linked to other social media more on Facebook than Twitter whilst the LoC and NLA had similar percentages on both platforms. The event and government were the least used links, with events only being linked to on the NLA Facebook and government only used on the NLA and NLS Twitter. Other libraries or archives were only linked to by the LoC and NLS, with LoC linking on both platforms and NLS only linking on Twitter.

4.2.2 Images

Table 7 Libraries' use of images shows the spread of image-text relationships in the datasets.

Overall, no one particular type of image-text relationship was most common in the datasets, with the relationships varying by platform and by library. On Twitter, more than half of the images of each library were complementary with the text, whereas on Facebook the libraries had a mixture of different relationships: over half the images were independent from the text in the LoC datasets; the NLA dataset had a more even spread between independent, complementary and image subordinate relationships; and in the NLS dataset, the majority of the relationships were complementary.

Table 7 Libraries' use of images

code	Facebook percent of posts			Twitter percent of posts		
	LoC	NLA	NLS	LoC	NLA	NLS
image and text independent, exposition	52.3	24.3	5.4	8.1	16	22.6
image and text independent, text more general	7.3	1.4	2.7	0	0	0
image and text complementary, exposition	0	1.4	16.2	1.6	0	13.2
image and text complementary, extension	2.8	0	16.2	7.8	12	3.4
image and text complementary, enhancement	16.5	40.5	40.5	66	47	38.3
image subordinate to text, image more general	8.2	31.1	10.8	10.9	23	9.9
text subordinate to image, text more general	0.9	0	5.4	0	0	0.4
no image	11.9	0	2.7	7.8	2	12.3

Mann-Whitney testing showed the LoC had a statistically different distribution of codes and relationships on Facebook and Twitter (p value <.001) while NLA and NLS had a statistically similar distribution of codes and relationships on both platforms (p values .985 and .712). The different distribution of codes and relationships in the LoC datasets could be down to the larger number of embedded links in the Facebook dataset as the library did not have control of the images that were presented alongside the text whereas in the other datasets, the libraries were choosing images that more properly reflected the relationship with the text they desired.

Kruskal-Wallis testing showed that the libraries had statistically different distributions of the codes and relationships when comparing the libraries against the others on the same platform (Facebook p value <.001 and Twitter p value .006), meaning on both platforms the libraries were posting images with different image-text relationships from the other

libraries. On Facebook this difference can again be partly attributed to the LoC's use of embedded links as well as the differing number of posts in each dataset with no images. The differing number of posts with no images can also account for some of the differences in the Twitter datasets, as well as differing strategies by the library for example the NLS posting more images with the 'image and test complementary, exposition' than the other libraries.

The following descriptive section gives a clearer idea of when each code was used and how it appeared in the different datasets with examples from the datasets showing the different image-text relationships.

The code 'image and text independent, exposition' was used for images that were independent but still synonymous with the text, such as images that arose from embedded links or from shared posts. In these instances, the libraries had no control over the image chosen meaning the image was independent from the text. When the libraries were linking to their own pages, the embedding often generated an image from the link that was relevant, however when linking to external websites this was not guaranteed. The code accounted for half of the image-text relationships on the LoC's Facebook page, however accounted for less than 10 percent on their Twitter. Nearly a quarter of the image-text relationships in the NLA Facebook fell into this category and the drop in percentages on Twitter was not as pronounced. The NLS had the opposite pattern with just over five percent of posts on Facebook having this relationship but over 20 percent of posts on Twitter. Image 11 image-text relationship 'image and text independent, exposition' is an example of this image-text relationship.

Image 11 image-text relationship 'image and text independent, exposition' (Library of Congress, 2018d)

The relationship of 'image and text independent, text more general' was used when an image gave specific details or examples of the text. The code was not used on Twitter and appeared in small percentages of posts on Facebook. The LoC had the highest percentage at 7.3 while the NLA had the least at 1.4 percent. See Image 12 image-text relationship 'image and text independent, text more general' for an example of this relationship.
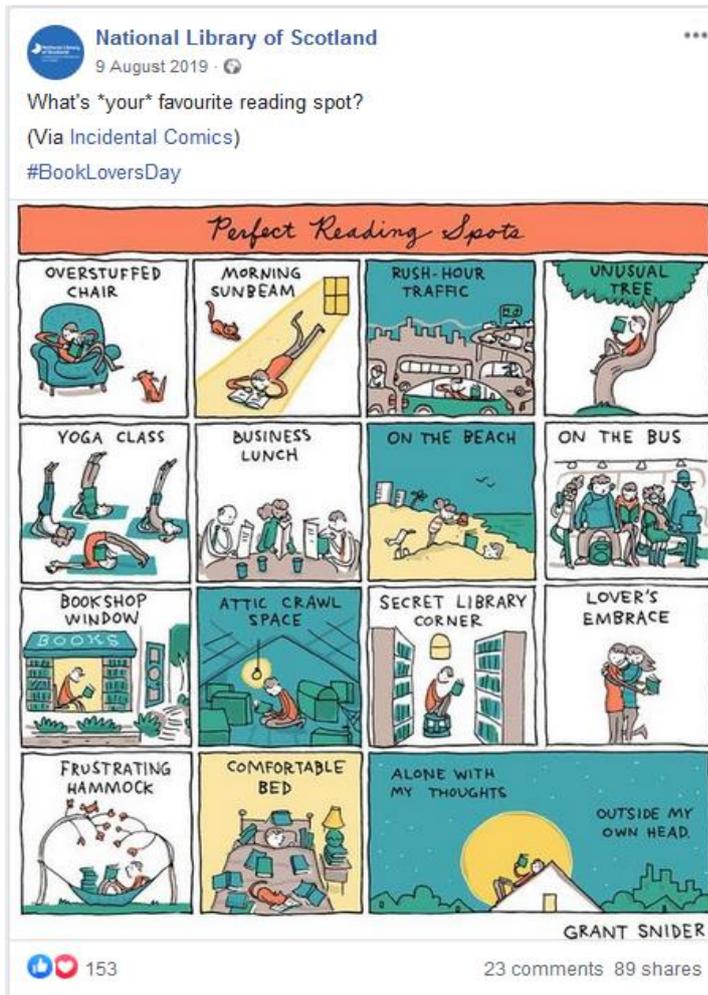
The code 'image and text complementary, exposition' was used on images where the text identified the image. This code was used mainly by the NLS, with similar numbers on both platforms, and on a small percentage of posts on the NLA's Facebook and the LoC's Twitter. An example of this image-text relationship is seen in Image 13 image-text relationship 'image and text complementary, exposition'.

Image 13 image-text relationship 'image and text complementary, exposition' (National Library of Scotland, 2019i)

The relationship 'image and text complementary, extension' was used when images and the text accompanying were complimentary and either the image or the text gave new information about the other. The code was used by all libraries but to differing extents and differently on each platform. The LoC and NLA had higher percentages on Twitter than Facebook, with the code not being used on the NLA Facebook posts. The NLS had the opposite pattern with the highest instance of use of all libraries on Facebook and a much lower use on Twitter. The code appeared in posts such as Image 14 image-text relationship 'image and text complementary, extension'.

National Library of Scotland
12 August 2019 · 🌐

This elephant appears in the first edition of the Encyclopaedia Britannica (1768-71).

View our fully-browsable historic editions of the Encyclopaedia >
https://digital.nls.uk/encyclopaedia-brit.../archive/188936619

#WorldElephantDay

👍❤️ 78   8 shares

The relationship 'image and text complementary, enhancement' was used for occasions where the text provided context and enhancement to the images such as livestreams where the text explained what the stream was about or images to accompany links and text that were specifically chosen to match and enhance the text. This code was the most commonly used code on all datasets except the LoC Facebook. There the code accounted for just over 16 percent of posts while on Twitter the usage was over 65 percent. Both the NLA and the NLS showed similar percentages on both platforms, accounting for approximately 40 percent of posts. Posts where this relationship appeared were typically like Image 15 image-text relationship 'image and text complementary, enhancement'.

Image 15 image-text relationship 'image and text complementary, enhancement' (National Library of Australia, 2019c)

'Image subordinate to text, image more general' was used in instances where the image accompanied the text was an image that was generally relevant but could be interchanged without affecting the interpretation of the text. The code was used by the NLS to a similar extent on both platforms, but the NLA and LoC varied by platform. The relationship was not used by the LoC on Facebook but accounted for over 10 percent of posts on Twitter. The NLA posts contained the relationship in nearly a third of posts on Facebook but in none on Twitter. In the NLA datasets, this relationship was generally found on posts announcing

'library business' such as in Image 16 image-text relationship 'image subordinate to text, image more general' NLA,

Image 16 image-text relationship 'image subordinate to text, image more general' NLA (National Library of Australia, 2019e)

Where they image could easily be replaced by any other of the bookshop without effecting the information in the post. In the NLS Twitter dataset, the relationship often occurred in posts where the library was responding to other social media and often included gifs such as in Image 17 image-text relationship 'image subordinate to text, image more general' NLS Twitter example.

Image 17 image-text relationship 'image subordinate to text, image more general' NLS Twitter example (National Library of Scotland, 2019n)

In the NLS Facebook and LoC Facebook and Twitter datasets, the more general images were either logos of events or general images of the person or items being discussed in the post, usually for a library event, for example as in Image 18 image-text-relationship 'image subordinate to text, image more general' NLS Facebook example.

Image 18 image-text-relationship 'image subordinate to text, image more general' NLS Facebook example (National Library of Scotland, 2019c)

'Text subordinate to image, text more general' was used on the occasions where the image was a visual representation of a quote and was the focus of the post rather than the text that accompanied it, or on the occasion there was no text to accompany an image. The code was used by NLS on both platforms and by LoC on Facebook. The LoC and NLS on Twitter only used it on less than one percent of posts but the NLS on Facebook had a higher usage at five percent, with posts similar to Image 19 image-text relationship 'text subordinate to image, text more general'.

Image 19 image-text relationship 'text subordinate to image, text more general' (National Library of Scotland, 2019b)

The percentage of posts that contained no image varied by both platform and library. The LoC had a higher percentage on Facebook than Twitter with the NLS had the opposite pattern. The NLA had images on every post on Facebook and only two percent of posts on Twitter contained no image. No image relationship most often appeared in the LoC Facebook and Twitter and NLS Twitter though for different reasons. In the LoC datasets, no image generally accompanied library news themed posts such as closure announcements such as in Image 20 no image-text relationship LoC example,

Image 20 no image-text relationship LoC example (Library of Congress, 2018b)
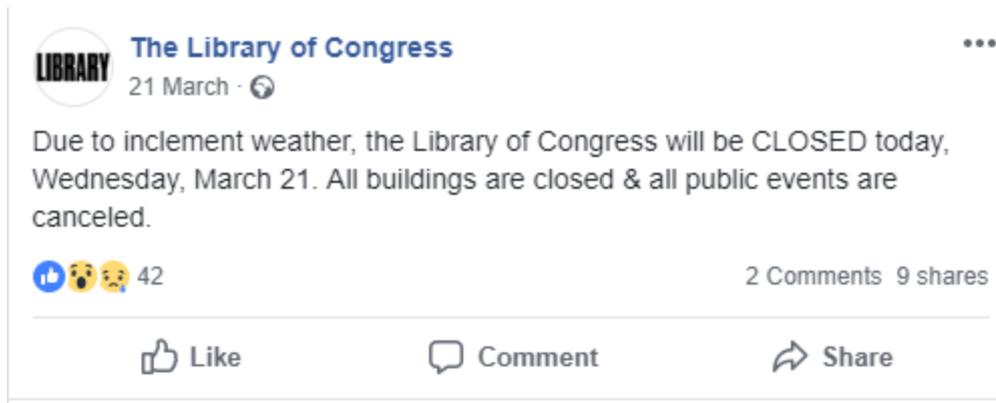
while in the NLS Twitter dataset, the posts with no image were usually thematically coded as 'responding to other social media' for example Image 21 no image-text relationship NLS example.

Image 21 no image-text relationship NLS example (National Library of Scotland, 2019k)

4.2.3 Theme

Table 8 Libraries' post themes

code	Facebook percentage of posts			Twitter percent of posts		
	LoC	NLA	NLS	LoC	NLA	NLS
article by library	3.7	2.7	0	5	1	0
collection	15.6	6.8	13.5	15.1	6	17.9
collection news	17.4	4.1	10.8	12.4	2	3.4
exhibition news	6.4	2.7	0	1.2	0	0
issues relevant to library	0	1.4	10.8	0.4	0	4.7
job advert	3.7	0	2.7	1.2	0	2.6
library business	8.1	12.2	0	7.4	10	3.8
library event	11.9	25.7	13.5	9.3	25	14
library exhibition	0.9	8.1	24.3	2.7	8	12.8
library news	4.6	0	0	2.7	3	0.4
library project	4.6	14.9	0	2.3	9	0.4
library resources	0	14.9	0	5	13	1.3
media coverage of library	4.6	1.4	5.4	3.9	3	1.7
responding to other social media	0	0	0	1.9	15	28.9
Today in history	18.3	5.4	2.7	29.5	5	2.6
weather update	0	0	16.2	0	0	5.1

Table 8 shows that overall there was no one theme or group of themes that were most commonly used across all libraries or platforms. For example, collection or collection news accounted for approximately a quarter of posts on LoC and NLS on both platforms but less than 10 percent of posts in the NLA datasets. The library project or library resource posts accounted for over nearly 30 percent of posts on NLA Facebook and 22 percent of posts on NLA Twitter in contrast to less than two percent of posts on NLS Twitter and less than seven percent on LoC Facebook and Twitter. The codes library events and library exhibitions were

popular in the NLA and NLS datasets, accounting for over a quarter of the posts on both platforms, whilst the codes only accounted for 12 percent of posts by the LoC.

Mann-Whitney testing showed that the LoC and the NLA had statistically different distributions of codes for themes between their Facebook and Twitter datasets (p values .025 and .022) while the NLS had a statistically similar distribution of codes on their Facebook and Twitter datasets (p value .502). The differences between the LoC and NLA Facebook and Twitter datasets indicates that the libraries were adapting the themes of their posts to the different platforms while the similarity of the NLS Facebook and Twitter datasets suggest the NLS was keeping the themes the same across both platforms (with the previous content analyses of the link and images suggesting that they were just adapting their approach to the theme on each platform).

Kruskal-Wallis testing showed the libraries Facebook datasets had a statistically different distribution of themes from each other (p value .031) whilst on Twitter a statistically similar distribution was observed between libraries (p value .732). Differences in strategies become apparent between the libraries on Facebook, with the NLS having a much higher percentage of posts about library exhibitions than the other libraries, while the NLA has a higher percentage of posts on library projects and library resources than the other libraries. On Twitter, while there was variation in the percentage usage of the codes between the libraries, the variations were mostly much smaller which suggest the libraries were taking a similar approach to their posting on Twitter.

The following descriptive sections show more detail about what codes represents and the patterns of usage across the datasets.

'Article by library' was used when the post highlighted an article written by the library, usually on a blog post, about a specific topic. The code was not used at all in the NLS dataset, and only in a small amount by the LoC and NLA on both Facebook and Twitter, with LoC having a slightly higher percentage of use than the NLA. Post with this theme often linked to the library website, for example:

'Collection' was used when the post covered an item or items in the collection, usually linking to item's online catalogue page. The code was used on posts by all three libraries, with percentages for individual libraries mostly consistent between platforms. The NLA used the code least out of the three libraries with the LoC and the NLS having similar usages, for example:

Image 23 Collection theme example (National Library of Scotland, 2019g)

'Collection news' was used when the post contained news about the collection such as new items, or new ways of digitising the collection. Usage varied by both platform and library with the LoC using it the most on both platforms, for example:

Image 24 Collection news theme example (Library of Congress, 2018g)
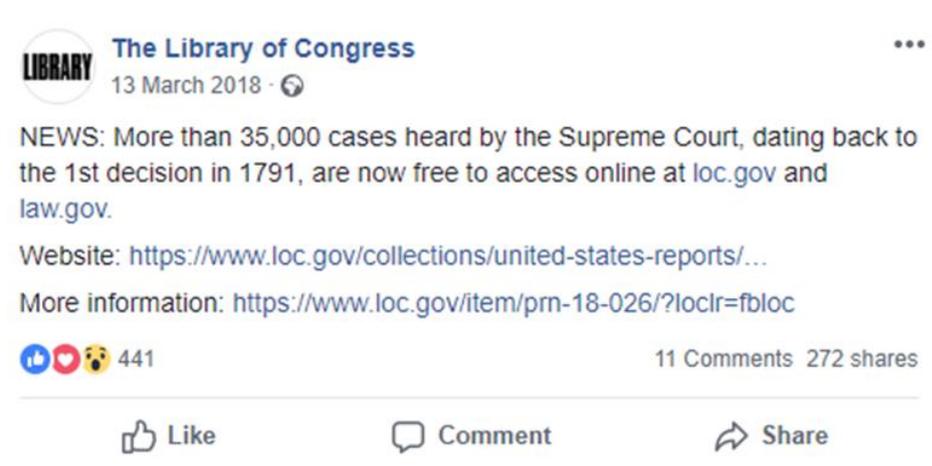
The NLA used it least, with a slightly higher usage on Facebook than Twitter while the NLS used it slightly more on Twitter.

'Exhibition news' covered exhibitions and events that ran for a more than one session that contained material from the library but was not primarily hosted by the library. The code was only used on both LoC datasets and the NLA Facebook dataset, with percentage usage quite small, with posts such as:

Image 25 Exhibition news theme example (Library of Congress, 2018a)

'Issues relevant to library' covered a variety of posts with topics such as local issues for example festivals as well as local public libraries, quotes from books, comics about reading and books, as well as articles about reading and literature. The code was used most by NLS

on both Facebook and Twitter with the Facebook percentage approximately double that of Twitter, with posts such as:

Image 26 Issues relevant to library theme example (Scottish Book Trust, 2019)
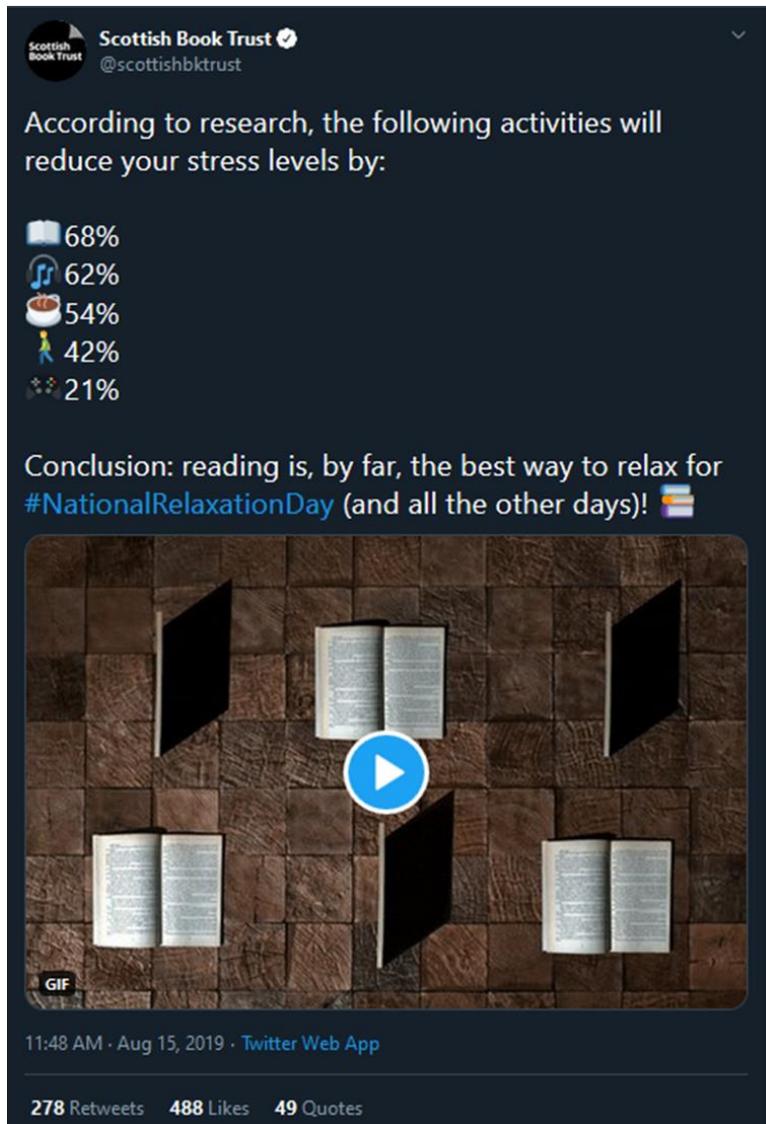
'Job advert' was the code used for posts that were advertising vacancies within the libraries and occurred only as a small percentage of posts. The theme was initially considered part of library business, but the subtheme appeared often enough to be considered its own theme. NLS had similar usage across both platforms while the LoC had more than double the usage of the code on Facebook. The code did not appear in either NLA dataset. Posts in the NLS datasets were similar to:

Image 27 Job advert theme example (National Library of Scotland, 2019a)
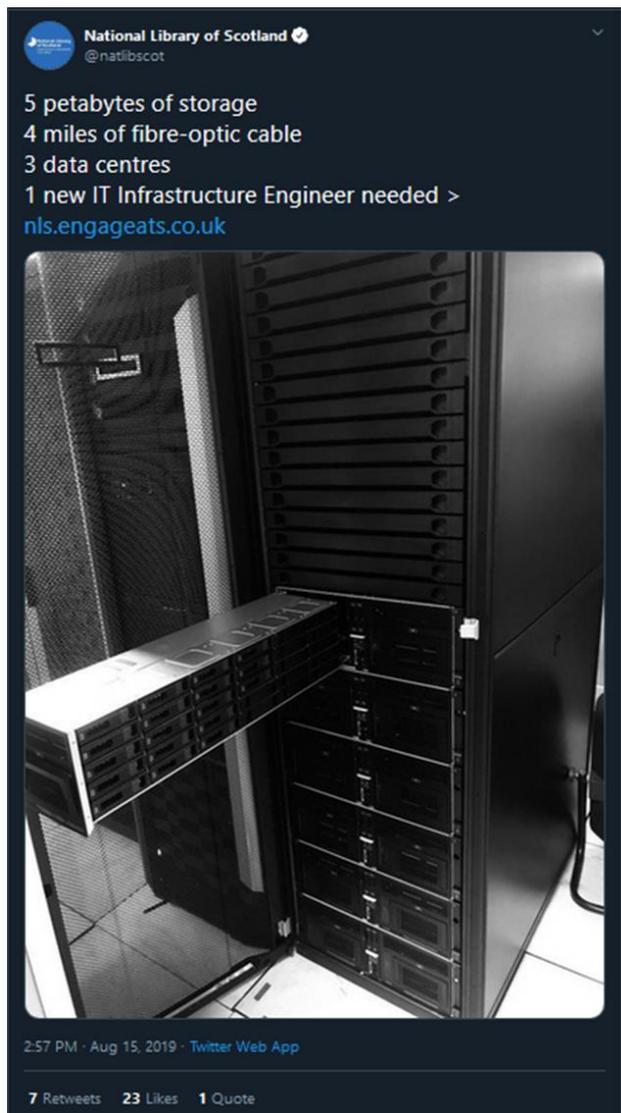
'Library business' covered a variety of posts such as posting about the bookshop, any closures of the library, highlighting items for sale or donation as well as advertising any grants available to users to study in their collection or images taken in various parts of the library. In the case of the LoC this code also covered information from library subdivisions such as the Copyright Office. The code appeared in NLA and LoC datasets with similar levels of usage on both platforms, although NLA has slightly higher usages. The code only appeared in the Twitter dataset of the NLS and at approximately half the usage of the other libraries. This post is a common example of the theme:

Image 28 Library business theme example (National Library of Australia, 2019f)

'Library event' differed from library exhibition in that it covered one-time events such as lectures, talks or celebrations, with many posts sharing a livestream/video recording of the event or pictures taken at the event. In the NLA datasets, the code accounted for a quarter of posts on both platforms. Both NLS and LoC also had consistent levels of usage across both platforms but at lower levels with NLS usage at approximately 14 percent of posts and LoC between seven and nine percent of posts. Posts that livestreamed events often looked like:

Image 29 Library event theme livestream example (National Library of Australia, 2019b)

while post with information about upcoming events looked like Image 30.

Image 30 Library event theme information example (National Library of Australia, 2019d)

'Library exhibition' covered all sizes of exhibitions from small specific displays to larger curated collections, with the code again used the criteria of consisting of any event that ran for more than one day or session. NLS had the highest percentage of usage on both platforms, with the code on Facebook accounting for a quarter of the posts and nearly 13 percent on Twitter with posts such as:

Image 31 Library exhibition theme example (National Library of Scotland, 2019d)

The code usage was consistent in the NLA datasets with eight percent of posts on both platforms. The code usage was lowest in the LoC datasets, with less than one percent of posts on Facebook and under three percent on Twitter.

'Library news' covered any news about the library not specific to a collection or exhibition/event such as new trustees or prominent staff members, new grants, new reading programmes and awards. In the Facebook data, this theme only appeared in LoC posts with just under five percent of posts coded as library news. In the Twitter data, the code was assigned to all three libraries with usage in LoC and NLA posts similar at

approximately three percent of posts while NLS barely had any posts with a usage of 0.4 percent. Posts with this themed were similar to:

Image 32 Library news theme example (Library of Congress, 2018j)
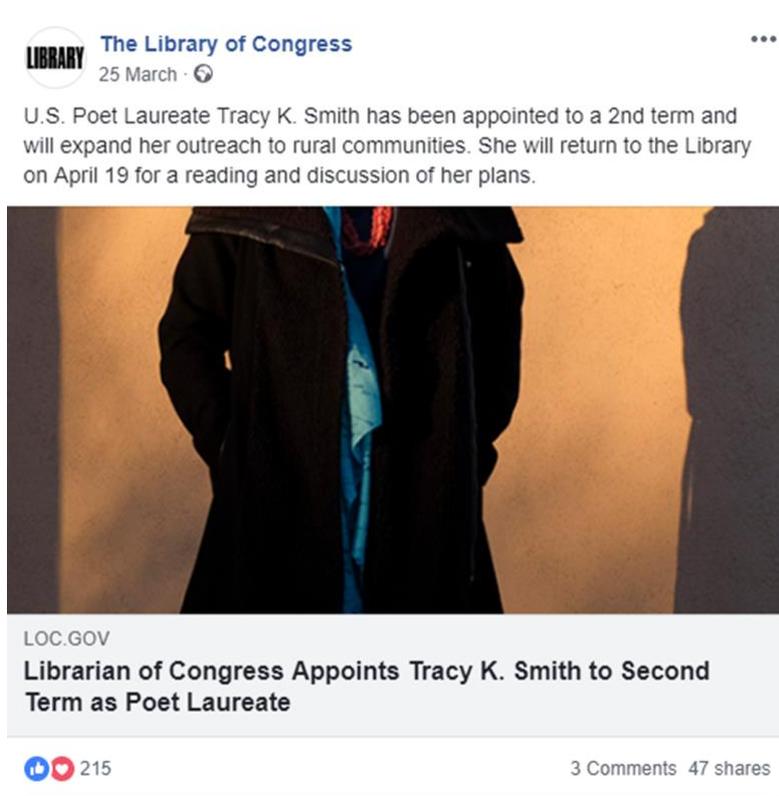
'Library project' covered posts about books or items the library had published, as well as literary awards they were involved with and research they were conducting. The code appeared most often in the NLA datasets, with nearly 15 percent of posts on Facebook and nine percent of posts on Twitter coded this way. The code also appeared in both LoC datasets but at lower rates with 4.6 percent on Facebook and 2.3 percent on Twitter. In contrast, the code was not used in NLS Facebook posts did in a tiny percent of Twitter posts. Post typically looked like:

'Library resources' covered posts that highlighted or directed users to information guides about how to use the collections, as well as newsletter sign ups, or making users aware of a particular service. The code appeared in NLA posts most often with levels similar across both platforms, nearly 15 percent on Facebook and 13 percent on Twitter. The code was not used in the LoC or NLS Facebook datasets but was used in their Twitter datasets with small usages than the NLA with five percent for the LoC and 1.3 percent for the NLS. The theme was seen in posts such as:

Image 34 Library resources theme example (National Library of Australia, 2019a)

'Media coverage of library' was used when the library linked to outside sources, typically newspapers and television news, that covered something the library was running or taking part in. The code was used in all datasets with usage rates all below six percent. The LoC used it similarly across both platforms while in the NLA datasets the code appeared slightly more often in the Twitter posts and in the NLS datasets the usage was higher in the Facebook posts. Posts on Twitter were often retweets of the news organisation for example:

Image 35 Media coverage of library theme example (STVNews, 2019)

'Responding to other social media' was as the name suggests used when the posts were in response to other social media posts, usually on the same platform. This code did not appear at all in the Facebook datasets and at varying levels in the Twitter datasets. The code appeared in less than two percent of LoC posts while appeared in 15 percent of NLA posts. The NLS had the greatest percentage of posts coded as this with nearly 29 percent of posts responding to other social media. Posts were either quote tweeting such as in the image below or replying to comments.

Image 36 Responding to other social media theme example (National Library of Scotland, 2019f)

'Today in history' was used when the post highlighted a historical event that happened on that day and in most cases linked to something in the collection from that event. The code most commonly appeared in the LoC datasets, with this accounting for nearly 30 percent of Twitter posts and just over 18 percent of Facebook posts. The usage in the NLA datasets was

similar across both platforms with the code accounting for approximately five percent of posts on Twitter and Facebook. The code appeared less often in the NLS datasets with just over 2.5 percent of posts on both platforms coded today in history. Posts typically looked like:

Image 37 Today in history theme example (National Library of Scotland, 2019h)

'Weather update' was a somewhat unique code, used for posts that gave a bookish weather quote and had an image to the view from a library window. Weather update as a theme was only used on the NLS dataset with Facebook showing a higher percentage of posts coded in this way, just over 16 percent compared to five percent on Twitter. Posts generally appeared as:

4.2.4 Observations of differing strategies

Analysing the posts manually allowed for noticing trends that were not necessarily shown in the codes generated from the analyses which could indicate subtle differences in the libraries' strategies. For example, the NLS often used link shortening services, especially on Twitter, where in comparison the LoC often embedded links on Facebook, showing some of the different strategies to make posts look less messy. Further evidence in differing strategies includes the already mentioned use of tracking codes in the links, primarily by the LoC, showing some of the differing monitoring processes.

Differences were also noted in the images the libraries used. This was apparent in the more informal images the NLS often used, such as gifs or memes (often classified as the image-

text relationship 'image subordinate to text, image more general') especially in contrast to the LoC, which often used embedded links which meant the platform decided which image to use. Additionally, on Facebook the NLA made a deliberate choice to ensure there was a relevant image on every post, even such as closure or downtime announcements.

Manually coding the posts for theme revealed differences in the language and styles of the different library posts. The LoC took a more informational tone and approach, often with formal language, in contrast to the NLS which used more informal language as well as made the occasional joke and used slightly off topic themes, such as the weather update theme. The NLA was more similar to the NLS in tone with a balance of both formal and informal language, such as posts giving information about resources as well as posts asking users about favourite books, but did not make jokes like the NLS did. Additionally, it was noted that there was some variation within the LoC posts with some posts within a short time span using hashtags where none of the others did, possibly indicating a different staff member handling the social media during that period.

The manual analysis of all three components at once also allowed for observations to be made across the different types of analyses that indicated some differences in the library strategies. This was most apparent in by the observation that the LoC had no images on some library business posts, such as announcements of closures or downtime, in contrast to the NLA which used images from their archival material to accompany those posts on the platforms. These pictures were usually relevant in some way to the announcement, such as an archive image of a phone exchange used on a post to notify users the library phone lines were down. Additionally, many of the posts in the NLS Twitter dataset without an image were responding to other users.

These factors are noted as they may influence user response but may not be apparent in the codes used and are indicative of the different strategies the different libraries are employing.

4.2.5 Conclusion

Overall, the content and thematic analysis revealed that the libraries were all mainly linking to their own controlled spaces and posting a variety of library centric themes such as collections and collection news, as well as library news and events. No one theme or type of link was predominant with each library showing a mix of links and themes. The LoC and NLS showed a different mix of links and themes on each platform, which could be due to the large difference in the number of posts in the Facebook and Twitter datasets. All libraries shared a different mix of codes from each other on Facebook, but on Twitter the libraries showed a similar distribution of codes. Additionally, the theme 'responding to other social media' only appeared in the Twitter dataset, likely due to the platform differences in posting comments to other users.

Analysis of the image-text relationships showed most posts had images, but about 10 percent of LoC and NLS posts had no images. Again, no relationship was most predominant and the relationships varied by both platform and library. More than half of the image-text relationships on Twitter were complementary while on Facebook the relationships were more varied. The LoC had nearly half of the image-text relationships as independent due to the embedded links selecting the image while the NLA had an even mix of different relationships and the NLS relationships were mostly the image and the text complementing each other.

Observations from the manual coding of the analyses showed some differences in strategies, such as the LoC's more informational approach while the NLS was more conversational including the use of gifs or memes. Additionally, the NLA was observed to use relevant images on all posts, even on closure announcements, in contrast to the LoC.

4.3 Relationships between codes and number of reactions

4.3.1 Frequency of reactions

The number of reactions a post receives are one of the usual measurements of engagement on a post, both in research such as Ibrahim et al. (2017) and by social media companies such as Hootsuite (McLachlan, 2020), therefore, analysis of the publicly visible reactions was conducted.

The number of reactions to a post and the number of posts that have that same reaction are fully charted in Appendix 7: Reaction Count Graphs, with separate charts for each library due to the wide variations in counts that made consolidated charts extremely difficult to read.

Likes

On Facebook, no real pattern emerged in the number of likes a post received, with lots of unique counts i.e. that number of likes was only achieved by one post. Apart from one post in the LoC dataset, all posts on the three library pages received at least 4 likes. The NLA showed the smallest number of interactions as well as the least variation in like numbers, varying from five to 117 with numbers above 50 less common. The NLS received higher levels of interaction and showed greater variation with numbers varying from four to 262 with an outlier of 577. The majority of likes a post received was under 140. The LoC had the largest number of likes and interactions out of the three datasets as well as the greatest variation in like counts, with numbers ranging from zero to 407 with an outlier of 878. The majority of the likes received were under 400.

On Twitter, a Zipfian distribution emerged, with many posts receiving a small number of likes and fewer posts receiving higher counts. The NLA posts received the fewest number of likes, ranging from zero to 59 with an outlier of 131. The NLS and LoC had similar levels of variation, with the NLS ranging from one to 652 with an outlier of 1800 and the LoC ranged between four and 650 with several outliers of 927, 1100, 1615 and 6400. For both the LoC

and NLS the majority of likes received were under 200 and the LoC and NLS showed similar levels of interaction.

Other Facebook reactions

The other reactions on Facebook are newer and showed considerably less use. The sad and angry reactions were barely used at all, with the haha and wow reactions slightly more used and the love reaction most used out of these newer reactions. Again, the reactions showed a Zipfian distribution with lower number of reactions received more common than higher numbers. The NLS received the most haha reactions of the three libraries and while the NLS also had the highest individual count of wow reactions, the LoC received more wow reactions overall. The LoC had the highest number of love reactions to a post, 282, with the majority of posts receiving less than 100 loves. The NLA received the smallest number of love reactions, the maximum number being 23 and had the highest number of posts without the reaction, 33 percent of posts. The majority of NLS posts received up to 20 love reactions, with a small number receiving up to 94, and the NLS had the least number of posts without a love reaction.

Shares and retweets

On Facebook, there was no overall easily discernible pattern in the number of shares a post received with both LoC and NLS having a large number of unique counts. NLA had a Zipfian distribution with less than 13 shares being more common than higher numbers, and the majority of posts being shared less than 20 times with some outliers being shared up to 155 times. LoC had higher numbers of shares with unique counts ranging from three to 137, with several outliers of up to 670. NLS unique counts ranged from zero to 40, with outliers up to 327 shares on one post.

On Twitter, a Zipfian distribution was again apparent. The majority of LoC posts had under 130 retweets with some unique counts up to 1800 shares on a post. The majority of NLA posts were retweeted under 35 times, with one post shared 82 times. NLS had a slightly higher rate of retweets with the majority of posts being retweeted up to 40 times, with outliers being shared up to 429 times.

On both Facebook and Twitter, all LoC posts were shared at least once, however on Facebook both NLA and NLS had approximately five percent of posts that were not shared. These numbers were lower on Twitter, with NLA having one percent of posts without retweets and NLS having three percent.

Comments

Similar Zipfian trends were noted on both Facebook and Twitter with lower comment counts much more common than higher counts though the variation and highest number of comments varies by library and to a lesser extent platform. On both platforms, LoC has the largest comment count on a single post but these were outliers. Otherwise, NLA had higher comment counts on Facebook while NLS was higher on Twitter.

On Facebook, the majority of posts by LoC and NLS received 12 or fewer comments while NLA had a slightly lower count with the majority receiving eight or less comments. On Twitter, the comments counts were lower, with the LoC and NLA having a majority of posts receiving up to four and three comments respectively. In contrast the NLS had a higher count, more similar to the Facebook numbers, with the majority of posts receiving up to nine comments.

On Twitter, all three libraries had no comments in response to approximately 50 percent of posts, and this was mostly the same on Facebook with NLA and NLS having the same level of no responses but LoC having less than two percent of posts without a comment.

4.3.2 Statistical tests for relationships

To determine if there was any relationship between the content and theme of a post with the number of reactions received, chi-square testing was first performed on the datasets. The test was performed with each type of code generated in the content and thematic analysis against each type of reaction. However, the test revealed a higher number than acceptable of cells with frequencies less than five which meant the requirements for the chi-square test were not met and that no relationship, or a lack of a relationship, could be determined between the content and theme of the post and the number of reactions (Vaughan, 2001). Following the suggestion by Vaughan (2001), the number of likes and

shares were merged into ranges instead of exact numbers, such as intervals of 0-19, 20-39, and tested again. However, these tests also showed the same higher than unacceptable number of frequencies. Therefore, based on these samples, it is impossible to tell if there is a relationship between the type of link, type of image relationship or the theme and the number of reactions a post receives.

4.3.3 Conclusion

The inability to tell if there is a relationship between the content of the national libraries' social media posts and the number of responses from users, as well as a lack of informative patterns in the number of responses means it is difficult to answer RQ3 and understand how users respond to national libraries' posts from the response numbers alone. This means that it cannot be understood if the social media presence of national libraries' is effective or worthwhile from the response numbers alone therefore justifying the creation and use of the toolkit discussed in more detail below to analyse user responses in a more holistic method.

4.4 Thematic discourse analysis toolkit

The toolkit developed in 3.3.4 Thematic discourse analysis answered RQ2 'How can user engagement be analysed beyond response numbers?' by creating a checklist of questions that can be considered when looking at user comments. Answers to these questions can show what the users are responding to, their motivations behind commenting, and contextual information that gives more detailed indications of whether users like content and why, and if they are actually responding to the content and thereby actually engaging with the posts.

The toolkit, shown in Appendix 4: Comment analysis toolkit, was designed to be flexible and used on any social media platform due to the generality of the questions. The straightforward nature of the questions that form the main component of the toolkit mean that no specialised training or equipment is required to analyse comments. This enables anyone interested in learning more about what users are responding to on social media posts or what motivates users to respond to posts can perform the analysis. The toolkit also

enables social media managers to determine if the effort they invest in social media is worth the response they receive from users in a more holistic way than just the use of response numbers.

The toolkit contains information about how to access comments, formatting data for analysis, how to analyse as well as tips on reporting the data to ensure that user engagement with the social media posts are understood.

The five questions that form the main analytical component of the toolkit are:

1. What is the comment responding to?
2. Does the comment match the content of the post?
3. What emotions or motivations for responding are present?
4. Is there any context to the comment?
5. Is there anything else that affects how the comment could be interpreted?

With each comment analysed using all five questions to fully understand both the individual comment and overall trends in the comments.

Discovering what the users are responding to, for example the content or the account, gives a good indication of whether the content the library is posting is being reacted to, or if users are merely using the post as a convenient way of contacting the library. This question also accounts for the option of users responding to comments and engaging in a conversation in the replies. All three types of responses will increase the traditional engagement metrics but have widely different levels of interaction with the content meaning the toolkit provides the opportunity for a more nuanced understanding of response numbers.

Determining whether the response matched the content of the post is also a good indicator of whether users are responding to the content itself, but also allows for understanding if conversations between users have veered off topic but are still somewhat related. Whilst these conversations may not necessarily be useful for national libraries to know, knowing, and showing that they can start conversations among users can be a powerful tool and provide insight into why the content impacted users.

Looking at the comments and asking what, if any, emotions or motivations for responding are apparent allows libraries to see why users are responding. For example, users can state they found something interesting or liked it, indicate if they found the content useful, or show that they disliked the content enough to make that dislike known. These answers provide a deeper understanding of why material may be successful in encouraging users to respond or share, and provides evidence that what the library is doing is having an impact on users, something that is sometimes difficult do in libraries and is not fully possible to do using current engagement metrics.

Checking what context there is to the comment includes checking whether there are any replies to the comments, whether comments are liked (or another reaction in the case of Facebook) by other users, whether users that have been tagged or mentioned in a comment have publicly responded to being mentioned in some way, or if questions asked in the comment were answered. This contextual information provides indications whether other users pay attention to the comments, with reactions to comments giving an indication if others agreed with the comment but maybe did not comment themselves. This can provide evidence of the depth of impact the posts have and users' reactions to them. Publicly seeing a response to a user tag or mention also provides evidence that sharing is a valuable tool that does indeed increase the reach of the library's social media page. Looking at the context of the comment also allowed the observation of patterns of response to questions by users, such as determining who responded to the questions in user comments: other users, the library whose social media account is being analysed, or in some cases no response at all. This gives valuable information to the libraries about any shortcomings in their current management and strategy.

The question if there was anything else that could affect how the comment could be interpreted was not always appropriate or useful as most relevant information had been often captured in response to the other questions. However, it did leave a space for noting strengths of reactions, especially if it was the same commenter several times in a post, or any other reaction that could not be predicted but was still useful to note. Where there were circumstances that made it difficult to understand the comment, such as

indecipherable acronyms or uncertainty over the response being to the right pots, was also recorded here.

Combined together, the answers to these questions allow analysts or social media managers to get a more nuanced picture of user responses to social media posts and note trends that can influence their practise to ensure their time and effort is worthwhile.

4.5 Thematic Discourse Analysis of comments

4.5.1 User comments

The comments made by social media users in response to the national libraries' posts were analysed using the thematic discourse analysis toolkit developed. During the analysis, it was found that the emotions behind user responses and possible motivations for responding were sometimes indistinguishable from each other leading to them being coded together. Throughout this section they will be referred to as motivations as a simplification for ease of reading. The full lists of codes generated during the thematic discourse analysis can been seen in

Appendix 4: Comment analysis toolkit

Beyond Response Numbers
A toolkit for analysing user responses
Jennifer Hamilton

BACKGROUND

User engagement with social media posts are often numbers based but this does not always give a full picture of how users are interacting with posts. This toolkit will enable you to analyse user comments to understand what they are really interacting with, such as the content of your posts or other users, and what is motivating users to respond.

WHAT YOU NEED

You'll need the comments in response to the posts, and a spreadsheet for easy analysis.

HOW TO GET COMMENTS

Comments can be retrieved from your social media accounts in two ways. (Ensure that comments are from a public forum and stored securely with no identifying information.)
- API access (search online for further guidance) can be quicker but more difficult to set up especially since platforms change access requirements constantly.
- Copying the comments manually can be more time consuming but allows you to become familiar with the comments and notice conversations and formatting.

HOW TO FORMAT COMMENTS

Give each comment its own row in the spreadsheet or table alongside the columns in the image below. This enables easy analysis. For further ease of use, use a new table or sheet for each set of comments.

comment	what is comment responding to?	does the comment match the post?	what emotions /movitations are visible?	comment context	anything else relevant?

Examples of codes generated by comment analysis:
- responding to organisation
- responding to content
- matches post
- amused by content
- aware of history around content
- like content
- sharing memory of content
- responding to comment
- comment liked by other users

HOW TO ANALYSE COMMENTS

The framework asks five questions of each of the comments:
1. What is the comment responding to? (such as the content or your organisation)
2. Does the comment match the content of the post? (yes, no or partially eg if a conversation started on topic and then wandered)
3. What emotions or motivations for responding are present? (such as liking content, amusement, gratitude, asking a question, making a joke)
4. Is there any context to the comment? (such as replies or likes to the comment, same user as other comments?)
5. Is there anything else that affects how the comment could be interpreted?

HOW TO REPORT RESULTS

Note trends such as whether users are responding to your content or communicating with you. Do they have emotional connections to the content? Are they showing multiple motivations for responding and showing more involved comments? Are they sharing their opinions? Participating in discussions? Are you responding to your users?

Appendix 5: Thematic discourse analysis codes.

It was during the analysis of motivations that the presence of emojis in comments added value. While not every comment contained an emoji, their presence allowed some ease of understanding the motivations as they often provided a clue to tone that was not always readily apparent. A full code book of the emojis used in comments and the meanings they were ascribed are in Appendix 6: Emoji codebook.

There were a few cases where it was difficult to determine the exact nature of the response, either due to the comment being in a language unfamiliar to the researcher and difficulties with translation, or a case of seemingly the comment being completely unrelated to either the content, the library or any other user. This led to the creation of the 'not sure' code and meant that some comments were not fully part of the dataset.

Using the toolkit to analyse the comments established which common motivations for responding were present and revealed users were often responding to the content of the posts.

User comments quoted are all reported verbatim with no corrections to spelling or grammar and only usernames redacted.

What are users responding to?

Answering the first two questions in the toolkit revealed that in most datasets, users were mostly responding to the content of a post with most of the comments coded as 'responding to content' with most of these comments coded as matching the content of the post. The exceptions to this were the NLA and NLS Facebook datasets with approximately half of the comments coded in this way. One of the main reasons for the difference is the number of comments in these datasets coded as responding to 'comment above' indicating the comment was part of a conversation. Comments that were coded as comment above in response to question one of the toolkit were usually part of a discussion and are discussed more in section Responding to comments as that was part of the motivation for the users commenting. These comments were mostly coded as matching the content of the post due to the conversation discussing the content, however, some were coded as partially

matching the content as some conversations veered slightly from the starting point during the course of the conversation.

In four of the datasets, LoC Facebook and Twitter, NLS Twitter, and most notably in NLA Twitter, there were some comments in the dataset that were found to be responding to the library rather than the content, and these comments were found to not match the content of the post as in many cases they could have been posted on any of the posts interchangeably or were spam comments.

One other type of user response was noted in the dataset, that of tagging other users. This merited a separate code due to the nature of some of the comments just containing a user name making it impossible to determine if the user tagging was tagging the other user because of the content or the library. Comments coded with this were present in all datasets except for the NLA Twitter dataset, with the other twitter datasets only showed a small number of users tagging, whilst the practice was more common in the three Facebook datasets. Comments that consisted of just the user being tagged's name were often coded 'unsure' to question two as there was no context to determine if the reason for tagging matched the content of the post. Of those with more context, the comments usually matched the content of the post.

Some of the responses by libraries in the Twitter datasets were coded as 'thread' as they were expanding on the original post with more detail, something only seen on Twitter due to the restrictive character count.

Responding to content

Examples of responses matching the content of the post include responses to a today in history post in the LoC Facebook dataset about Earth Day being first observed, where users shared memories and experiences:

'*It was a very big deal. My senior year in high school. My biology teacher was Art Cooley who co-founded the Environmental Defense Fund.* *https://en.wikipedia.org/wiki/Art_Cooley*'

and

'*Took my 4th graders outside to clean up the playground. Wonder if they remember?*'

Both are sharing memories of the day in the content and clearly relating to the content of the post rather than the library.

Examples from the other datasets include;

'*I love these pins!*'

In response to LoC Twitter post advertising pins available in the library shop.

In response to a NLA Facebook post discussing the Punch magazine as part of a library exhibition, one user responded;

'*We had Punch delivered weekly. Tis how I think I created my dry sense of humour. Also how to write witty & learn about being a liberal rebel*.'

In the NLA Twitter dataset, one post about newspaper archives at the NLA asked users what details they found in newspaper articles, and one user responded:

'*I've found many family history stories in newspapers from court cases to births marriages & deaths, the details every family cherishes*'

In response to a NLS Facebook post sharing a video of a choir singing in the library from a rare choirbook one user responded:

'*I would love to be able to see more of this exhibition! Looks so interesting.*'.

And in response to a NLS Twitter post about collecting Fringe catalogues a user asked;

'*Have you got 1981? I just found my copy* 👌 '

Most of these responses were coded in question two of the toolkit as matching the content of the post as they not only responded to the content but were also talking about the

content. Only a small number of responses were coded as partially matching the content, with these comments typically using the content as more of a starting point for the comment rather than directly engaging with it. For example, in the LoC Facebook dataset, one response to a livestream post of a reading and music event for children that was hosted by the Dolly Parton Imagination Library;

> '*Love the DPIL. My grandson loves his* 📚.'

Showed that while the comment was responding to the content (the Dolly Parton Imagination Library), it did not actively engage with the event being livestreamed.

Responding to library

The comments that were coded as 'responding to library' were often general ones that could have been posted anywhere on the libraries' social media pages, for example;

> '*How can I get a copy of a book in the LBC*',

> '*Love Library of Congress. Carla Hayden is doing an exemplary job!!*',

> '*This is out of the blue but will you marry me National Library of Scotland?* 😍'

And

> '*The http://loc.gov site is not working! I cannot access any documents or load many pages.*'

and in all cases, these were categorised as not matching the post because they were nothing to do with the content of the post.

This category also included tweets from bots such as;

> '*Congrats on writing a great government tweet! http://oztweets.measuredvoice.com/nlagovau/status/1166964442707316736 (Ranked 45th for Aug 29.)*'

In response to a post about study grants the NLA offers. The response could have been referring to any post the library made and did in fact appear on many other posts with the same wording, indicating that the content was of no relevance to the bot generating the responses.

'Bot' and 'trying to make post more visible' were the second most common motivations for responding in the NLA Twitter dataset and all comments were dual coded with both motivations. These comments were the result of a system to highlight popular tweets by Australian governmental bodies and all comments followed the same format as the following comment;

> *'Congrats on writing a great government tweet! http://oztweets.measuredvoice.com/nlagovau/status/1166964442707316736 (Ranked 45th for Aug 29.)'*

With slight differences to the link and date in each comment to reflect the different tweets being responded to.

One other type of comment was coded as responding to the library rather than the content, comments that were also coded as spam. These primarily appeared in the LoC Twitter dataset for example, in response to a LoC Twitter post with a snippet from a historical newspaper, a user responded with;

> *'The book of Prophet KACOU Philippe is the book of your judgment http://philippekacou.org [*Image 39 Image from user comment dual coded 'responding to library' and 'spam'*]'*
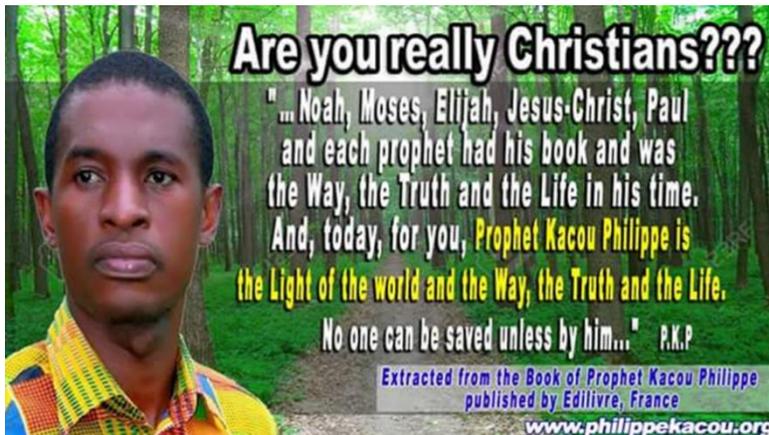
A few comments also appeared in the NLS Twitter dataset, such as;

> *' Too much. It takes #InfiniteLove and #ZeroJudgement Add love diminish hate until hate becomes 0 so love becomes Infinite!'.*

In response to a post to responding to another user stating its free to use the NLS.

Tagging other users

Many of the comments coded this way consisted of just the person being tagged's name, and were coded as being 'unsure' whether they matched the content of the post, however in some cases more context was added such as

> '[name] *This is great!*'.

> '[name] *this looks like a good exhibition for September.*'

> '[name] *thought this might be up your street!*'

And

> '[name] 😻 '.

These comments were usually found to match the content of the post.

Motivations for responding

Answering question three in the toolkit provided an understanding of the emotions present in user comments and what motivated users to respond, while answering questions four and five allowed for fuller context that may affect the interpretation of the comment, such as same commenters responding in conversations or if a comment was popular with other users, as well as keeping track of responses to comments, especially those that asked questions.

Analysis of the comments revealed that the majority of comments indicated a positive motivation for the users' response. In five of the datasets, liking the content was the most common motivation for responding and in the sixth dataset, NLA Twitter, the motivation was the third most common. Similarly, the top three motivations were mostly the same across the six datasets, with more variation in the less common motivations. 'Responding to comment' was the second most common motivation in three of the datasets, NLA Facebook and NLS Facebook and Twitter, and reflects the more conversational tones present in those posts which encouraged more conversation between users as well as the responses by the libraries. 'Thought user tagged would find it interesting' was a top three motivation for responding in the three Facebook datasets due to the high number of users tagging other users to share the posts with them, a notable contrast with the Twitter datasets where the same public tagging ability is available but does not seem to be used by users. For the LoC Facebook dataset, the third most common motivation was 'gratitude', and in the LoC Twitter dataset the second and third most common motivations were 'celebrating' and 'gratitude', both due in part because of the high number of comments in response to posts either about or by famous musicians. The third most common motivation in the NLS Twitter dataset was 'sharing relevant memory', which combined with 'liking the content' and 'responding to comment' shows high user engagement with the NLS Twitter posts. In contrast, the second and third most common motivations in the NLA Twitter dataset were 'bot' and 'trying to make post more visible' as a result of an account giving automated responses to try and make Australian posts more visible but this had no noticeable affect on engagement levels.

The motivations for responding appeared in comments both as the only motivation for responding as well as alongside another motivation as noted below.

'Thought user tagged would find it interesting' appeared in all six datasets, both individually and paired with 'like content'. The closely related code, 'suggestion from friend' both singly and with 'like content' only appeared as a common motivation for responding in the LoC Facebook dataset. The context field was valuable here for noting if users publicly responded to being tagged, with the results indicating that even if users did not respond with a comment, they often responded by liking the comment tagging them.

'Like content' appeared as a motivation for responding for commenting in all six of the datasets, however, the dual motivations that appeared alongside it differed throughout the datasets. Comments with the single motivation varied from short one-word comments (more often in the LoC datasets) to longer comments that gave more detail about what exactly the liked in the content. 'Sharing relevant memory' was the most common dual motivation and appeared in all datasets except the NLA Twitter, and were in response to a wide manner of different content with comments often including childhood memories, family histories and personal interactions with the material mentioned. 'Gratitude' as a second motivation appeared in both LoC datasets and the NLA Twitter dataset, with users often expression gratitude for new material or access to material in the library. 'Appreciation' was a second motivation in the LoC Twitter and NLA Facebook datasets with users often expressing appreciation about the services of the libraries as a whole as well as the easy access to information. 'Admiration' as a secondary motivation appeared in the LoC Facebook and these dual coded comments were mostly in response to posts about the Dolly Parton Imagination Library initiative and associated events. 'Excitement' appeared as a dual motivation in the NLA Twitter dataset, especially in response to news about sales in the library bookshop. The NLS Twitter dataset had two further dual motivations with 'like content': 'sharing relevant content' and 'making a joke' with the former mainly in a post about kickstools and users sharing images of their own kickstools, and making a joke was often noted in response to some of the light-hearted remarks in the NLS Twitter posts.

'Responding to comment' emerged as a major motivation for users commenting in all datasets. These comments were usually coded with 'comment above' in response to

question one in the toolkit and either as matching or partially matching the content in response to question two depending on where in the conversation the comment occurred. Comments coded with this were in all datasets though appeared less often in the LoC datasets. Short comments in response to being tagged accounted for most of the comments coded this way in the LoC Facebook dataset and about a third of the comments coded in the NLS Facebook dataset, while in the NLS Twitter dataset the comments singly coded were often users replying with gifs to other users' comments. In the three Twitter datasets, the motivation was commonly dual coded with 'like the comment' with often emojis used to indicated enjoyment. 'Sharing relevant memory' appeared as a dual motivation in the NLA Facebook and both NLS datasets, with the comments in the NLA dataset mostly in response to one history post while in the NLS datasets the comments were spread out over a variety of posts, especially 'weather update' posts. 'Gratitude' was a dual motivation in the NLA Twitter and NLS Facebook datasets and were usually when users received an answer to the question they asked. 'Making a joke' as a dual motivation appeared in both NLS datasets, again due to the light-hearted nature of the NLS posts and comments. 'Sharing relevant content' appeared in the NLS Twitter dataset as users responded to others with relevant links or information. Three motivations, 'answering a question', 'suggestion from friend', and 'aware of history around content', were found to be dual coded with 'responding to comment' in the NLA Facebook dataset. 'Answering a question' was self-explanatory and 'suggestion from friend' was as previously mentioned users responding publicly to being tagged. The dual coded comments 'aware of history around content' were all in response to one post in the dataset, the same history post mentioned earlier where comments were 'sharing relevant memory' indicating that the post is one that is clearly popular with users. Question four in the toolkit allowed for the understanding of other responses to comments such as the number of likes, with different patterns emerging in the different datasets. LoC Facebook comments rarely received likes, with most only if a user had been tagged, with more in the LoC Twitter dataset receiving at least one like and notably more comments receiving likes in the other datasets.

'Sharing relevant memory' emerged as a main motivation on its own in both LoC datasets as well as the NLA and NLS Twitter datasets. Singly motivated comments represented a large number of comments coded in this manner in the LoC datasets, with comments often in

response to today in history posts. In the NLA Twitter dataset, these comments were in response to a variety of posts including Australian food and history. Only a small number of comments were singly coded in the NLS Twitter dataset, mostly in response to a children's book mentioned in the library's birthday post. The main second motivation of comments dualled coded with 'sharing relevant memory' included 'answering question in post' in both NLA datasets and 'thinking of image' in the NLA Facebook dataset. In the NLA Twitter dataset the 'answering question in post' dual coded comments were in response to one post asking about favourite Australian children's books, while in the NLA Facebook post the responses were scattered among a few family history posts. Comments dual coded with 'thinking about image' were in response to several posts in the NLA Facebook datasets and were often directed at the archival images included with announcement posts. Additionally, the LoC Twitter dataset contained comments dual coded with 'gratitude', 'celebrating', and 'admiration of person in content', which were all in response to posts about famous musicians and their initiatives.

The following motivations were less common but still notable.

'Celebrating' as a main motivation for commenting appeared in the LoC and NLS Twitter datasets. Most often these were in response to posts celebrating the libraries' birthday, with the dual motivations 'appreciation' and 'admiration of person in content' appearing in the LoC Twitter dataset on posts celebrating famous musicians entering the national record. A number of comments in the NLS Twitter dataset were dual coded with 'making a joke' on the same birthday posts.

'Asking a question' as a motivation appeared dual coded with 'responding to content' to indicate users were responding to the content of the post and appeared in the LoC and NLS Twitter datasets. Question four of the toolkit revealed that the comments in the NLS dataset received a public answer from the library while the comments in the LoC dataset did not (though some were answered by other users).

'Answering question in post' was a motivation that appeared in both the NLS datasets, with the Facebook comments all in response to one post while the Twitter comments were

spread over a few posts, with all posts asking users things like favourite reading spots or books they would take with them on holiday.

'Making a joke' in addition to the previous mentions was dualled with 'responding to content' in both the NLS datasets and were often in response to weather update posts.

'Gratitude' as a singular motivation was found in both LoC datasets, often aimed at both the library and those mentioned in posts. In the LoC Twitter dataset, the dual motivations 'admiration of person in content' and 'appreciation' were noted alongside 'gratitude' and were mostly in response to the already mentioned posts about the Dolly Parton Imagination Library.

'Admiration of person in content' was a main motivation for responding in the LoC Facebook and Twitter datasets on the often-mentioned posts about Dolly Parton and her imagination library initiative.

'Saying hello' as a motivation for commenting only appeared in the LoC Facebook dataset, and was only seen in the responses of livestreamed events.

'Appreciation' as the main motivation for commenting was only seen in the LoC Twitter dataset and was usually in response to posts about famous musicians.

A small number of comments were coded as 'political agenda' as a motive for responding, all of which appeared in the LoC Twitter datasets. It was most often dual coded with 'spam' as it had nothing to do with the content or library, but a few of the comments did refer to the content, often on today in history posts that contained political events.

'Sharing relevant content' as a main singular motivation was most apparent in the NLS Twitter dataset and appeared in response to a variety of different posts.

A small number of comments were coded 'negative motivations' as the main motivation for responding and these appeared in the LoC Facebook and Twitter, NLA and NLS Twitter datasets. There was a tonal difference between the datasets though with the NLA and NLS comments more light-hearted in response to posts about puns and marmite while the

comments in the LoC datasets were more disappointed in closures or downtime. Additionally, a few comments in the LoC datasets were dual coded with 'aware of history around content' where they expressed their disapproval of some of the historical events or figures mentioned.

The following sections cover each motivation with examples of comments coded with the motivation from each of the datasets it appears in.

Thought user tagged would find it interesting

The motivations 'thought user tagged would find interesting' was related to 'tagging other users' as the motivation was assigned to comments that were tagging others. As such, this motivation was prevalent in the datasets where tagging was common, all three Facebook datasets. Exact usage varied slightly, with the motivation being the most prevalent in the NLA dataset, the second most prevalent in the LoC dataset and third most prevalent in the NLS Facebook dataset.

In most cases the motivation appeared as a single motivation because as noted above many of these comments simply consisted of the person being tagged's name. The small number of comments that had further detail, including the examples above, were coded with 'like content' as a dual motivation as the further detail indicated the user liked the content, such as:

> '[name] *Check this out!!!* 💙 *watch the whole thing please!!*'

with the blue heart emoji indicating that the commenter liked the content and wanted to share it.

The context field was valuable in analysing this motivation as while many of the comments received no comment from the user tagged, this field allowed the observation that these comments often received a like or other reaction from the user tagged showing that the sharing was successful.

Suggestion from friend

The code 'suggestion from friend' was also closely related to the previous two codes, 'thought user tagged would find it interesting' and 'tagging other users' as the code was assigned to those comments that were responding to being tagged with the comments usually coded as responding to comment above in question one of the toolkit.

However, this code only appeared as a prevalent motivation in the LoC Facebook dataset and even there it was only in response to approximately a quarter of comments coded as tagging user. The code appeared as a single motivation, with users often saying some variation of thanks to the user who tagged them as well as appearing as a dual motivation with like content for example;

> '*She is one of my favorites!!! :))*'

In response to being tagged in a post about the author Laura Ingalls Wilder, and

> '*Oh my goodness!!! That sounds awesome! I am not completely ready to do something like that, but I might just apply and see what happens*'

Where the comment was in response to a comment where the user had been tagged in the comments of a job advert post.

Like content

When the motivations for posting were analysed, liking the content emerged as the most prevalent in five of the datasets, and third most prevalent in the other (NLA Facebook).

In many comments, liking the content was the only motivation for responding, and the comments ranged from one- or two-word comments saying

> '*I like*'

> '*s.good…*'

> '*cool*'

'Fabulous!'

'Love this! 😍'

to longer comments such as

'Amazing! Sometimes tech is used for the greater good!'

In response to a post mentioning new resources available after digitisation, as well as;

'I'm really not much of a baseball fan, but I enjoyed watching this old newsreel. It's amazing in what good shape this old film is. And I loved seeing Coolidge. He looks as if he'd rather be doing almost anything else!'

In response to a post linking to a vintage newsreel, and

'Such an inspired use of @librarycongress open collections--digitally colorising historical photos'

On a post linking to a blog on how users use the LoC's collections, and

'Two of these images are Art. #Talking1980s continues to delight'

In response to a NLS Twitter post displaying examples of glitches in digitisation.

While 'like content' often appeared as the only observable motivation, there were many comments where a second motivation was apparent alongside.

In five of the datasets, (the exception being NLA Twitter) 'sharing relevant memory' was a prevalent dual motivation. This included comments such as;

'Wonderful, My Girl is my ringtone. Love me some Temptations!'

In response to a post about certain music tracks being added to the National Recording Registry in the LoC Facebook dataset,

'*Good to research & learn about it. Congrats. Been researching it 4 decades. Nice 2 see younger people learning & growing. :) I am part Native, American & Part Irish. :)*'

In response to a post sharing a blog post that shared research undertaken in the Slave Narratives Collection in the LoC Twitter dataset.

In the NLA Facebook dataset, a post talking about kangaroos and linking to an article on them received the comment:

'*Thanks, NLA, for this interesting article. Wish I'd had it as a child to take to school for our Nature Studies lessons! We were in the Dandenongs, with nature all around us and John Gould we knew well as young Bird Lovers ... but unaware of his Kangaroo research. A long historical road, indeed, that these animals have hopped along!*'

While in the NLS Facebook dataset, the comment;

'*thanks for showing this today ! hadnae watched the whole film from start to finish for years 🤩 theres SO much to love about it 🎞️ its ageing beautifully like a great whisky ☆☆☆☆☆localhero @nlskelvinhall @ParkCircusFilms https://t.co/VDUcjSzdBi*'

Was made in response to a post about a showing of the Local Hero film. in the NLS Twitter dataset one user commented:

'*Thought I was the last person on the planet to remember Zelazny. Read him voraciously in my late teens.*'

in response to a weather update post that contained a quote from the author Robert Zelazny.

'Gratitude' appeared as a dual motivation with 'like content' in three of the datasets; LoC Facebook and Twitter, and NLA Twitter. For example, the comment

'*Just ordered the book for my library! Thank you.*'

Was received in response to a post about an exhibition and its accompanying book in the LoC Facebook dataset, while;

> '*What an awesome document showing the evolution of Walt Whitman's work. Thank you for preserving this part of American #history #poetry #archives #OCaptainMyCaptain!* [Image 40 Gif in user comment coded 'like content']'

Image 40 Gif in user comment coded 'like content' (mikexdavis, 2016)

Was received in response to a post sharing an image of a digitised work in progress document from Whitman in the LoC Twitter dataset.

In the NLA Twitter dataset, comments coded with this dual motivation included;

> '*An honour and joy to be on the list*'

In response to the commenters book being included in the list of books mentioned in the post, and

> '*Merci beaucoup!*'

In response to a post about French resources for Bastille Day.

'Appreciation' appeared as a dual motivation in two of the datasets, LoC Twitter and NLA Facebook. This included such comments as;

> '*The books are incredible. So many beautiful bindings! Highly recommended to anyone with the chance to visit @librarycongress .*'

In response to a LoC Twitter today in history post that shared an image of the some of the original books when the library was founded, and

'*I love Trove. Been using it for many years.*'

In a NLA Facebook post detailing webinar on how to use Trove (a digital repository).

'Admiration' appeared as a dual motivation in the LoC Facebook dataset. This appeared in comments such as;

'*Wonderful program, wonderful woman!*'

In response to a post about the Dolly Parton Imagination Library.

'Excitement' appeared as a dual motivation in the NLA Twitter dataset, such as in the comment:

'*Get on it book lovers!! #SwinLibStudents*'

In response to a post about a sale in the NLA bookshop.

The NLS Twitter dataset revealed two other dual motivations, 'sharing relevant content' and 'making a joke' that were coded with 'like content'. A number of comments dual coded with 'sharing relevant content' were in response to the NLS's post asking users to share their kickstools and comments resembled:

'*Such a weird coincidence we just walked past these two and thought how cute they looked* 😊 *[*Image 41 Image in user comment dual coded 'like content' and 'sharing relevant content'*]*'

'Making a joke' appeared as a dual motivation in comments such as;

> *'Soul moosic. Worth it for the horns part alone.'*

Which was received in response to a post making a joke on cow appreciation day.

Responding to comments

The first question in the toolkit, 'What is the comment responding to?' had two further answers: 'comment above' and 'earlier comments'. These codes were used to show when conversations occurred in responses and helped provide context for when responses did not necessarily match the content but were still linked to the post. These were often seen in conversations where at least some of the comments nested and usually the first comment was responding to the content. Responses in these categories were often coded either 'yes' or 'partial' to the second question 'does the comment match the content of the post?' as they could often be directly related to the content, or in the case of 'partial' matches the content was often a starting point for the conversation that followed but the conversation was not completely about the content. For example, in response to a today in history post in the LoC Facebook dataset mentioning Andrew Carnegie building his first library, one user commented:

> *'Yeah after he exploited thousands while he built up his wealth.'*

To which another user responded with:

'*Then, in retirement, built libraries all over the United States with that wealth, before retiring back to Scotland. Evidently, it wasn't "all about money". He wasn't a fan of labor unions but he employed many men that chose to work for him.*'

This comment was coded as responding to the comment above and as matching the content. The comment then received the response:

'*they didn't have much choice, without education or connections you get nowhere in life. It was about his ego, and winning, and showing off his wealth. Many documentaries about him, and biographies. Both he and Henry Clay Frick treated their laborers like garbage. Which is why they ended up in deadly strikes in their steel mills in PA.*'

Which was coded as responding to the comment above and as a partial match to the content as it was still discussing Andrew Carnegie but no longer directly about his libraries. This type of exchange was typical of these codes in that often the initial response was responding to the content and then the conversation shifted focus slightly.

'Responding to comment' also emerged as a response to question three, 'what emotions or motivations for responding are present?'. The code appeared in all six datasets, to varying degrees with the motivation the second most prevalent motivation in both NLS datasets and the NLA Facebook dataset whilst being the fifth motivation in the NLA Twitter dataset and the sixth and seventh in the LoC Facebook and Twitter datasets. In the NLA Facebook dataset, the code appeared mostly in response to two posts, post 74 about self-published family histories, and post 123 about a famous gold robbery. These were also the posts in the dataset with the most comments, and the use of this code indicates that this is a result of conversations occurring between users.

The motivation appeared in all six datasets as a single motivation though to varying extents. Singly motivated comments accounted for most of the comments coded this way in the LoC Facebook dataset and approximately a third of the comments in the NLS Facebook dataset. In the other datasets, the number of singly coded comments was small. Comments that were singly coded in the LoC Facebook dataset include:

'*OXOX*'

And

'*My pleasure,* [name]*!*'

Both in response to users saying thank you for being tagged.

Examples from the NLS Facebook dataset include;

'*It's a small world*'

In response to the comment

'[name] *this has totally messed with my head. Maxine's brother Garry is married to one of my good friends from school, Kay Munro. #brainfried*'.

As well as

'*[National Library of Scotland] could be....* 😊 '

In response to

'*Hi* [name] *- it's on until 18 April next year so maybe there's still time for you?*'

In the other datasets, the few comments that were singly coded as responding to comment tended to be short, such as

'*Yup*'.

In response to this comment from the LoC Twitter dataset;

'*#dyn the Jefferson Papers at Princeton just released a new project?! Check out http://jefferson3volumes.princeton.edu ! Just went live today!*'

And in the NLS Twitter dataset, comments singly coded with responding to comment were mostly gif responses that seemed to have a superficial connection to the comment they were responding to.

'Like the comment' was a dual motivation alongside responding to the comment in the three Twitter datasets, with liking the comment the most prevalent dual motivation in all three. Examples of this dual motivation include a user responding to the comment on an on this day post in the LoC Twitter dataset covering the discovery of Pluto and its subsequent reclassification;

'Dwarf humans are still, in fact, human. Ergo, Pluto remains a planet....'

with

'exactly!! 😊'

In the NLA Twitter dataset, one user mentioned visiting the library to which another user commented:

'Hope you've had a great day!'

With the original commenter responded with the comment that was dual coded:

'🎨 listened to some oral history 🤩 #Prhistory'

In the NLS Twitter, a user commented on a post about relaxation activities for national relaxation day with:

'So with 📖 68% and 🎧 62% ... audiobooks are 130% relaxing. I knew it!'

To which another user responded to that comment with:

'Good maths skills there.'

'Sharing a relevant memory' emerged as dual motivation with responding to comment in the NLA Facebook dataset and both NLS datasets.

In the NLA Facebook dataset, these dual coded comments were mostly in response to one post, post 123 which covered a famous gold robbery. For example, the comment:

'[name] *how kool is that'*

Received the response:

'Interesting [name] *I had a Daniel Egan in our family who was in the Victorian constabulary for many years after leaving the Irish constabulary (Tipperary) after a number of years ..he died in 1889'*

Where the user responded to the surname of the original commenter and shared information about an ancestor that could be related to the commenter and possibly served in the police force at the same time as the incident in the post.

In the NLS Facebook dataset, the dual motivation was apparent in comments such as;

'[name] *I'd agree, although I missed the Danny Olsen character!'*

In response to

'My very, very favourite film of all time and, despite my trepidation, the stage musical version stood up quite well!'

When responding to a post about the film Local Hero.

In the NLS Twitter dataset the dual motivation is shown when a user commented on a weather update post and made a joke in their initial comment:

'Rain? Scotland?'

This received a response from the NLS:

'Never happens. Never'

To which the initial user replied with the dual coded comment:

'I speak as one who grew up on - and has known for approaching 60 years - the west coast, North Ayrshire !'

'Gratitude' emerged as a dual motivation with responding to comment in two datasets, NLA Twitter and NLS Facebook. Examples of comments coded 'responding to comment' and 'gratitude' include;

> *'Thanks for collecting and preserving me* 😌 🌶 *CL'*

in response to a comment from the NLA liking a tweet about being archived in the library, while the NLS responded to comment asking for more detail with this comment:

> *'Nothing quite as *splendid* perhaps, Jude, but we do have others with volvelles and of course many with astronomical calculations. You might also be interested in reading about last year's acquisition of an astronomical rotula created by a Scot, James Ferguson c.1752 > https://www.nls.uk/media/1553885/cairt32.pdf'*

Which lead to the user response which was dual tagged with 'responding to comment' and 'gratitude':

> *'Thanks so much! I'll check it out!'*

'Making a joke' appeared as a dual motivation alongside 'responding to comment' in both NLS datasets. In the Facebook dataset, one user commented on a post showing a sneak peak of the Dragon digitisation system:

> *'So ... you won't be digitising dragons then.* 🥴 *'*

To which the library responded:

> *'We tried to digitise Smaug... but it was a Tolkien gesture :-)'*

This exchange was typical of the comments dual coded in this manner. In the Twitter dataset, the comment mentioned earlier:

> *'Good maths skills there.'*

Was responded to by the original commenter with a gif that features a monkey using a calculator as seen in Image 42 Gif in user comment dual coded 'responding to comment' and 'making a joke'.

Image 42 Gif in user comment dual coded 'responding to comment' and 'making a joke' (AlexCoh, 2019)

In the NLS Twitter dataset, a number of comments were coded with the dual motivation of 'responding to comment' and 'sharing relevant content'. For example, in response to a post about a new acquisition that depicted the Scottish Nation Antarctic Expedition, one user commented;

'There is currently an exhibition about Scotia in Troon library this month. Great displays and very interesting'

To which another user responded;

'Free entry to the exhibition - it's on until Saturday 20th July, well worth a visit https://south-ayrshire.gov.uk/libraries/events.aspx'

Which included a link to further information on the exhibit.

In the NLA Facebook dataset, three other motivations were dual coded with 'responding to comment'; 'answering a question', 'suggestion from friend' and 'aware of history around content'. appeared as a common dual motivation with 'responding to comment'. For

example, in response to a post about self-published family histories in the NLA's collection, a user responded to the comment;

'How can you get access to these books when you are in another state?'

With the comment;

'Yes they may be in your local or state library and you can always request an Inter Library Loan from your local library'

Where the comment was directly aimed at the first comment and provided an answer to the question asked by the original commenter. The other comments tagged with the dual motivations of 'responding to comment' and 'answering a question' combination of motivations followed the same pattern.

The dual motivation of 'suggestion from friend' and 'responding to comment' indicated some users who were tagged thought enough of it to respond to the comment where they were tagged. As mentioned previously in regards to 'thought user tagged would find it interesting', some of the comments tagged with 'suggestion from friend' and 'responding to comment' were in response to a comment with just the users name, which lead to exchanges that looked like;

'[name]'

And a response from the named user;

'[name] *think they already have mine.'*

Where the above response was in response to the same post about self-published family histories in the NLA, and other examples were similar.

Comments that were dual coded with 'aware of history around content' all occurred in one post in the NLA Facebook dataset, the previously mentioned post 123 that discussed the largest gold robbery in Australian history and remains unsolved. Comments included:

'The inn was a cob and co stop but was an inn before that on the road from orange to Forbes .... I would like to think that the Bush rangers visited this inn the stage coaches stopped there and the inn still sits there in the sun with lots of Story's in its walls .... I almost bought the pub for twenty grand but the amount of work and money to restore it inside put me of people from Sydney own it now and it's full of junk storage I live above the inn on a hill in this little hamlet and think of the Bush ranging days of Dun Gilbert and Ben hall'

In response to the comment:

'At the time of the robbery the stage line was "Ford & Co" (owners John Ford and Phillip Mylecharane). Cobb & Co bought them out early July 1862. That's nit-picking for you Chris! There were also some scurrilous rumours that the coach driver, Jack Fagan, may have been "involved" in the robbery. He went on to work for Cobb & Co, but appeared to "come into money" shortly after.'

Both comments show an awareness of detail around the event that were not shown in the post and seem eager to share their knowledge. These comments were typical of those coded with this dual motivation in this dataset.

Question four in the toolkit, 'is there any context to the comment?' allowed for recording if comments received a status response, such as a like, that was not otherwise part of the dataset. Patterns of usage here were different in all datasets. Only one dataset, NLA Facebook, showed that status responses were not a common response to comments by other users.

In the LoC Facebook dataset, many comments received nothing at all, especially the shorter comments highlighted previously in the like content section. Of those comments that received a like, or in rarer cases a love or wow, the majority were from users who had been tagged in the comment, with only some from apparently unrelated users.

In the LoC Twitter dataset, nearly 160 comments received at least one like. The majority of these comments received between one and three likes, with small number receiving up to 10 and a few outliers receiving 22, 38 and 89 likes.

Nearly half the comments in the NLA Twitter dataset received likes from other users. These typically ranged between one and three likes with nearly half of the comments receiving at least one like.

In the NLS Facebook dataset, 86 comments received at least one like (45 from other users) while 13 comments received a haha and 12 received a love. Only 3 received a wow reaction and 1 comment a sad reaction, and no angry responses were noted.

In the NLS Twitter dataset, nearly 420 comments receiving between one and 11 likes, with one to three being the most common. A small number of comments received random higher number of likes, such as one comment receiving 172 likes.

Sharing relevant memory

In addition to the previous sections where 'sharing relevant memory' emerged as a dual motivation with 'like content' and 'responding to comment', the motivation appeared as a major motivation in its own right singly in four of the datasets (All Twitter datasets and the LoC Facebook dataset), and with other dual motivations in three of the datasets (LoC Twitter and NLA Facebook and Twitter).

In the LoC Facebook dataset, 'sharing relevant memory' emerged mainly as a single motivation for commenting, with responses especially in response to Today in History posts. For example, in response to the post about the major fire and earthquake in San Francisco in 1906, one user responded:

'*My grandpa was there and survived!*'

Whilst another responded:

'*My grandparents met in the days after this earthquake* ❤️'

Showing that users were not only reading the content but sharing how it related to them personally.

Another post celebrating the birth of Laura Ingalls Wilder had the response:

'She is an ancestor of ours on my dad's side, and I did not have this picture yet! Thank you for sharing!'

As well as:

'The book series was given to my older sister when she was a preteen. I was around 7 or 8 at the time and tried reading them for myself. I was hooked!!!'

In the LoC Twitter datasets, a quarter of comments coded as 'sharing relevant memory' were singly coded. This included comments such as;

'A roomful of Renoirs was a pleasure offered by The Art Institute of Chicago, where I grew up. Along w/lots of other yummy stuff.'

In response to a post discussing Renoir and sharing links to articles covering his work.

In the NLA Twitter dataset, comments coded as 'sharing relevant memory' were mostly singly coded. For example, in response to a post about vegemite recipes, a user shared;

'My Mum used to tell me that she made Vegemite broth for me when I was a toddler in the early 60s.'

And in response to a post about a well-known historical British convict, a user responded;

'First came across him as a school boy in an illustrated history book'.

In the NLS Twitter dataset, the motivation did appear on its own in a small number of comments. For example, in response to one of the library's birthday posts that had an image of a children's book, one user commented;

'My children love that book'

And another commented;

'We had this book when my kids were little! ❤️*'*

'Answering question in post' emerged as a dual motivation alongside 'sharing relevant memory' in both NLA datasets.

These dual motivations were shown in such comments as;

> '*Done my DNA and found many matches with trees that go back to 12 Scottish Kings and Queens and 6 English royals and nobles. Including Robert the Bruce, William the Conqueror, Ethelred the Unready, King of England. Also a 20xgreatgrandfather was Vladimir 1, Prince of Kiev.*'

In response to a Facebook post on using library resources to discover family histories, including royal connections, which asked users if there could possibly be royalty in their family tree.

In the NLA Twitter dataset, all the comments dual coded this way were in response to one post, post 497 which asked users what their favourite Australian children's books was as part of advertising their children's literature exhibition. Examples of the comments include;

> '*When The Wind Changed was my favourite as a kid, by Ruth Park. Love Margaret Wild's 'Fox' with Ron Brooks amazing art. Green Sheep too, if just for Near Sheep!*'

And

> '*Got to be Mulga Bill's Bicycle - loved reading it as a kid! I also adore the Getting of Wisdom, one for older kids*'

Where users not only answered the question but stated the answer as part of their childhood memories.

Furthermore, all instances of comments coded with 'answering question in post' were in response to the post.

Also in the NLA Facebook posts, 'thinking of image' emerged as a dual motivation with 'sharing relevant memory'. For example, a post about library phone lines being down which was accompanied by a black and white image of an old telephone exchange and operators

received comments that were clearly 'thinking about the image' and 'sharing relevant memory' such as

'*That was my job when I left school. A Dandenong exchange girl*'

Rather than engaging with the text of the post.

In the LoC Twitter dataset, several other dual motivations emerged with 'sharing relevant memory'; 'gratitude', 'celebrating' and 'admiration of person in content'.

All the comments dual coded with 'admiration of person in content' were in response to one post, post 2155 which was a retweet from Dolly Parton celebrating the 100 millionth book from the Dolly Imagination Library, and comments included;

'*As a fellow Tennessean, I am so proud of what you have done to encourage young readers. As a former Metro Nashville teacher, I know how important reading is in developing young minds, and that's why my car proudly sports your IL license plate. Way to represent our state, Dolly!*'

Similarly, most of the comments dual coded with 'gratitude' and 'sharing relevant memory' were also in response to post 2155. This included comments such as;

'*Thank you. My 3-year old daughter loves her books and has since the very first one when she was a newborn.*'

'Celebrating' as dual motivation with 'sharing relevant memory' was also present in the dataset, some again in response to post 2155, with more than half in response to post 2019, a retweet from Tony Bennett celebrating a song being added to the National Recording Registry. Comments dual coded this way include;

'*Although my uncle has long since passed, he sang that song at every family wedding. A wonderful memory to keep! Congratulations and all the best!*'.

Celebrating

'Celebrating' as a main motivation appeared in two datasets, LoC Twitter and NLS Twitter.

In the LoC Twitter dataset, just over half the comments coded as 'celebrating' appeared as a single motivation. Notably these comments were mainly in response to four posts: post 1854, celebrating the birthday of the library; post 2013, a retweet from Smokey Robinson celebrating a song being added to the National Recording Registry; and the previously mentioned posts 2019 and 2155. These comments typically looked like;

'*congratulations!*'

And

'*Yeeha!!! What an achievement!*'.

In the NLS Twitter dataset, almost all the comments coded with 'celebrating' appeared on two posts, posts 133 and 134, where the library was celebrating its birthday. Over half of the comments were single coded, for example;

'*Have a great birthday and ensure that you have a great time.*'

And

'*Happy birthday* 🥲 🥰 🎉 😍 *!!*'

In the LoC Twitter dataset, 'Appreciation' emerged as a dual motivation, and again was evident in the same posts. These comments included;

'*Happy birthday, @librarycongress!! We truly don't know what we'd do without you.* 📚 ❤️ 📖''.

Also in the LoC Twitter dataset, a small number of comments were dual coded with 'admiration of person in content' and these were mainly in response to post 2155, for example;

'*Love you for what you do. From one Southern to another, "You did your parents proud." Congratulations on your milestone.* 💕'

The only other noticeable trend in dual motivations with 'celebrating' in the NLS Twitter dataset 'making a joke' and again in the posts celebrating the library's birthday. For example;

'*Happy birthday! You don't look a day over 93* 😊 *[Image 43 Image in user comment dual coded 'celebrating' and 'making a joke']*'

Image 43 Image in user comment dual coded 'celebrating' and 'making a joke' (National Museums Scotland Library, 2019)

Asking a question and Responding to content

In the LoC and NLS Twitter datasets, a small number of comments were coded as 'asking a question', with most of these comments being dual coded as 'responding to content' as they were specifically asking about something within the post rather than just a general question about the library. These include;

'*Who is on the invitee list? How do I get on this list to tell #Copyright Office what it's really like to register your work in the new digital order. Start with absurd limit of 750 on Group registration limit. #BoycottCopyright*'

In response to a LoC post on public hearings about Copyright and;

'*Tell me more about this #ChronAmParty hashtag! Is it monthly, weekly, whenever? Can individual researchers join in?*'

In response to a LoC post using the hashtag and sharing an image from a historical newspaper. The first question received no public response while the second received an answer from a different user.

In the NLS dataset for example, one user responded to a post about that stated the library's Scottish Enlightenment exhibition was open that day with the comment;

> *'Please enlighten me how long it is on for if I can't make it today?'*

Which received an answer from the library.

Answering question in post

'Answering question in post' emerged as a theme in two datasets, NLS Facebook and Twitter. In the Facebook dataset, all the comments coded 'answering question in post' were in response to one post – post 18. This post shared a comic of perfect reading spots and asked users their favourite reading spots. Users obliged and the comments were all singly coded such as;

> *'In bed, loads of pillows and peace xXx'*
>
> *'Overstuffed chair'*
>
> *'Anywhere, anytime.'*

And

> *'Bathtub'.*

In the Twitter dataset, comments coded this way were in response to a few posts, such as post 312 which asked users what books were on their holiday wish list, and post 431 which asked users their preferred terminology for a piece of equipment. Responses include;

> *'Anything with Oor Willie and/or The Broons.'*

To post 312 and;

'Kick stool....'

To post 431.

Making a joke

The motivation 'making a joke' was prevalent in two datasets, NLS Facebook and Twitter. Comments were mostly dual coded with the previously mentioned 'responding to comment' and 'like comment' with the rest of the comments being dual coded as the general 'responding to content' indicating that the joke wasn't random and related to the post. In the Facebook dataset, most of these comments were in response to one of the NLS's weather update posts which specified there was a heatwave (by Scottish standards) going on. Comments included;

'23 again? How do you do that? :)'

'Is that 23C real or is that the "heat index"?'

And

'. . . or like a sweaty Betty 😊 '.

In the Twitter dataset, these comments included a response to a post that jokingly asked if a library building could wear sunglasses and shared an image of sunglasses against the front of the NLS to which a user responded;

'They have sunglasses in Scotland now?'.

Gratitude

'Gratitude' was a common positive motivation for responding in both LoC datasets. Comments ranged from gratitude towards the library itself;

'Thank YOU, Library of Congress, for all that you do to further involve us in the joys of reading and research.'

Towards the programs and events the library hosted;

'*Thank you Dolly. Reading is so important!*'

And for the content posted;

'*Thanks for this!!*'

Both datasets 'gratitude' was dual coded with the previously mentioned 'like content'.

In the Facebook dataset, 'gratitude' was also expressed between users, leading to the dual motivation of 'gratitude' and 'responding to comment';

'*Maybe there were having issues, but the link is working fine for me today. Thanks for submitting an alternative. :)*'

In response to another user's comment about a link in the original post not working.

In the Twitter dataset, two-thirds of the comments coded with 'gratitude' were in response to one post, the previously mentioned post 2155. Comments in response to this post were a mixture of singly and dual coded. For example;

'*Thank you for promoting literacy and your generosity!*'

Appeared singly coded as 'gratitude' while comments such as:

'*Thank you for recognizing the need and dedicating your charity to such an important cause. You are an inspiration!*'

Were dual coded 'admiration of person in content', with other comments dual coded as the previously mentioned 'sharing relevant memory' and a small number dual coded with 'appreciation' with comments such as

'*thank you Dolly! your efforts are appreciated!*'.

Admiration of person in content

'Admiration of person in content' was a popular positive motivation in both LoC datasets, though this may be skewed by the large number of responses to posts featuring Dolly Parton. In the Facebook dataset, all instances of the code were in response to post 153 which was a livestream with Dolly Parton, who is regarded as stated by users as a national treasure, and is a rare event on the LoC's Facebook page. Comments included;

'Love and admire Ms Dolly. She is an inspiration to all of America! Thank you for allowing this to be shown to America!'

'This is awesome! Love Dolly and her entire staff at the Dollywood Foundation. They are all doing a wonderful work with the Imagination Library!'

'Yet another reason to admire Dolly Parton. What an extraordinarily generous person....'

Other responses are similar in tone and the words '*wonderful*' '*amazing*' '*love*' and '*generous*' are repeated across many comments indicating the depth of feeling for Dolly Parton.

In the Twitter dataset, most of the comments coded with 'admiration of person in content' appeared in response to the often mentioned post 2155, a retweet from Dolly Parton celebrating the 100 millionth book from the Dolly Imagination Library. Nearly half of the comments coded with this motivation were singly coded, for example;

'You have a beautiful soul, Miss Dolly.'

The motivation then appeared dual coded with the previously mentioned 'gratitude', 'celebrating' and 'sharing relevant memory'.

Saying hello

In the LoC Facebook dataset, 'saying hello' was observed as a common motivation for responding to posts that were livestreaming events. This code was applied to comments that often simply said

'*hello*',

'*greetings*'

or

'*hi*'.

This code was only used in the comments of livestream posts, indicating that users could be responding to a speaker introducing themselves.

Appreciation

In the LoC Twitter dataset, the motivation 'appreciation' appeared as a prevalent theme. The code mostly appeared dual coded with the previously mentioned 'like content, 'celebrating' and 'gratitude', but a small number of comments were coded singly. These comments were in response to the previously mentioned post 2019, a post from one of the artists chosen to have their songs added to the National Recording Registry, and included;

'*One of my favs Tony ..*'

And

'*An icon!*'.

Political agenda

Also in the LoC Twitter dataset, 'political agenda' emerged as a notable a motivation for responding to posts. It was most often dual coded with 'spam' where the comment was not responding to the post itself. For example, the comment;

'I DO NOT WANT THIS HISTORY. 1940 TO PRESENT. This is the Time?. The best 1945. That It IS. (ISIS)!'

Was posted in response to the previously mentioned post about the digitisation of a Whitman poem.

The code also appeared singly coded where comments were referring to the content of the post. For example, in response to a today in history post celebrating the Grand Canyon National Park act, one user commented;

'And presently our POTUS and EPA want to destroy these national monuments because hey there could be valuable oil or gas in these monuments so who cares about them anyway since POTUS is a New York City Slicker who never camped a day in his life.'

Where clearly the user did not look favourably in the leadership at the time.

Sharing relevant content

'Sharing relevant content' emerged as a notable motivation for responding in the NLS Twitter dataset. Over a third of the coded comments coded with 'sharing relevant content' were dual coded with the previously mentioned 'like content', with a smaller number then being dual coded with the also mentioned 'responding to comment'. The code appeared on its own in similar proportions, with comments such as;

'Queen's Park to Glasgow Thistle, 1868. Oldest known letter asking to arrange a fixture. Resides with @SFootballMuseum [Image 44 Image from user comment coded 'sharing relevant content']'

in response to a post about the formation of Queen's Park football club and its appearance on one of the NLS's historical maps.

Negative motivations

Negative motivations (disappointment, disapproval, and doesn't like content) were present in four of the datasets (LoC Facebook and Twitter, NLA Twitter and NLS Twitter) but only in a small number of comments and the usage varied in the datasets.

In the LoC Facebook and Twitter datasets, negative motivations were expressed as disappointment and disapproval and tended to respond to either divisive issues or closures of the library. Responses to a post about a planned power outage and closure of the library and websites received comments such as;

> '*Bummer. There go my research plans. I'll have to regroup. Tomorrow is another day.*'

And

> '*So much for doing some advanced research over the weekend before going to the library next week. . .*'

Show that users were expressing their disappointment at the resources being unavailable.

Disapproval was apparent in response to posts about historical figures and events, and often appeared with the code 'aware of history around content'. For example, in response to a post about Andrew Carnegie starting to build public libraries;

'*Yeah after he exploited thousands while he built up his wealth.*'

And

'*blood money*'

Indicating that users are aware of some of the history around Andrew Carnegie that does not appear in the post and disapprove of him.

These dual motivations were also apparent in response to a post sharing the front page of a newspaper covering a historical massacre;

'*It wasn't about "tensions boiled over." The Guard and hired company thugs attacked miners and their families, burned women and children to death in their tents.*'

'*"Tensions boiled over"?!? Rockefeller paid the CNG to turn machine guns on strikers & families. Broke butt of rifle over the head of an unarmed union organizer, stomped on his face, then shot him in the back. Shot a boy, burned women & children alive. Don't let $ write history.*'

Disapproval was also shown in response to a modern political post with one user responding to a post sharing a link to a conversation with a Supreme Court Justice;

'*Never, He's and his wife are members of the Tea Party, both republicans. Never listen.*'

In contrast the negative emotions in the NLA Twitter and NLS Twitter datasets were more lighthearted and coded as disapproval or doesn't like content. Most of the comments in the NLA Twitter dataset were responding to a post detailing marmite recipes, with marmite apparently being something people either love or hate, for example;

'Oh no no no no no no no no no! Vegemite with butter atop A #SAO biccie or PROPERLY toasted bread. Those recipes are UNACCEPTABLE! 🤢 🤢 🤢 🤢 🤢*#Vegemite #HappyBirthday'*

Clearly expressing a dislike of the content.

Only two comments in this dataset were coded disapproval with both being dual coded with 'political agenda', for example in response to a post about the most requested object in the collection being the papers of a famous politician;

'Liberals fawning over pursuits of a man who was PM during a period of post-war industrial & community growth which had nothing to do with him there was growth in every country regardless of their leadership. Industry & community made it happen just as it does now ignoring govt.'

Where the tone is much more serious and disapproving of politicians.

In the NLS Twitter dataset the small number of negative motivations were coded as 'doesn't like content'. Three of these were in response to a post covering a book about knitting with dog hair;

'ALL OF THE NO TO ALL OF THIS! [Image 45 Gif from user comment coded 'doesn't like content' 1*]'*

Image 45 Gif from user comment coded 'doesn't like content' 1 (OfficialMovieGoer, 2014)

'🤢'

And

'😳'

Other responses were equally light-hearted for example one comment consisted of just this gif;

Image 46 Gif in user comment coded 'doesn't like content' 2 (CindyJade, 2015)

In response to a post that contained a pun.

4.5.2 Library comments and responses

As no usernames were recorded in the datasets, question four in the toolkit, 'Is there any context to the comment?' allowed for recording if the comment was posted by the library the dataset was collected from, or if a comment received a like or other status from the library. This allowed the analysis of the data to answer research question four: how do national libraries respond to user engagement?

In five of the datasets (all except the NLS Twitter) comments marked as belonging to the libraries were mostly in response to other comments, while the NLS Twitter dataset also had library comments as part of a thread, all determined by the answers to question one in the toolkit, what is the comment responding to?

4.5.2.1 Comments

The number of comments from the libraries varied widely in each dataset. The LoC only had nine comments out of the 808 in the Facebook dataset and only a slightly higher 19 in the

Twitter dataset of 689 comments. Four of the comments in the Facebook dataset were part of a thread, providing further information on the livestream event on post five and updating users on technical issues, for example;

'Hello again - We have resumed the livestream with Tracy K. Smith on our YouTube channel at https://www.youtube.com/watch?v=sfWZuCu6ZP0. Please join us there. Tracy is now talking with Ron Charles of Washington Post.'

The NLA also only had nine comments in the Facebook dataset, out of 389 comments total, most of which were posted in response to one post, post 74. In the Twitter dataset, the NLA only had three comments out of 119 in the dataset. In contrast, the NLS had 27 comments out of 254 total comments in the Facebook dataset, over 10 percent of the total comments. In the Twitter dataset, the NLS had a total of 178 comments out of the total 785 comments, with 132 of those comments responding to user comments and 46 comments that were part of a thread giving further detail to the original post. Some of these threads were multiple comments long but others were only one extra comment. For example, the NLS replied to their post that shared an image of a large mixer and joked about whether it would fit in the bake off tent with;

'Image via Encyclopaedia Britannica, Ninth Edition, Volume 3 (Athens-BOI) EB.17, 1875 / #NLSDigitised - check out our digitised copies > https://t.co/m4DPMgxo2m?amp=1'

To provide more information about the image used.

Responding to questions

In five of the datasets, 'answering a question' was a dual motivation with 'responding to comment' for the libraries, with the exception being the LoC Facebook dataset.

In the LoC Twitter dataset, there were two comments dual coded in this manner, such as the user comment;

'I'd like to see a comparison of Dorothea Lange's and Ansel Adams' photos of internment camps'

On a post about photos by Adams in the LoC collection receiving:

> *'Search on Lange's photos (not a separate collection):*
> *https://loc.gov/photos/?q=japanese+%22dorothea+lange%22 Collection of Adams'*
> *photos:https://t.co/ZFibWVn640?amp=1'*

From the library.

Most of the library comments in the NLA Facebook dataset were in direct response to a user question. For example, the library responded to a question by a user in the comments;

> *'Will NLA accept pdf copies if we only have one copy of a family history? Not sure*
> *how this fits with copyright if we didn't write the book?'*

With

> *'Hi* [name]*, this can be a bit tricky in terms of copyright. If you contact our legal*
> *deposit team, they will be able to chat with you. Their contact details can be found here:*
> *https://www.nla.gov.au/legal-deposit :)'.*

In the NLA Twitter dataset, a few questions were given a direct response if no answer was received from other users. For example, a user commented on a post asking for donations to help digital preservation;

> *'hey, love these posters @nlagovau, but shouldn't this be done with tax dollars rather*
> *than crowdfunding? who is the responsible minister?'*

To which the NLA responded:

> *'Hi* [name]*, we want all Australians to be able to discover and enjoy their national*
> *collection. The government is supporting this work but, with over 10 million items in our*
> *collection, we can do more faster with a little extra help.'*

In the NLS Facebook dataset, eight of the library comments were dual coded with 'responding to comment' and 'answering question. This included where one user commented on a video of a choir singing in the NLS with;

'Is that in Latin?'

To which the NLS responded

'yes it will be. The choir book is digitised and you can see it here > https://digital.nls.uk/early.../archive/100214610*...'*

Another example shows the NLS responding to what could be considered a rhetorical question. One user responded to a post highlighting the NLS' exhibition on the Scottish Enlightenment (giving a list of some prominent men featured) with

'Brilliant but what about the women?'

The NLS responded with

'Hi [name] - *good point and we talk about this in the exhibition. Although they were excluded from universities and the legal profession women could also be active participants in clubs. The Fair Intellectual Club (1717) was the first recorded in Britain that promoted and celebrated female intellectual sociability. Women such as Alison Cockburn acted as the central hub for social interaction among the literati, helping to facilitate social bonds and providing alternative venues for intellectual debate.'*

In the NLS Twitter dataset, over 20 of the library comments were dual coded in the same manner. This included when the NLS responded to the user comment;

'Excellent! I'm wondering why also half of Salisbury? It _is_ the northern half, but still some distance from the border :-)'

On a post about new maps on the map service with;

'Our collection aim for these was Scotland, but the few south of the border were kindly donated to us :)'

With this exchange was typical of NLS answering user's questions in comments.

It was notable that in contrast to the above responses by other libraries, the LoC did not respond to user questions in the Facebook dataset. In most cases, questions asked by users in comments had no visible response from the LoC, with some only receiving other users crowdsourcing answers or sharing their own opinions. For example, in response to an image in a post about a pop-up exhibition for National Cherry Blossom Festival, a user tried to guess the painter of the image but no response was received. In another post, a user responded to the news of a technical outage by asking if a certain functionality was affected as they were having problems but there was no public response at all by the LoC to indicate the question had been seen.

Gratitude

The library expressing gratitude when responding to user comments emerged in three datasets, LoC Twitter and both NLS datasets.

Most of the library comments in the LoC Twitter dataset were coded with the dual motivation 'responding to comment' and 'gratitude', and all 15 of these comments were in response to comments on one post, post 1854, where the library responded to users expressing birthday wishes with comments such as;

>'*Thanks!*'

>'*Thank you! :)*'

And

>'*Our staff has always been our most valuable asset, cousin--just like yours is to you! Thanks for the kindness*.'

>Similarly, in the NLS Twitter dataset, most of the comments dual coded in this manner were in response to two posts celebrating the library's birthday, posts 133 and 134. These comments also followed the patter of

>'*Thanks,* [name]'.

In the NLS Facebook dataset, comments followed the same pattern as above but were in response to user comments such as

> ' *Love these images as part of the marketing campaign* 😲 😲 '

Where the user was commenting in the images used to advertise the current exhibition.

Like comment

The dual motivation 'responding to comment' and 'like comment' appeared in the three Twitter datasets, though to varying extents.

In the LoC dataset, only one of the libraires responses was coded in this manner. In response to a post announcing closure due to inclement weather and the postponement of an event, one user commented;

> '*So sad! Hope you don't wind up in Oz!*'

To which the library replied;

> '*Hmm… [contemplating life as the Library of Oz]…*'

With the square brackets and whimsical tone indicating the library liked the original comment enough to reply.

In the NLA Twitter dataset, two comments were coded in this manner. The first, in response to a user's tweet about an essay of theirs being in the library's collection was;

> ' 😊 ❤️'

Both positive emojis, while the second responded to the comment;

> '*That is, of course, if you define requested/visited as meaning you're physically in the building…*'

With:

'Correct :) there could be many different definitions for 'most visited' when it comes to the Library and our collections.'

Where the use of a smiley emoticon indicating the library liked the comment.

Half of the comments by the NLS in the NLS Twitter dataset were coded with this combination of dual motivations. For example, the NLS responded to the comment on a post in which the library asked users about kickstools:

'Love our 50th anniversary of @kikstep kickstool with quotes from literature. (from Glen Mills, Pennsylvania in the US) #kickstoolparty #LibraryLife' [Image 47 Image in user comment coded 'sharing relevant content' 2*]'*

Image 47 Image in user comment coded 'sharing relevant content' 2 (Rachel Kohl Community Library, 2019)

With

'Wow, this is spectacular! (with a gif of someone saying SPEC-TA-CU-LAR)'

Indicating that the library likes the comment. Many of the comments coded this way were in response to other comments to this post as well as to posts 133 and 134 celebrating the NLS's birthday, and many of the NLS comments contained similar gifs and positive emojis such as 😛 and 😊 .

Responding to feedback

'Responding to feedback' as a dual motivation with 'responding to comment' varied across the datasets and only appeared in the Facebook datasets.

In the LoC Facebook dataset, one comment was dual coded this way, where a user asked for caption for the livestream in the post;

>	*'It would help to have closed captioning.'*

To which the LoC responded:

>	*'Captions are available on the YouTube version of this event: https://www.youtube.com/watch?v=pK1R54PWmqg'*

Notable though is that since that question, the LoC now standardly includes that YouTube link with captions in the post of livestreams.

In the NLA Facebook dataset, similarly one comment was dual coded this way. A user responded to a post detailing the story of a well-known Australian figure with;

>	*'I think it gained popularity as a saying just because it's an amazing true story! Now tell a story about some indigenous person who is not nameless who we want to celebrate for NAIDOC week.'*

To which the NLA responded;

>	'[name] *thank you, we plan to* 😊'

With both the words and the smiling emoji indicating that the library was glad to hear this feedback.

In the NLS Facebook dataset, several of the comments were dual coded with 'responding to comment' and 'responding to feedback', often in response to users pointing out errors. For example, one user commented;

'Ferdinand, brother of Charles V, was not King of Spain'

In response to a post that highlighted a rare and interesting book and originally gave the wrong title to the Ferdinand mentioned. The NLS responded;

'Indeed - thanks for pointing that out, [name], and we've amended the post 👍'

with the words and thumbs up emoji indicating the library was grateful for the feedback.

Excitement

The NLS responded to some comments in the Facebook dataset by expressing excitement and joy about the comment. For example, in response to a post about an exhibition the NLS was holding, one user commented;

'[*Saving money since right now*]I MUST attend this exhibition!!! ɪᴛ ✈️ 🏴 []

To which the NLS excitedly responded;

'Yay!'.

Making a joke

In the NLS Twitter dataset, a small number of comments were dual coded with 'responding to comment' and 'making a joke'. For example, in response to a comment on a post on international cat day and showing a screenshot of the library 'cat' (catalogue), another library commented;

'But we thought our cat was purrfect 😼'

To which NLS responded with;

'Unfortunately we have sharper clause'

Showing a relaxed conversation that was full of puns.

Giving further detail

In the NLA Facebook dataset, one response from the library to a user comment was dual coded with 'responding to comment' and 'giving further detail'. The original post discussed the ship Cutty Sark, with one user commenting;

'I believe it was nearly completely destroyed by fire several year's ago and needs complete restoration'

To which the NLA responded with:

'Amazingly, the 2007 fire wasn't as devastating as initially thought. According to Royal Museums Greenwich's website: '90% of the ship in Greenwich today is original.' For more about the history of the ship, see https://www.rmg.co.uk/cutty-sark/history For details on damage caused by the fire, and the ship's restoration, see: https://www.rmg.co.uk/cutty-sark/history/cutty-sark-fire'

Which directly responded to the users comment and gave further information that was not in the original post.

4.5.2.2 Likes/other statuses

Question four in the toolkit revealed the that libraries did respond to some user comments using the like or other status reactions, often more commonly than they responded with comments.

In the LoC Facebook dataset, 29 comments received a like, again mainly in response to comments on live streams, and their twitter dataset, 32 comments in the dataset received a like from the library. Both numbers further added to the impression that comments were not often monitored.

The NLA responded to 62 comments on Facebook using the like reaction (with two receiving a love reaction), and it was notable that these were typically in response to comments that answered a question in the post or shared a relevant memory. In the Twitter dataset, the library liked 42 comments, approximately one third of the user responses. The number of

likes and reactions gave a better impression than the comments along that the NLA was monitoring comments, especially in the Twitter dataset.

In the NLS Facebook dataset, the NLS liked 41 comments while in the NLS Twitter dataset the NLS liked 269 user comment further adding to the impression that the NLS monitored responses to posts.

4.5.2.3 Other signs

There were some signs in the NLA Facebook dataset that some additional monitoring of responses was occurring even though no comment or status reaction was received. For example, one user commented;

'This is the proper link:https://bookshop.nla.gov.au/australian-books/home.do'

In response to a post about a sale in the NLA bookshop. The link was correct and reflected the comment at the time of data collection, indicating that although the comment received no response, the feedback was listened to.

Additionally, after a user asked about the possibility of captions for events and livestreams, the LoC routinely started linking to YouTube versions of videos and livestreams where captions could be generated for those that need assistance for following along what has been said, indicating some monitoring of comments and feedback was occurring.

4.5.3 Conclusion

The above sections shows that users are responding to the content that the national libraries are posting, as well as in some cases discussing the material with other users or sharing the content with friends, and that users were showing emotional reasons for responding to the content. Variations existed between the libraries, such as many of the LoC comments being shorter and less conversations take place in the comments of LoC posts than the other libraries, as well as the range of motivations for responding and the existence of dual motivations.

Motivations for responding were mostly positive and included liking content, gratitude, sharing relevant memory, appreciation and making a joke. Liking content was a predominant motivation in all the datasets and responding to comment as a motivation for commenting was also present in all datasets but more prevalent in the NLA and NLS datasets. Other common motivations for responding included responding to a suggestion from a friend, sharing a relevant memory, and answering question in the post. Gratitude as a main motivation was more common in the LoC datasets and was often aimed at famous musicians. There was also some variation between the platforms, for example sharing a relevant memory appeared as a main motivation in the NLA and NLS Twitter datasets but not their Facebook datasets.

Dual motivations for commenting were more common in the NLA and NLS datasets due to the longer comments and more conversations occurring. Dual motivations were present in the LoC datasets but these were often expressing admiration or gratitude alongside sharing relevant memories or liking content, especially notable in posts celebrating famous music artists. This contrasted with the other libraries' often more varied dual motivations including responding to others comments with aware of history around content or making a joke or sharing relevant memory as well as sharing relevant memory with answering question in post or thinking of image.

Negative emotions were rarely found in comments, though it was notable that in the LoC datasets negative emotions were often around the historical content in posts while in the NLA and NLS datasets comments were more light hearted and often around differing opinions such as on marmite or knitting with pet hair.

Additionally, analysis of the comments revealed the differing levels of response from the libraries towards their users, with LoC showing hardly any responses while the NLA answered questions and liked comments and the NLS interacted the most by liking and responding to comments as well as questions.

The observed differences in the libraries' approaches, as noted in 4.2.4 such as the use of more informal language or images as well as relevant images by the NLS and NLA, and the differing levels of responses from the libraries provide possible reasons for the differences

in user responses, for example more conversations happening in the NLA and NLS datasets, suggesting a more welcoming environment at encourages users to respond, alongside more dual motivations for commenting in those datasets with often more involved comments.

Overall, the analysis of user comments reveals differences that both indicate the strengths of the thematic discourse analysis and shows why the research is valuable and worthwhile. The toolkit shows a better reflection of the engagement of posts than just the response numbers by showing what users are connecting with, such as the history in today in history posts or famous musicians rather than simply just the news about famous musicians, as well as what sparks discussions, such as memorable events and content related to them, and why, such as users sharing their personal connections to the content. Analysing the comments of three different national libraries' posts allows for comparisons between the libraries that shows the results of the differing strategies used. This provides information for not only for academics to see what influences how users react to information encountered via social media and possibly why, including more evidence for the conceptual model used in this research, but also for the staff at national libraries to see what may work better for their social media presence and make better use of their time and resources spent on social media activities.

4.6 Conclusion

This chapter presented the results of the analysis of the posts and responses of both platforms in all three libraries in the study. The chapter also presented the results of the developed toolkit in the previous chapter and how it was applied to the datasets.

Analysis of the posts revealed the themes of library posts, as well as where the libraries were linking to and the relationship between the text and any image or video contained in the post. Libraries were revealed to more commonly link to places controlled by the library such as their website or other social media accounts. The content analysis revealed that libraries linked to; their own websites, their catalogue, blog posts, their social media as well as other social media pages and news sites with some posts containing no links. Statistical testing showed the NLS and LoC linked to different places on the different platforms while

the NLA links were similar on both platforms. One suggestion from this could be the larger number of posts on Twitter in the NLS and LoC datasets that did not contain links.

Content analysis of the relationships between the text and any image or video in the posts revealed that only a small percentage of posts had no image or video in the posts. Relationships of the image to the text mainly fell into either independent of the text, or complimentary with the text, with small numbers being subordinate to the text and the occasional post where the text was subordinate to the image. The LoC showed a different distribution of relationships on Twitter than on Facebook, while the NLA and NLS showed similar distributions across both platforms. One suggestion for the LoC difference were the large number of embedded links on Facebook which gave the library no control over the images posted. Comparing the relationships of the libraries against each other on Twitter and then on Facebook revealed that each library had a unique distribution of relationships, suggesting that each library had a different posting strategy.

Thematic analysis of the posts revealed a variety of themes from library centric themes such as library news, library events, collections, collection news, to other themes such as today in history, media coverage of library and responding to other social media. No one theme or group of themes were most prevalent, and statistical testing revealed the LoC and NLA had different distributions of themes across Facebook and Twitter, while the NLS had a similar distribution across both platforms. Further testing also revealed that the three libraries had different distributions of themes from each other on Facebook but similar distributions on Twitter.

The manual coding of the content and thematic analysis allowed for observations of different library strategies that were not apparent from the coding schemes of the three analyses. This includes the observation that the NLS used more informal language, such as jokes, and informal images, such as gifs and memes, in their posts while the LoC took a more formal and informational tone. Additionally, the NLA had a balance of tones but also ensured that each post on Facebook had an image in contrast to the LoC, especially notable on library business posts that were announcing downtime or closures, with the NLA choosing relevant images to accompany the posts while the posts on LoC were mainly dry

announcements. These observations are valuable as research from the literature review indicate they may have an impact on the user responses each library received.

Frequency counts of reactions revealed either no pattern in the distribution of the number of reactions or a Zipfian distribution, with smaller numbers of reactions more common. On Facebook, likes were more commonly received than the other newer reactions such as wow or love, while share and comments were present on both platforms. On Facebook, most LoC posts received at least one comment, whilst in all other datasets, only approximately 50 percent of posts received a comment. Zipfian trends were apparent in the numbers of comments received.

Statistical analysis of the number of reactions against the codes created in the link, image and theme analyses proved impossible as the conditions for chi-square testing could not be met, meaning a link between the number of reactions and the content of the post could not be determined. This inability to determine a relationship, coupled with the lack of informative patterns in the response numbers both lead to and justified the creation of a toolkit to analyse user responses more holistically.

The toolkit developed as part of this research was shown to based around five questions to be asked of each comment to understand what the comment was replying to, did it match the post, were there distinguishable emotions or motivations for posting and context that may influence the comment. The toolkit, seen in Appendix 4, was designed to be flexible to apply to any social media platform and requires no specialised training or equipment to run, thereby enabling anyone to use it, especially the target audience of social media managers looking to determine if their effort in social media is worth the response they get from users in a holistic way. The chapter covered each question with how the answers could illuminate user responses, such as determining if users were responding to the content or the organisation, sharing opinions, connecting with the content or discussing the content with other users as well as what motivated the users to respond to the posts.

The developed toolkit for thematic discourse analysis of the comments revealed what motivated users to respond to posts, as well as what they were responding to. It also revealed how the library responded to user comments. The content was revealed to be

what most comments were responding to, with comments also tagging other users or responding to an existing comment. Most of these comments matched the post, although some of the comments that tagged others were coded as not sure because there was not enough context in the comment. A small number of comments were responding to the library directly rather than the post, with these coded as not matching the content of the post. Table 8 below shows the main motivations present in the datasets alongside the most common dual motivations.

Table 9 Motivations and dual motivations for users commenting

Motivation	Datasets present in	Dual motivation	Datasets present in
Tagging other users/Thought user tagged would find it interesting	All	Like content	All
Suggestion from friend	LoC Facebook	Like content	LoC Facebook
Like content	All	Sharing relevant memory	LoC Facebook and Twitter, NLA Facebook, NLS Facebook and Twitter
		Gratitude	LoC Facebook and Twitter, NLA Twitter
		Appreciation	LoC Twitter, NLA Facebook
		Admiration	LoC Facebook
		Excitement	NLA Twitter
		Sharing relevant content	NLS Twitter
		Making a joke	NLS Twitter

Motivation	Datasets present in	Dual motivation	Datasets present in
Responding to comment	All	Like the comment	LoC Twitter, NLA Twitter, NLS Twitter
		Sharing a relevant memory	NLA Facebook and NLS Facebook and Twitter
		Gratitude	NLA Twitter, NLS Facebook
		Making a joke	NLS Facebook and Twitter
		Sharing relevant content	NLS Twitter
		Answering a question	NLA Facebook
		Suggestion from friend	NLA Facebook
		Aware of history around content	NLA Facebook
Sharing relevant memory	LoC Facebook and Twitter, NLA Twitter, NLS Twitter	Answering question in post	NLA Facebook and Twitter
		Thinking of image	NLA Facebook
		Gratitude	LoC Twitter
		Celebrating	LoC Twitter
		Admiration of person in content	LoC Twitter
Celebrating	LoC Twitter, NLS Twitter	Appreciation	LoC Twitter
		Admiration of person in content	LoC Twitter
		Making a joke	NLS Twitter

Motivation	Datasets present in	Dual motivation	Datasets present in
Asking a question and Responding to content	LoC Twitter, NLS Twitter		
Answering question in post	NLS Facebook and Twitter		
Making a joke		Responding to content	NLS Facebook and Twitter
Gratitude	LoC Facebook and Twitter	Admiration of person in content	LoC Twitter
		Appreciation	LoC Twitter
Admiration of person in content	LoC Facebook and Twitter		
Saying hello	LoC Facebook		
Appreciation	LoC Twitter		
Political agenda	LoC Twitter	Spam	LoC Twitter
Sharing relevant content	NLS Twitter		
Negative motivations	LoC Facebook and Twitter, NLA Twitter, NLS Twitter	Aware of history around content	LoC Facebook and Twitter

'Like content' emerged as the most prevalent motivation for responding in five of the datasets, and third most prevalent in the remaining dataset.

'Responding to comment' appeared as a motivation for responding in all six datasets, and additionally, question four in the toolkit, 'is there any context to the comment?' revealed that many comments also received a status response, such as someone liking the comment.

Comments dual coded 'sharing relevant memory' with 'gratitude' and 'celebrating' were notably in response to posts about the libraries' birthdays or notable figures celebrating the libraries.

Codes coded 'appreciation' were notably in response to posts featuring well-loved music artists.

Negative motivations for responding such as 'disappointment', 'disapproval' and 'doesn't like content' were present in four datasets but only in a small percentage of comments. In the LoC datasets, 'disappointment' was often in response to library closures while 'disapproval was in response' to historical figures and events. In the NLA and NLS Twitter datasets, the negative emotions were more light-hearted and in response to posts concerning marmite and knitting with dog hair.

Question four in the toolkit allowed for recording if libraries responded to user comments. Patterns varied across libraries, with the NLS most often replying to comments (often answering questions, responding to comments or expressing gratitude), the LoC barely responding to comments (with no direct questions answered) and the NLA responding with some comments (including direct questions) but also liking some comments.

The differing user responses can be accounted for by the differing strategies of the libraries observed in the content and thematic analysis of library posts, a difference that cannot be noted in the response numbers to the posts but is apparent in the comments themselves. This indicates the strength of the thematic discourse analysis approach for user comments, and allows for academics to better study online information encountering. More importantly, the analysis enables national libraries to better determine if their time and resources used on their social media are well spent or can be improved using some of the strategies observed on other social media accounts.

The next chapter will contrast and discuss the libraries differing responses and behaviours more explicitly to ensure the research questions are answered, as well as linking the results to existing research, discussing implications for practice, and suggesting avenues of future research.

Chapter 5: Discussion

5.1 Introduction

The previous chapter conveyed the results of the different analyses on the datasets from LoC, NLA, and NLS. This chapter will discuss those results in relation to the research questions. The research questions were:

1. In what ways do national libraries use Facebook and Twitter?
2. How can user engagement be analysed beyond response numbers?
3. In what ways do social media users respond to national libraries posts?
4. How do national libraries respond to user engagements?

Section 5.2 will connect the results to the conceptual model used to underpin the research. Section 5.3 will relate the results of the content and thematic analyses to other research and reflect on the ways that national libraries use Facebook and Twitter. The section will also contain personal reflections on the research methods and processes used as well as observations not strictly part of the analysis that were noted while performing the analyses. Section 5.4 will reflect on the traditional metrics of post engagement of the posts in the datasets while section 5.5 will reflect on the toolkit developed to answer research question two and how it functions. Section 5.6 will then reflect on the results gained from analysing user comments using the new toolkit and use these results to answer research questions three. Section 5.7 will use these results to discuss how libraries respond to user comments. Sections 5.3 to 5.7 will discuss explicitly the perception factors in the conceptual model that each section has an impact on, as well as linking the findings to existing research. Section 5.8 will reflect on the currency of the research while section 5.9 will reflect on the implications for national libraries social media practises that arise from the research. Section 5.10 will look at possible future research arising from this work.

Overall, the chapter discusses the main findings that the three national libraries in this study mostly direct social media users to webspaces they control, use images that complement the text of posts or enhance it, and post predominantly about themes that are directly related to the libraries and their activities. However, the libraries all responded to users

differently, with the LoC barely responding to comments or direct questions, with both the NLA and NLS liking comments and answering questions. The NLS also responded to other user comments such as user jokes about the material posted. These differing levels of responses had an effect on user responses, with more conversations taking place between users in the comments of NLA and NLS posts than in the LoC posts. Aside from this, users were responding to the content of the posts in all the datasets, predominately because they liked the content. Other major motivations for responding included sharing relevant memories of content, being thankful or appreciative of the content, or asking a question about the content. These findings can be used to help inform the libraries' social media practises, with a focus on responding to users and using informal language and tone to create user engagement. The toolkit developed to analyse user comments was shown to be a robust but flexible method of analysing user engagement that can be used by practitioner and academics alike for future research. The research also strengthened the conceptual model used to underpin the research by providing further evidence of the user perception factors that affect online information encountering.

5.2 Relating results to conceptual model

Stages from conceptual model used to underpin the research, the online information encountering model by Jiang et al. (2015) as discussed in 2.5.3.1 Conceptual model, can been seen in the research and results, with the research providing further evidence of the user perception factors that affect online information encountering.

As the research is based on specific social media posts and their interactions being analysed, the main pre-activities associated with the research were social interaction and browsing (such as when someone they follow shared the post into their feed or timeline) however, searching could happen, but this research would not uncover that due to only looking at posts on the national libraries' accounts.

The content and thematic analyses of the library posts relate to the stimuli and content processes in the mid-activities of the model, and the resulting codes show the type of information given, one of the constant factors in perception with influences what user interact with. The codes reflect what the library can alter in regards to stimuli and what

users are noticing. The wide variety of these codes, with the different themes, links, and images allow for some activity diversity, one of the constant user factors that influences user perception of content.

Other user factors affecting the mid-activities of the model such as intentionality, curiosity, sensitivity and expertise could not be reliably determined from the results as users were not interviewed and these characteristics were not determinable from the comments being analysed. Responses to the differing codes and differences in behaviour between the platforms give some insight into the activity diversity influence on responses while emotions and attitudes could be partially determined during the thematic discourse analysis of the comments. Jiang et al. (2015) report that positive emotions favoured encountering of information and this research supports that in that most of the comments received were positive, suggesting that those with happier emotions and attitudes at the time are more likely to follow through the encountering process.

Of the information factors affecting perception, sources can be hard to account for in this research because the reactions analysed are solely in response to national library official accounts, essentially one source contrasted with the multiple sources in the model. The focus on the national libraries also impacts the type of information analysed. Jiang et al. (2015) consider as type of information as such categories such as events, news, and celebrity gossip, and while some of these categories can be approximated by analysing the theme of the post, the types in this research are all very specific about the library so it does not quite reflect the wide variety of types of information in the model.

The relevance and quality factors can be assessed to some degree through the analysis of the user comments and the presence of traditional metrics. The presence of comments and shares suggest that users found the posts relevant or of high enough quality to respond or share the content with others. Analysing the comments gives more insight to what users judge to be relevant as comments were found to be sharing their own relevant memories, sharing relevant content or indicating why they were sharing the post. Analysis of the comments also indicated what users thought of the quality of the posts as users often mentioned that they liked the content or indicated their enjoyment or usefulness of the

posts. However, both these factors are dependent on user judgement so some nuance will be missing until users are questioned.

Jiang et al. (2015) define visibility as the extent to which a post can attract attention for example does the post contain images or appear at the top of a search or have hashtags. Whilst the use of hashtags or appearing in a search cannot be answered with this research, the impact of images on responses can be determined by linking the type of image-text relationship to the number of responses.

Both environment factors, time limit and interface usability, are hard to determine the impact of in this research as again they are user dependent. Some evidence of the impact of time limit could be gathered from the research as there are a wide variety of post sizes, from images to links to sometimes sharing of live stream events. However, there no apparent connection with how much content a post contains and engagement as some of the longer livestream posts from the LoC have high comment numbers but some of the NLA livestreams only have a few comments. Interface usability as a factor can somewhat be seen in the difference of comment lengths and the number of comments and reactions to a post on Facebook versus on Twitter, but this is more of a general platform difference than an individual's perception.

Traditional metrics give an idea of some of the post-activities in the model: the number of shares, the number of likes on Twitter, and number of comments can give an indication how many people are 'exploring', 'using the content' or 'saving' but these numbers show no real understanding of why users are undertaking these activities or any of the factors that affected their perception. The differences in these metrics on Facebook and Twitter can show some of the effects of interface usability and visibility especially in light of the algorithm mentioned further in section 5.4 Traditional metrics. However, the fact that samples are different means this is difficult to generalise or accurately analyse without an understanding of user dynamics or demographics.

The thematic discourse analysis of the comments gives further insights into user mid- and post-activities, especially whether users find the content useful or interesting, why they noticed the content, any thoughts they had when they were examining the content, and

why they were sharing or exploring the content. As mentioned above in the perception factors, this analysis also allowed for insight into perception factors by examining what emotions and attitudes were present, as well as the possibility of understanding the expertise of those users who were asking questions.

The research suggested possible additions to the post-activities of the model. The thematic discourse analysis of the comments revealed that people shared content they found interesting as well as content they found useful, leading to the suggestion that 'sharing' be added to both categories of content in the model.

The prevalence of 'sharing relevant memory', 'sharing relevant content' as well as 'making a joke' and other emotions such as 'gratitude' and 'admiration of person in content' as motivations for responding to posts suggests the addition of a new category. These responses do not fit comfortably within the other post-activities and given they are usually responding to the content, 'responding' is suggested as a new post-activity that could be appended to both interesting and useful content as user can be seen responding to useful content such as library business/closures as well as content they stated they found interesting.

5.3 What ways libraries use Facebook and Twitter

The results of this research address the knowledge gap identified in the literature review that there is no current understanding of the ways that national libraries use social media, especially Facebook and Twitter, thereby providing a key contribution to knowledge.

The first research question asked, 'In what ways do national libraries use Facebook and Twitter?' and the use of content and thematic analysis as described in Chapter 3: Methodology were designed to answer this by analysing the theme of the posts, where the posts were linking to, and the relationship between the text and any image in the content.

With some variance between the libraries and platforms, the three national libraries in this study were found to use links to direct social media users to webspaces they controlled, used images that either complemented the text of posts or enhanced it, all in posts that mostly directly related to the libraries, their collections, and their activities.

Links

The results as shown in section 4.2.1 Links show that if the post contained a link, the links were more often directing users to a library-controlled spaces than to an external source. While the exact numbers varied across platforms and libraries, this shows that the libraries are using posts on Facebook and Twitter to direct users to information on their own webspaces. This included both directly to relevant sections on the library website such as exhibition pages, blog posts, and catalogue entries for collections or items, as well as more generally to the catalogue, shop or website.

The small number of external links were shown to be mostly leading to external news sites, or the social media pages of a news site, that were covering library events or projects.

No other consistent pattern emerged as platform and library differences were too great.

When checking the links to analyse where they were linking to, it was noted that the LoC commonly used referral codes in their links that allow webpage owners to track which site visitors are coming from for example, https://www.loc.gov/item/prn-18-057/?loclr=fbloc with the letters after the question mark the referral code. Usage of referral codes was mixed in the other libraries but links that were embedded had a referral code automatically added by the platform. The NLA and NLS occasionally use the link short shortening service bit.ly, for example using bit.ly/InkedNLA for the link https://www.nla.gov.au/whats-on/exhibitions/inked-australian-cartoons?fbclid=IwAR10IGh7mbCQOOzAUFnC9Y4hDZahz2HpeIasbbiqbW0DVkc30Qv4xptrw7k.

The different codes and code usages for links show that there is some activity diversity and differing levels of visibility in the posts that can attract user notice. According to the conceptual model used in this research, this increases the stimuli and content for users to notice and examine, and therefore increases the opportunity for information encountering.

Further research including interviews with IT staff members at the national libraries or log analysis of their website traffic could give important information about whether users click through from social media links and if they do so, what links do they click on and what are

their behaviours once in library-controlled spaces. Further research directly with users in the form of interviews, surveys or diaries could help understand what links users like to see, and if different links affect their motivation to respond to the posts.

If repeating the content analysis of links, then the decision to separate out embedded links from non-embedded links would be altered, as the additional codes did not add anything to the analysis that could not be gathered from analysing the image-text relationship. The initial decision to separate out the links was taken after a pilot analysis of LoC Facebook data which contained a lot of embedded links, whereas a pilot analysis of other datasets with less embedded links would have encouraged a more general code set that was not as large.

Linking to other existing research is difficult, as analysing the link in posts does not seem to be common practice in library studies. Stvilia and Gibradze (2014) analysed the tweets of six academic libraries, finding nearly half contained a link and that there was a weak positive correlation between tweets that contained a link and the number of retweets a tweet received, but no analysis or mention of where the link lead was made. Peruta and Shields (2017) noted the presence of a link in Facebooks posts of US college and university libraries but not where the link directed. The numbers in that research differ dramatically from the overall numbers here as Peruta and Shields (2017) show that on average, 32 percent of posts were classified as a link post. This is in stark contrast to the number of posts in this research, with the exception of the NLS Twitter, where the number of posts without a link can partially be accounted by the number of posts responding to other social media. However, Peruta and Shields (2017) do not mention nor analyse the post enough to see if this is the same case in their research. The difference between that research and this may not be down to the slightly different time periods, as previous research on national libraries social media engagement (Hamilton, 2015) showed similar numbers of posts with links to this research, indicating that it could be a matter of the different library types causing different behaviour or that the libraries in each study may have had different social media policies.

Analysing the link seems to be the domain of health information research such as the Chew and Eysenbach (2010) research mentioned in the literature review, with research searching for sources of misinformation on pandemics. Whilst useful, that research and others analyse

social media posts from users who use specific hashtags, not from specific accounts or groups of users. Slightly more relevant is research by Yavetz and Aharony (2021) that analysed Facebook posts by Israeli government ministries and concluded that the majority of the links in the study were to internal Facebook spaces rather than official government webpages. That research contradicts the research cited by Yavetz and Aharony (2021), Mergel (2016), which is more in line with this research, in which interviews with social media managers in US government agencies stated they were often using links in twitter to direct users to their sites to learn more.

This tells us that link analysis, especially that of links from a specific account, is underutilised in the library and information field and gives nothing to compare the results of this research to. While this small sample size is valuable in understanding the behaviours of the libraries involved, the lack or other research means we cannot extrapolate the behaviours by other libraries, even that of other national libraries. Suh et al. (2010), Zhao et al. (2013) and Hamilton (2015) (as discussed in the literature review) shows the presence of links can affect the retweets a post gets, but if no analysis of links, even a simple one such as presence or absence, is done how can we understand the effect of social media on website traffic? How can we understand where libraries are directing social media users to, and how can a best practise approach begin to be formulated? These questions underpin the need for this analysis and indicate the need for further research, with a larger scale analysis of just links giving clearer detail about where other libraries are linking to and help determine if the link affects the traditional engagement metrics. Research with users could also help understand what types of links users prefer, and what makes them click on links, and if they click on links, do the comment on the initial post.

Images

The coding scheme used in the analysis looks at the relationship between the image and the text. This helps understand the way the information in the post is displayed, such as understanding if the text or image was a major component of the post and what in the post contained the information. This has major impacts on the visibility of the posts, one of the factors in the conceptual model that can affect the encountering process and increase user interaction with the posts.

The results of the analysis showed that no one type of relationship was most common across all libraries or platforms, and that the libraries had different distribution of codes from each other although the NLA and NLS had a similar distribution of tags on their Facebook and Twitter posts.

However, 'image and text complementary, enhancement' was more common in five of the datasets, indicating that the text enhanced the image or image enhanced the text by providing contextual details about the other.

The manual coding of the image-text relationship allowed for observations of differences in the images used by the different libraries. The LoC used a high proportion of embedded links which meant that the images were not chosen by staff but were randomly picked by the platform. This is in contrast to the NLA and NLS where most of the images accompanying posts were chosen, though they did use some embedded links but not to the same extent. Whilst most of the images created by the embedded links were fortunately relevant, especially on internal links where the linked page contained an image that was relevant to the subject, this was not always the case, especially when linking externally, and this disconnect may contribute to the shorter and less involved comments noted in the LoC datasets compared to the NLA and NLS datasets. The NLA and NLS both had slightly different approaches that showed more thought went into image selection with these approaches showing more engagement than the LoC received. The NLA had an image on every Facebook post (with only a small number of posts without images on Twitter and those were often responding to others on social media) including those that had no images in their LoC counterpart such as announcements about closures. The NLA images were archive images that had a connection to the post, such as a telephone exchange for a post about phone lines being down, and were clearly attractive to users as these images often had comments that were coded as 'thinking of image' and indeed that motivation for responding only appeared in the NLA dataset. The NLS approach included using some more general images in posts, with these often appearing as relevant gifs or memes (such as gifs of books or libraries often from television shows or films) which added to the more informal feel of the NLS posts. Additionally, the use of images that show views through one of the library's windows, as seen in the 'weather update' posts, further personalise the NLS social

media and attracted users who commented on the images often by sharing memories or making jokes.

This analysis helps us understand where the information in the post is, such as is it in the image or in the text or are both components complementing each other, thus helping understand the ways national libraries use Facebook and Twitter. This is especially apparent in the cases where the one of the components is more general to the other, such as the image more general where we can see that the image was clearly added as a visual stimulus rather than providing information, such as in the examples above where the generic but related images added to the feel of the post but did not add information. The fact that relationships where one of the components are more general is in the minority and, embedded links side, most relationships are complementary indicate that information in posts is presented in both text and image form and that libraries are using a full range of activity diversities to attract user attention. This is also important as images have been shown to have a strong impact on people with photo-elicitation used as a research method both generally such as that established by Collier and Collier (1986) and in information behaviour research as seen in Hicks and Lloyd (2018), with images found to sharpen user memories and explore memories and experiences in a variety of ways not always linked to the original message.

Photo-elicitation studies have been done on social media such as the already mentioned Hood and Reid (2018) and Albannai (2016), both of which use archival images to draw users in as well as Yung (2019) with more recent images of locations around a specific city in Macau. The images were found to start conversations and users shared details about the image that were not originally known by the original posters. Further considerations for the careful choice of images come from the marketing field which show that colour in an image is a factor that can influence what users engage with (Li and Xie, 2020, Wang et al., 2020, Liu et al., 2022, Cuesta-Valiño et al., 2023). Having a mixture of both items from the brand as well as users and staff were found by Hartmann et al. (2021) to influence both engagement with the social media posts and the total brand engagement, which aligns with this research as posts from the NLA and NLS that show a mixture of images including some behind the

scenes images as well as the more content driven images often generate more involved comments.

Additionally, Pinto et al. (2022) found that images that share location specifics, unique buildings as well as inspiring landscapes were more popular with users, which matches the finding here of how popular some of the NLS 'weather update' images of an area outside the main library location are, with users often leaving friendly and involved comments in response to these posts. This echoes Michael and Fusté-Forné (2022) which found that emphasising the uniqueness and novel setting of an institution through images can attract users to engage with posts. Whilst these studies apply to food, luxury branding and hotels research, they reinforce the importance of image selection as a way of drawing in users, and clearly indicated that spending time to select images carefully rather than letting platforms chose the images is in the libraries' best interest.

The issue of breadth of the nature of content of the national libraries archives and social media posts also makes the research harder to compare against some of the photo-elicitation studies or against smaller libraries or local history collectives such as the already mentioned Hood and Reid (2018) and Albannai (2016) which both have a narrower focus on a local history archive or archival images of one location, or Baxter et al. (2015) which shows the emotional connection people can have to the locations or people in images which is often because they know or know of the locations or people in the images. This means it can be harder for national libraries to generate the same level of responses to posts because as shown in those studies, those users often know or know of the people in the images whereas the breadth of material the national libraries can use means the likelihood of users having that personal connection is much smaller. However, the NLA shows that this is possible – the archival images they used can be related to by many and this is indicated by the 'thinking of image' and 'sharing relevant memories', as is the NLS use of images in 'weather update' posts showing the view of the library location. The occurrence of the conversations between users generated by these types of images shows that choosing the images carefully is a good use of national libraries time and effort, and the results of this research suggest it is an area at which the LoC could improve its social media practise.

Despite the fact that only a small number of codes from the coding scheme were actually present in the datasets, the coding scheme worked well with the data as, as stated above, it indicated where the information in the posts were, and also identified images that would be worth further investigation, such as those coded as enhancing or extension. The scheme also allowed for unrelated images such as reaction gif or memes, especially on Twitter, to be analysed as part of the dataset without adding otherwise unhelpful codes. Furthermore, the act of analysing the text and image to ascertain the relationship made performing the thematic analysis easier due to the increased familiarity with the data.

This research is important as it presents a step towards understanding some of the activity diversity and visibility that can be varied by libraries, which can attract users' attention according to the conceptual model as well as the thoughts that images can conjure for users as mentioned in the above section about photo-elicitation. The research is also important as it tells us if the images themselves are worth analysing further, for as discussed in the methods chapter the breadth of variety of the images can make deciding a focus of analysis difficult. The method would make that analysis easier as it can give an idea of images to exclude, for example, we can see images with the relationship 'image and text independent, exposition' were not chosen by the user, instead being generated by the platform from the link and could sometimes be just a header image from the linked website. It can therefore be argued that images with this image-text relationship are less likely to provide useful information for libraries to select images that could increase encountering and engagement. However, further research would be needed to understand if the visual stimuli and activity diversity from these not chosen by the library images are as impactful as images chosen by the libraries.

Research such as Hamilton (2015), Jones and Harvey (2016), Joo et al. (2018) have shown that the presence of an image can affect the retweets and interaction a post gets, with Zhao et al. (2013) confirming this and adding that posts with images can have a longer lifespan. However, the research only covers the presence or absence of an image in a post, underscoring the importance of this research to give further information about whether specific types of image-text relationships affect the interactions a post gets.

Further research interviewing staff members could analyse why images were chosen, especially in those instances where images were independent of the text, including gifs or embedded link images. Interviews could also understand where in cases where the image or text were subordinate to each other or complementary with each other, what was the original starting point for the post, the image or text.

As with the link analysis, a larger sample size just studying the image relationship could provide more generalisable results about how libraries use images in their social media posts.

Further analysis of certain types of relationships, such as 'image and text complementary, enhancement' and 'image and text complementary, extension' could indicate what about the image is enhancing the text or vice versa.

Research with users, whether in the form of interviews, surveys or diaries, could be performed to understand why users react with certain types of image-text relationships, or if they think the type of image and the image-text relationship is important.

Theme

The results of the thematic analysis revealed what type of information the libraries were posting, one of the factors that can influence what users pause to examine in the conceptual model that grounds this research. The results showed that no one theme or group of themes were most common across all libraries or platforms. Statistical testing of the theme code revealed that the LoC and NLA posted different distributions of themes in the Facebook datasets from their Twitter datasets, while the NLS had similar distributions on both platforms. Testing also showed that the libraries posting on Facebook had a different distribution of theme codes while on Twitter the distribution was more similar though there were small variations in the numbers of posts for each theme.

Unsurprisingly, themes that focused on the library such as 'library event', 'library business' and 'collection' were the main types of themes present in posts, with only three themes not immediately related to the libraries.

'Today in history' was a popular hashtag used by a variety of other social media users that the libraries took part in to highlight objects and collections in the libraries' holdings. The 'today in history' posts possibly could have been coded as 'collection' as most often the posts used an image of something relevant in their collection, or linked to a relevant exhibition or sub-collection, however the tone of the posts indicated that the item was specifically chosen to match the today in history theme. It was noted during analysis that many of these posts appeared on both Facebook and Twitter, with NLA and NLS having similar percentages of theme posts on both platforms, although LoC had a slightly higher percentage of the code usage on Twitter.

'Responding to other social media' was exactly that, though the theme was only used on Twitter datasets. Usage variations of the theme 'responding to other social media' also showed the differences between the platforms as the code was not used on Facebook at all. This could be explained by the differing ways the feeds work on the platforms, with responses on Twitter showing in the libraries' feed that the data was gathered from, while on Facebook, responses stay in the comments of the posts and therefore were not collected.

The other, 'weather update', only occurred in the NLS datasets. While seemingly unrelated to libraries at first glance, these posts shared an image from one of the NLS office windows of one of the local streets and always connected the image with a quote from an author or book and gave a more personable connection to the library.

Some of the percentage differences in themes between the platforms can possibly be attributed to the large difference in post numbers between the Facebook and Twitter datasets and the random nature of the sampling, as during analysis, as it was noted that in many cases the same posts occurred on both platforms. The shorter character limit on Twitter means that what could be contained in one post on Facebook takes several posts on Twitter, therefore skewing the results, for example, information about a collection item could be contained in one post on Facebook but may take several posts to convey all the information on Twitter. The random sampling could mean that some matching posts on each platform could be missed during the sampling.

Overall, the results of the thematic analysis can be related to Chen et al. (2012) where, as stated in the literature review, four broad categories of posts by libraries: information disseminating, knowledge sharing, communicating with users and knowledge gathering. Themes such as 'collection news', 'exhibition news', 'issues relevant to library', 'library business', 'library event', 'library exhibition', 'library news', 'library project', 'library resources', 'media coverage of the library' fall into the category of information disseminating. The themes 'article by library', 'collection', 'today in history' come under knowledge sharing, and together with the themes for information disseminating, these make up most of the posts by the libraries, in alignment with Chen's findings. Communication with users was a much smaller category of themes, with 'weather update', 'responding to social media', and 'job advert' falling into this category, which noticeably appeared more in the NLS datasets or in the Twitter datasets. None of the themes that emerged from the analysis fell into the knowledge gathering theme found by Chen, and whilst not strictly part of the thematic analysis, it was noted during the analysis that few of the posts asked users questions, with the LoC asking least of all, but the NLA and NLS asking for some responses from users, aligning with Chen that knowledge gathering is the least common type of post from libraries.

Whilst not strictly part of the thematic analysis, when looking at the posts to determine theme, certain trends were noticed within posts. The use of hashtags varied widely between the libraries and within posts in the same dataset. For example, the LoC generally did not use hashtags, however a small series of posts regarding photograph restorations and historical newspapers archives used hashtags that were used by others, suggesting that these posts were created by a different member of staff, for example:

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Image 48 LoC different staff members example 1 (Library of Congress, 2018f)

Versus the more common:

Image 49 LoC different staff members example 2 (Library of Congress, 2018i)

The NLS more frequently used hashtags, especially on Twitter, using a number of different ones to promote their posts, such as #Talking1980s as well as the more common #todayinhistory. For example,

Image 50 NLS hashtag usage example (National Library of Scotland, 2019e)

Variances in the formality of language were also observed during the thematic analysis. It was noted that the libraries had the mixture of formal and informal language used by public libraries as stated by Aharony (2010), though to varying extents. The NLS was observed to use the least formal language in posts, such as making jokes and the occasional emoji, which can be seen in these job advert posts from the LoC and NLS:

Image 51 NLS job advert example (National Library of Scotland, 2019a)

Against this one from the LoC:

Image 52 LoC job advert example (Library of Congress, 2018h)

The results of the thematic analysis primarily indicate what type of information is available to affect the noticing and examining activities of users according to the concept model the research is grounded in. However, differences in the theme usages also indicate some of the changes made to appeal to the activity diversity of users, especially themes such as today in history and weather updates being so different from library event or collection, as well as having a better chance of appealing to the differing levels of relevancy perception of users, with some users wanting information about events, others wanting more detail about the collection items highlighted, which again affect the activities of users that increase the chances of encountering information.

The research is important because it tells us the themes the libraries are deeming important enough to post about and is a large part of understanding the libraries' behaviour on social media. This research agrees with the literature review of other types of libraries, that the major themes discuss library events, library collections and other issues relevant to the library. Understanding the theme of the post is also the first step in determining what material users interact with more, as well as identifying any areas underserved by the social media of national libraries.

The open coding approach to the thematic analysis worked well, though some ideas for overarching codes were suggested from the other research. Further research could use the same coding scheme as the scheme was stabilised by the end of the analysis and proved to cover the wide selection of posts in the datasets. Overall, the coding scheme mostly aligned with other coding schemes, suggesting the robustness and validity of the codes.

The theme code alignment indicates that whilst differences exist between the types of libraries, national libraries are posting similar themes to the existing research in academic and public libraries as shown in chapter two. Whilst most of the other research does not use the exact same codes, as to be expected from the above-mentioned open coding approach used in this research, general categories seen in other literature such as such as 'library in general' did align with this research as the more specific subcategories such as library collections and library events were found in this research. Some of the themes in the research found could belong to several broader categories found in the literature review. Collection news, exhibition news, library news and library business could fall under the

category of either 'information about' or 'news or announcements' with library business also fitting under the category 'operational updates'. 'Promotion of services and events' could cover library resources, library exhibitions, library events, and collection.

Codes in this research such as 'article by library', 'media coverage of library', could fall under the 'other' category which fits with the small number of posts in these categories in this research and the small size of the 'other' category in the research found in the chapter two.

'Weather update', the theme that appears in only the NLS datasets, could also fit into the 'other' category, but given the fact most of these posts had multiple user comments with some conversations happening, this researcher argues that it falls more into the 'community building' general category. Similarly, the responding to other social media theme could fall into the 'communication' category, as well as the 'community building', however given the code only appeared on Twitter and generally was libraries quote tweeting in response to other users' tweets, often sparking further conversation, this research would argue that it too falls more into the 'community building' category.

Some of the smaller categories in the literature review such as general recommendations, study support, and technology were not widely seen in this research, highlighting a difference in the responsibilities of the different types of libraries as the national libraries have broader responsibilities and audience than public or academic libraries, which generally offer guidance on technology or study skills sessions to their smaller or more specific audiences.

Further research with both national library staff and social media users would provide deeper understanding of the themes posted by national libraries. Interviews with staff could uncover why they choose the themes and content to post and highlight, especially in regards to those posts that are using a popular hashtag. Questions to be asked could include whether the content was chosen to match a popular hashtag, or the content was chosen first and then waited until a suitable hashtag could be found, do staff notice if any themes are more popular than others, not just in terms of comments but in follow through to the library website.

Interviews with users, or a diary study could understand what themes users prefer to see from libraries or prefer to engage with, as well as what other themes they would like to see covered by the libraries.

So how are national libraries using Facebook and Twitter?

The results of the three analyses revealed how national libraries were using Facebook and Twitter. While the exact usage of the codes varied between the libraries and platforms, the same set of codes and thereby content and themes of material was found in all the datasets. This differing usage by differing libraries can be a good thing as it shows that the libraries are catering to their own audiences which may be slightly different due to the different demographics of the countries, as well as making use of the different platform characteristics.

Posts were linking to mainly internal to library websites or controlled spaces, often to library catalogues, and comparing the link analysis against the thematic analysis showed that links were consistent with the theme of the post. For example, posts coded as 'event news' were often linking to the libraries' webpages especially specialist sections if they had them, and similarly 'collection' and 'collection news' were directly linking to the libraries' collections on the catalogue.

Posts with no links varied a little from this. Posts from the LoC with no links on both Facebook and Twitter were often posts announcing library news such as closures whereas posts from the NLS with no links were often responding to other social media (especially on Twitter) or one of the NLS's weather update posts. In the NLA Twitter dataset, posts without links were often responding to other social media or sharing photographs from an event that had taken place, with posts on the NLA Facebook page without links were videos of livestreamed library events.

Overall, the libraries were using images to complement the text in posts, but some images were clearly added to posts to add visual stimulation, showing clear signs of the libraries attempts at increasing visibility and activity diversity, as noted in the conceptual model, to increase users pausing to examining the content. This is evident in posts where the image-

text relationship is coded as 'image subordinate to text, image more general', where the image was generally relevant to the text but could be interchanged with another image without affecting the information conveyed in the posts. In the NLA datasets, this relationship often appeared on posts announcing 'library business' with images from the collection for example of telephone exchanges for phone issues and broken equipment for other equipment failures, which was notably in contrast to the LoC announcements that had no image. In the NLS Twitter dataset, the relationship mainly occurred in posts where the library was responding to other social media (thematically coded 'responding to other social media') and often included gifs that seemed relevant through the emotions present in the gifs though this researcher was not always aware of the full context. In the NLS Facebook, and LoC Facebook and Twitter datasets, the more general images were either logos of events or general images of the person being discussed in the post, usually in posts coded as 'library event'.

Posts coded as 'library event' also had image-text relationships coded 'Image and text complementary, enhancement'. This relationship indicated that the text enhanced the image or image enhanced the text by providing contextual details about the other, for example in library event posts the text often provided context for an image or video of the event that could be open to multiple interpretations, or the image gave more context to the text description of an event, often by providing relevant examples of things covered in the event. The relationship was also notable in posts thematically coded as 'collection' where the text gave context to and enhanced the image of the collection item by providing further details and often linking to the object's catalogue page.

The other image-text relationship linked with posts coded thematically as 'collection' was 'image and text complementary, extension', where the text and images were complementary and either item explicitly provided new information about the other. Posts tagged with this combination of codes usually consisted of an image of an object from the collection explained by the text of the post. The relationship similarly appeared in posts coded 'today in history'.

The relationship 'image and text independent, exposition', used in cases where the image was independent from the text with some possibility of being related, was not associated

with any particular theme or links but did mostly appear in the subset of link codes where the link was embedded, most commonly in the LoC Facebook dataset.

Posts thematically coded as 'weather update' always had the image-text relationship 'image and text complementary, exposition', where the text identified the image, with all 'weather update' posts appearing in both NLS datasets. While seemingly unrelated to libraries at first glance, these posts shared an image from one of the NLS office windows of one of the local streets and always connected the image with a quote from an author or book and gave a more personable connection to the library.

No image relationship most often appeared in the LoC Facebook and Twitter, and NLS Twitter datasets though for different reasons. In the LoC datasets, no image generally accompanied library business themed posts such as closure announcements while in the NLS Twitter dataset, the posts with no image were usually thematically coded as 'responding to other social media'.

The choice of images in the posts by the libraries did seem to have an effect on user engagement as evidenced by the differing strategies of the libraries. The LoC with its many outsourced images from embedded links had shorter and less engaged comments and conversations in its datasets while the NLA and NLS with more carefully chosen images had more conversations and more engaged comments. This indicates that the careful consideration of images is much better practise, with the NLA and NLS's differing approaches further indicating that there are multiple ways to do this, such as by using relevant archival images (in the case of the NLA especially on announcement posts) or using gifs or memes with similar emotional or content tones to the content or images from the library itself (NLS). Whilst the broad nature of the archives, material and content posted was explained as being harder to draw people in due to the wide variety and less chance of a personal connection, both the NLA and the NLS still managed to draw users in using these carefully chosen images indicating that the time and effort to select the images is worthwhile and that connections can still be made.

Notably, the libraries also took part in the popular hashtag 'today in history' which was and still is used by a variety of other social media users and lead to the creation of the 'today in

history' theme code. The coded appeared in all datasets, most commonly in the LoC, with libraries using the hashtag to highlight objects and collections in the libraries' holdings. The tone of the 'today in history' posts indicated that the items in the posts were specifically chosen to match the today in history theme, hence the different coding from other collection items, and links in these posts were all internal, with most linking to either the objects' page in the library catalogue or to a blogpost or page on the website that covered the topic in more detail.

Differences in the ways that the libraries used Facebook and Twitter were highlighted by the theme code 'responding to other social media' only appearing in the Twitter datasets. This is possibly a result of the quote tweet function allowing for easy sharing and commenting on other social media posts, as well as the way responses to tweets on Twitter are shown in the timeline of the user who wrote them, and therefore in the dataset, whereas on Facebook user responses to posts remain in the posts and not on the timeline. This discrepancy between platform shows libraries taking advantage of interface usability to influence users' perception to increase the chances of information encountering.

Breaking the analysis of the posts into the threes part worked well to give an overall idea how national libraries used social media while understanding the component parts of the posts allows for understanding what users may be responding to. Additionally, the manual coding of the three analyses allowed familiarity with the posts that allowed for noticing trends beyond the scope of the analysis, such as the slightly more informal language and more community building terms used by the NLS and the differing use of hashtags, behaviours that may have had an impact (as seen in the literature review, especially in Aharony (2010)) on user responses to posts that were not officially part of the analysis.

Overall, the results reveal that the libraries are using different stimuli and content to engage with users and using the posts to engage in sharing knowledge, disseminating information and communicating with users, similarly to Chen et al. (2012)'s findings though the lack of posts gathering information from users indicates a missed opportunity in library policies to directly encourage feedback or solicit ideas from their audience. Linking to other library-controlled spaces and the focus on library collections, items and activities in the posts indicates that the national libraries are using social media to help meet their responsibilities

of preserving and promoting the nation's cultural heritage as well as providing reference services directly to users.

5.4 Traditional metrics

Looking at the traditional metrics of comment, like and share counts revealed little information about what users were responding to in the national libraries' posts.

Response numbers

Perhaps unsurprisingly given the larger follower numbers and larger population, the LoC has higher response counts than the other libraries.

The response number metrics themselves, as shown in appendix 7, generally appear in a Zipfian distribution, which has been found in other research such as Joo et al. (2018).

The research is in agreement with Peruta and Shields (2017) that the lowest energy reactions such as simply liking a post are most common. On Facebook where other one click reactions are available, these newer reactions are not as commonly used as like, with love the next most commonly used reaction. This aligns with Sumner et al. (2020) who found that the newer reactions required more user deliberation and therefore more energy to use, as well as being more open to interpretation than like or love, suggesting people are less likely to use them because of the ambiguity.

Some of the differences in comment and share numbers between Twitter and Facebook may partially be down to the fact that quoted tweets on Twitter, where users comment on a tweet by adding it to a new tweet of theirs, were counted in with retweets/shares and some people may prefer to respond that way and therefore their comment is not counted as a comment in response. Garimella et al. (2016) found that quote tweets can increase engagement and discourse indicating their presence is a good indicator of valuable content, but this research found it difficult and incredibly time consuming to distinguish quote tweets from retweets as this involved clicking on the list of retweets and manually clicking through and checking every incidence.

So how are users responding to national library posts?

The number of responses a post receives can indicate the effect of the perception factors controlled by the libraries can have on the post activities and therefor information encountering by users. This includes the activity diversity, the type and visibility already identified in the images, links and themes as well as differences in platform reactions possibly showing the effect of interface usability and visibility. This led to investigating if there was any relationship between response numbers and the identified post content and thereby understand what could be changed it increase engagement.

The number of shares, likes, comments can give an indication how many people are finding the quality and relevance of the content acceptable as well as how many users are 'exploring' or 'using the content', the post-activities in the conceptual model that indicate users found the information interesting or useful, but these numbers show no real understanding of why users are undertaking these activities or any of the factors that affected their perception.

Chapter four revealed that there was no statistical relationship between the number of responses a post received and any of the analysed content, and comparing this research to other research is difficult because of that and the way other research categorises engagement. Ibrahim et al. (2017) simply states that numbers of comments over a certain level are good, and other research in the libraries areas, such as Alsuhaibani (2018), simply added up the total number of responses in each category and compared totals.

The previously mentioned research regarding content and presence of link or image affecting the responses a post receives, such as Suh et al. (2010), Peruta and Shields (2018) and Joo et al. (2020), all had much larger sample size which may account for the discrepancy with this research. These larger sample sizes may have overcome some aspects of the algorithms used by Facebook and Twitter that influence what users see and mean some posts are not seen by users. Little is known about how these algorithms work or filter material due to the platforms careful guarding and confidentiality, meaning that there are factors limiting users seeing posts that are outside the libraries control. This does provide a limitation to the research and further evidence that relying on traditional engagement

numbers does not provide a fuller understanding of user engagement. Previously mentioned further research of analysing larger datasets with the content and thematic analysis against the traditional engagement levels could provide understanding if this discrepancy is the result of the algorithm or if the codes used in these analyses are too specific and need to be broader.

Given these lack of results, thoughts must turn to other factors that may account for some of the differing response numbers.

Yavetz and Aharony (2021) noted that government social media posts that said hello, offered condolences or other good wishes were the most commonly responded to, and this aligns with this research in that the posts that received the highest number of responses in this research were often library birthday posts, or certain livestream events with famous people, for example Dolly Parton hosting an imagination library event at the LoC.

Higher levels of 'responding to other social media' as well as 'weather updates' and 'issues relevant to libraries' can possibly account for the larger comment numbers for NLS as these align to Gruss et al. (2020) who found that event posts and community building themes as created more engagement. Furthermore, the NLS was observed to use the least formal language in posts, such as making jokes and the occasional emoji, which could possibly contribute to the higher number of comments in those datasets as Ponce and Cordelier (2015) found people react to emotions related to happiness, and Schreiner et al. (2021) found that emotion in social media can impact user engagement. Similarly, Lund and Wang (2021) found that posts involving human elements such as stories and accomplishments received the most interactions, which is borne out in this research such as the birthday posts, family history posts, and celebratory posts having higher responses numbers.

These influencing factors suggest that further investigation of the comments is warranted, showing the validity of research question two. This is reinforced by looking at the comments on the above-mentioned posts and noting that some posts such as local or family history posts have conversations occurring in the comments while others such as birthday posts are mainly users echoing the same sentiments. This may help understand why comment counts are not necessarily a reflection of library size and follower count.

5.5 How can user engagement be analysed beyond response numbers?

The research has shown that user engagement can be analysed beyond response numbers by using a lightweight framework of questions on each comment that can identify if comments are responding to the content, what motivates users to respond as well as context to comments such as if questions are being answered or if the comments are by the same users.

The framework and toolkit developed to answer research question two and shown in Appendix 4: Comment analysis toolkit was a major output of the research and represents a significant contribution to knowledge. It was shown to be a lightweight but robust and flexible method of analysing user engagement that can be used by practitioners and academics alike in any field that has a presence on social media, both for future research and for revealing the depth of user engagements.

Through use on the six datasets, the framework of five questions was shown to be a rigorous and repeatable method that gave further insight to the responses to the posts. However, the method is novel enough that further testing would be recommended to ensure robustness, but some robustness is given by the fact it was used on multiple datasets, and that the codes generated in response to the first two toolkit questions, 'what is the comment responding to?' and 'does the comment match the content of the post?' very closely align with those in Hood and Reid (2018), some of which are in turn adapted from Henninger and Scifleet (2016). Codes in response to the first question align with 'content' matching 'comment', 'tagging (content') matching 'comment mention', 'comment above' matching 'conversation' and 'library' matching 'request'. The second question answer codes of 'yes' and 'partial' align with 'direct' and 'indirect' content.

The toolkit itself has several advantages for use by both practitioners and academics as it is flexible, easy to use, and provides a deeper understanding of user responses including what emotions are present, what material is being responded to, and what conversations are happening. Additionally, the compact nature of the toolkit, one A4 sheet of paper in size, means it is easy to store or print and can be used on a wide variety of devices.

The flexibility of the toolkit partially lies in that the questions are not situation or social media type dependent meaning they can be applied to any type of social media post and its responses. Flexibility also includes the ability to have more than one motivation present, and not every question in the toolkit, such as context or anything else, needs to be answered.

The flexibility of the toolkit also provides an advantage over measuring response with more traditional content or thematic analysis as tone and multiple motivations or emotions can be considered as part of the response. This is because the toolkit allows for understanding depth of engagement with the content, such as comments that simply 'like content' versus more engaged comments that both 'like content' and 'share relevant memory'. The presence of these more engaged comments suggests a further, higher, level of engagement, 'involved comments' that require more effort from users than simple comments, in addition to the one and two click reactions of like and share, and general comment as described by Peruta and Shields (2017). Future research could explore this further, both by using the toolkit and by questioning social media users as there is currently very little research on this aspect of comments, with most research so far being sentiment, content or thematic analyses for example Alhassan and Pennington (2022), Whiting et al. (2019), and Jenkins and Moreno (2020). Furthermore, the toolkit also allows observation of when the content starts conversations among users, again a strong indicator of the depth of engagement with the content.

In addition to the flexibility of the framework of questions in the toolkit, the toolkit provides some tips for reporting results that can be adapted to specifically what practitioners are looking for, such as reporting on content that causes users to give detailed involved comments, what content is inspiring users to share memories or other content, or where conversations start between users. More importantly, patterns in the organisation/account owners' responses to direct questions and users can be tracked to identify practices that could be improved upon or demonstrate good practice to others in the organisation. These same reporting details can also be used in academic research, much like this research, to analyse multiple datasets of posts and user comments across different organisations or

influencers to compare behaviours both by account owners and in different areas of social media usage.

The ease of use of the toolkit is demonstrated in how lightweight the framework is and the fact that no specialist software is required, indeed analysis can be done with pen and paper, and can be performed on as many or as little posts as the analyst has the time or requirements for. Whilst the data for the analysis in this project was gathered via API access and the NCapture plugin, with difficulties described in chapter three, organisations or individuals looking to analyse their own posts can more easily access their own data either by API access (without the permission issues now present on Facebook) or by going directly to their own accounts depending on the scale they want to perform the analysis on. This aspect of the toolkit is especially relevant to social media practitioners that may not have access to the resources or knowledge to perform other analyses, with the main cost associated with the analysis being staff time. This also means that practitioners can analyse competitors' social media easily as well to compare their engagement and usage to see if they can learn lessons or keep up to date with trends (as is advised by many social media research and discussed later in 5.9 Implications for practice).

Furthermore, while linguistic tools were used to analyse the comments as described in 3.3.4 Thematic discourse analysis, no formal or specialised training was required meaning non-academics or non-specialists can perform the analysis, especially if they already have critical thinking or analysis training. The analysis was also qualitative in approach meaning that those with more familiarity of the nature of the users responding may have better insight than a researcher in a different country, for example variations in emoji usage, differences in the exuberance of users' language or political nuances.

Academics could further take advantage of the flexibility of the toolkit to investigate different areas of user engagement with posts such as looking for particular motivations for responding that are more context dependent, identifying comments with specific relationships to the content, understanding user relationships both with other users but also with the organisation or content creators (especially in the case of studying the effects of social media influencers) as well as what content is starting conversations over multiple datasets. The toolkit can also be used to compare user responses in different areas outside

the library and information science field such as business and marketing exploring the response to brands or social media influencers selling items, as well as politics exploring responses to political party posts, or news/commentators accounts about elections or other political changes. The toolkit could also be used in the health information field or misinformation research to see how users respond to the information/misinformation or if behaviours differ between authoritative sources such as health or other expert organisations and more social based pages such as bloggers, podcasters and influencers. The toolkit can also be used to supplement the use of sentiment analysis of comments in research such as Alhassan and Pennington (2022), with sentiment analysis using machine learning be used to identify comments that could be investigated further using this toolkit, for example analysing just negative comments to see what upset users or neutral comments to determine if the users could be swayed or did not comprehend the content.

In conclusion, the framework of questions and toolkit generated as part of this research provides a quick, flexible, and rigorous method to analyse user comments and engagement on social media posts, one which can be used by practitioners and academics alike to understand what users are responding to, where conversations occur, what motivates users to respond, and how account owners respond to users.

5.6 How are users responding – comment analysis

On both platforms in the study, users were found to be responding to the content of national libraries posts, with one of the most predominant reasons for responding was they liked the content. Other major motivations for responding included sharing relevant memories of content, being thankful or appreciative of the content, or asking a question about the content. One major difference between the libraries was that more conversations were taking place between users in the comments of NLA and NLS posts than in the LoC posts.

What are users responding to?

One of the strengths of the toolkit is that it can distinguish what the comments on a post are responding to. Rather than simply rely on total comment counts, the comments that are

responding to the content of a post can be differentiated from those that are responding to the library or those that are part of a conversation, thus ensuring libraries can understand what users are engaging with, and understand what material starts conversations and further builds their communities.

Section 5.5 How can user engagement be analysed beyond response numbers? noted that the codes developed in response to the first question in the toolkit, 'what is the comment responding to?', were in alignment with previous research by Henninger and Scifleet (2016) and Hood and Reid (2018), with comments remarking about the content, mentioning or tagging another users, part of a conversations or making a request of the page itself. This research found similarly to Hood and Reid (2018) that comments on the content made up the majority of the comments while comments responding to the libraries were only a tiny fraction and the tagging of other users and comments made up the rest. Codes developed in response to the second question 'does the comment match the content of the post?' shared some alignment with Hood and Reid (2018), though Hood and Reid's further narrowed the code in this research as matching the content into direct content and indirect depending on how closely the comment matched the exact context of the content. Meanwhile, associate content mostly aligned with the partial code used in this research. Comments coded as partially matching the content were often part of a conversation, usually with users sharing relevant memories, with the initial comments matching the content but comments afterwards veering slightly from the exact content, usually into differing details in the memories.

More conversations were apparent in the comments of the NLA and NLS datasets than the LoC datasets. This was partly users talking amongst themselves, such as in the NLA datasets when they were talking about relatives or sharing relevant memories, usually in response to today in history posts, as well as partly the NLS responding to questions and user comments, especially in the NLS Twitter dataset. Longer conversations generally occurred more on Facebook, which could be due to the lack of character limit on Facebook more easily allowing more detailed comments and conversations. One other difference between the platforms was the higher number of tagging comments on Facebook in comparison to Twitter where only a few response comments were tagging other users. Given both

platforms have share options at the bottom of posts that can share privately in messages, there is no apparent reason for the public tagging in comments occurring more on Facebook than Facebook and there appears to be no current research that compares them or even studies the phenomenon on Twitter, giving rise to another avenue of future research on users.

It was notable in the comments that were responding to the library, aside from the number were further coded as spam, especially in the LoC datasets, the comments appeared to be users responding to the most current post available at the time to ask questions, but further research with users would help be more certain about this.

What motivations are present in user comments?

Section 4.5.1 User comments presented the main motivations found for users responding to comments, with examples from each dataset the motivation was common in (see Table 9 Motivations and dual motivations for users commenting for an overview). The top three motivations from each dataset were similar with 'like content', 'thought user tagged would find it interesting', 'sharing relevant memory', 'responding to comment' and 'gratitude' among the most commonly seen motivations. Most motivations were positive in tone, with comments coded with neutral motivations such as 'responding to comment' and 'sharing relevant memory' often showing positive language in the comments. Negative motivations such as 'disapproval' and 'disappointment' were present in very small numbers, often in response to unexpected closure announcements or unsavoury historical events.

During the analysis of the comments, it was noticeable that while the LoC Facebook had large numbers of comments coded as 'like content', many of these comments consisted of only one or two words and were shorter than comments in the other datasets. This difference could account for the fact that the LoC Facebook dataset had less dual coded comments than the NLA and NLS datasets. Additionally, the comments in the LoC Facebook dataset that were dual coded generally clustered in response to several posts, such as a livestream event with Dolly Parton where many users were expressing their 'gratitude' and 'admiration' of Dolly Parton as well as liking the content. Whilst the same effect of comments was not noticed in the LoC Twitter dataset, again many of the dual motivated

comments clustered in response to posts from other famous musicians such as Smokey Robinson and Tony Bennett announcing music of theirs was being inducted to the LoC National Recording Registry, with the comments coded as 'sharing relevant memory' with 'gratitude', 'admiration' and 'celebrating'.

Datasets for the NLA and NLS showed comments with a wider range of dual motivations, with some confirming where conversations were occurring, such as the pairing of 'responding to comment' with motivations such as 'sharing relevant memory', 'gratitude', 'making a joke', and 'answering a question'.

Notably, 'saying hello' as a motivation was only present in the LoC Facebook dataset and even there was only in response to posts that were livestreaming events. The NLS did not livestream events, and the NLA only livestreamed a few lectures which can account for the differences. The presence of the motivation indicates that users still want engagement with events and interact with them even when the events are virtual. However, much of the research or literature in this area so far is focused on creating engaging virtual events or focusing on gamers who are livestreaming, not the users who are responding, suggesting a possible area of future research.

Another notable trend that emerged during the analysis of the comments was that users asking a question was a major motivation in two datasets, LoC Twitter and NLS Twitter, though with a small number of questions in all the datasets, with the responses different in each dataset. In the LoC dataset, questions either went unanswered or were answered by other users, while in the NLS dataset, although other users did answer questions, most also received a response from the library as well. This pattern was repeated in the other datasets with only a small number of questions, with the NLA also answering the small number of questions.

The high number of direct sharing by tagging people implied that people gave thought to who they were sharing the content with and didn't just hit the share button to post on their own timeline. The motivations for these direct share comments were coded as 'thought user might find it interesting' with comments in response coded 'suggestion from friend'. The context field also revealed that some users being tagged responded by liking the

comment, rather than commenting. Not every user tagged in this research responded publicly, aligning with Ha et al. (2017) about tagging behaviour and responses, and that tagging can further share information beyond the libraries' followers.

The motivations that are revealed in this research align with the users motivations uncovered in other research in chapter two, such as Ames and Naaman (2007), Stvilia and Jörgensen (2010), Stvilia and Gibradze (2014) Oh and Syn (2015), Syn and Oh (2015), Kipp et al. (2017) and Gintova (2018).

The presence of the motivation of the dual motivation 'making a joke' and 'responding to content' in the NLS datasets backs up Jiang et al. (2019a) finding that about humorous stimuli being a good influence for users encountering information and responding, especially given the higher levels of engagement the NLS received.

Savolainen (2015) used content analysis to determine the roles of emotions involved in online information seeking, determining what emotions were present in an online discussion forum, suggesting that this type of analysis could be a starting point for understanding user emotion in comments. Emotions such amusement, contempt, pleasure, and worry were present, with a 42/58 split of positive and negative emotions found. The research also found emotions were more present in posts where users were sharing their opinions or sharing information.

So how are users responding to national library posts?

During the analysis of the comments by users, two overarching themes emerged. Comments were mostly positive in tone, with positive motivations for responding, and the responses were shown to be mostly engaging with the content in the post rather than primarily using the social media platforms as an additional means of communication with the libraries.

The context column of the toolkit analysis revealed that that some users responded publicly to being tagged by other users, either responding to the comment or liking the comment, while others had no response. The same column also revealed that there were some conversations in the NLA and NLS dataset where the users gave more than simply comment and response.

Some other trends emerged during the analysis of the comments, such as users often 'sharing (usually positive) relevant memories' in response to 'today in history' posts, and users generally answering questions libraries' ask in posts, such as the NLS asking users their favourite reading spot, or the LoC asking what images users would use from a linked collection.

While the LoC had the highest number of comments, this was partially due to the number of people simply saying like content or saying hello in response to live streams so it can be an indication that the high comment count does not tell the whole story. This is also reflected in the other libraries having more comments with dual motivations and more comments that contained more than one or two words.

As mentioned in the last section, the comments in the NLS posts had a much more relaxed feel due to the high number of jokes being made, especially as the NLS often responded to these. This relaxed feel could indicate why the NLS had a higher average of comments than the NLA and is nearly as high as the LoC despite not having the livestream posts with large numbers of comments or other outlier posts from famous musicians.

The presence of posts that received much higher levels of comments than the others occurred in all datasets, although they were most obvious with dramatically higher counts in the LoC datasets. The presence of these posts was expected as other research such as Winn et al. (2017) found similar posts. Their presence also echoed Palmer (2014) observation that there are mainly two types of posts; those with no comments, and those with large numbers of comments. The outlying posts themselves in the LoC datasets were from the already mention famous and beloved musicians such as Tony Bennett, Smokey Robinson, and Dolly Parton, with the comment analysis revealing that many of the comments were very similar, such as saying hello, saying thank you or admiring the person. Meanwhile in the NLS datasets the posts were celebrating the birthday of the library, which had similar comments expressing happy birthday, and also rather randomly a post conducting a discussion about kickstools that many users were involved in and sharing different recollections and images of kickstools. The outlying posts in the NLA dataset were less outlying than the other datasets but did involve conversations about relatives and historical buildings in response to a 'today in history' that discussed a famous robbery.

The research revealed that users responded to posts for mostly positive reasons, and often shared relevant memories and interacted with other users. Liking the content was a major motivation for responding in all six datasets, with responding to comments, expressing gratitude and thinking others would find it interest also main motivations. Motivations for responding were found to align with other social media research, including research on the LoC's Flickr activity as seen in Kipp et al. (2017) as well as other governmental organisations such as Gintova (2018), with motivations such as emotional reactions, personal opinions, responding to others, socialising and sharing knowledge. There were some differences in the exact motivations between the libraries, with some conversations occurring in the NLA comments, and more in the NLS datasets, while not many in the LoC datasets. The LoC datasets had higher numbers of celebratory and gratitude comments than the others, due to the above-mentioned outlier posts. The main interface difference between Facebook and Twitter in comments was the length of comments, as Twitter has a limited number of characters users can use while Facebook does not, however, this did not generally impact behaviour as many of the Facebook comments were also short, with only some for sharing relevant memories as part of a conversation, mostly on the NLA Facebook dataset, being longer. For the LoC and NLA there were less comments on Twitter than Facebook, but further research would be required to see if the platform differences caused this as nothing emerged from the motivations. Observations noted in the content and thematic analysis about the libraries' different posting strategies were reflected in the user responses. The NLS used a more informal tone in posts as well as occasionally using gifs or memes as their images and received comments that were making jokes in response, with this type of comment only appearing in the NLS datasets. The NLS also included a less obvious theme for posts, 'weather update', which contained an image out of one of the library windows and personalised the posts more, with users often responding to these by sharing excitement or relevant memories. The NLA was careful to chose images to accompany every post, even closure announcements, and these archival images often received comments coded as 'thinking of image', a code which only appeared in the NLA datasets. In contrast, the LoC embedded links which meant that images were often selected by the platform and therefore not always relevant. Different strategies extended to how the libraries responded to comments, with the two libraries that responded the most, the NLS and NLA, having more conversations both between users and between the user and the library with the

second largest motivation for commenting in both NLS datasets and the NLA Facebook dataset being 'responding to comment'. Notably some of the NLS responses were jokes back to the user, with both libraries answering user questions. Additionally, these two libraries shared user comments to their timeline on Twitter, as noted in the thematic analysis, and this added to the engagement levels. Comments to these two libraries were also noticeably had longer and more involved and more often had dual motivations such as 'like content' and 'sharing relevant content/memory' or 'responding to comment' and 'sharing relevant memory'.

The comment analysis revealed that the greater comment counts in the LoC datasets were in response to a few mentioned posts, all livestreams including Dolly Parton events or retweets of famous musicians, with many of these comments expressing gratitude, appreciation and admiration for the musician or simply saying hello in response to the livestream, with many comments shorter and singly motivated. Comments coded as 'saying hello' or 'admiration or person in content' only appeared in the LoC datasets and were in response to these posts.

These results indicate that the effort of the different strategies has different effects on users, with engaging more by responding to comments and retweeting other user comments, choosing material such as the images carefully, making jokes or keeping language informal increasing the engagement of users, both in terms of comments numbers as seen in the NLS Twitter dataset, but also in the number of conversations taking place in response to posts. This is important because as established in the literature review, if done well social media can be a valuable tool for spreading information, influence user behaviour towards the organisations with increased trustworthiness and positive associations, as well increase the reach of an organisation and the number of visits to a location either physical or digital. This research argues that the NLS especially and the NLA are making better use of Facebook and Twitter by using these different strategies and connecting with users and therefore showing increased engagement. The research also finds that the LoC could do better by using a mixture of less formal language, selecting images instead of embedded links, and most importantly responding to users, whether that be by commenting, liking comments or retweeting user comments.

Overall, the research demonstrates that users are engaging with national library posts in multiple ways. Users are not only responding to the content, but often connecting to the content by sharing relevant memories and personal connections, making jokes and expressing their gratitude and admiration, and in many cases forming connections with other users by sharing their personal memories and partaking in conversations, though these connections vary with the LoC datasets showing less than the NLS or NLA datasets. This corresponds to the NLS and NLA having more comments that were described in section 5.5 How can user engagement be analysed beyond response numbers? as 'involved comments'. The sharing of personal stories, and in the NLS's case the making of jokes, suggest that the users find the libraries trustworthy and good sources of information, and that users have overcome ay anxiety they may have had regarding the institutions. The lack of negative emotions and motivations, in contrast to much other research on social media, also suggests that the national libraries are held in high esteem by users and reflects well on the libraries' social media use.

The analysis of the comments revealed multiple aspects of users' perception factors from the conceptual model, as described in 2.5.3.1 Conceptual model, that impacted how they encountered the information in the posts, as well as revealing some of the post-activities that users partook in.

Emotions and attitudes were two of the user factors that the model showed affected perception of content and influenced users to notice and examine content, with the thematic discourse analysis of the comments in this research agreeing that these were two important factors for users engaging with content. Emotions such as gratitude, excitement, amusement, appreciation as well as generally moved by content and liking content emerged from the comment analysis. Overall, most of the motivations for responding were positive, indicating that the users commenting and encountering the content had an attitude that was willing to encounter information, which aligns with the findings in Jiang et al. (2015), with the presence of responding to comment, answering question and answering question in post as motivations also agreeing with the attitude of users willing to encounter information.

Quality and relevance of information are information factors affecting perception which are indicated in the research by what posts users chose to respond to, what users say they like, or say thank you for, with users decided the quality is good enough for them to pause and examine and furthermore comment on, indicating the information is either interesting or useful to them. Relevance is also indicated by the presence of the codes sharing relevant memories and content as clearly users think the content is relevant enough to them to share personal stories or content they like. Relevance is also shown in the use of the tagging (content) in the responding to question, as use of the code indicate that users think the content is relevant for both themselves and others to interact or examine. Furthermore, the code provides evidence of users post encountering activities in that it shows users are using the tagging function to share the content with specific users.

Visibility as a perception factor can be seen to influence some users to encountering the information in posts due to the presence of the code 'thinking about image'. While not a predominate motivations, the fact it exists further cements the conceptual model as the right choice for underpinning the research.

Differences in platforms behaviours can give some insight into the effect of interface usability (an environment perception factor) on users encountering the posts. While for the most part the main motivations for responding were the same on both platforms, it was noted during the analysis that comments on Facebook were longer, especially when sharing relevant memories, in line with there being no limitations of comment length of Facebook like there is on Twitter. This may have had an impact on the number of conversations on Twitter as both the LoC and NLA had less conversations, while on the NLS, conversations did take place, but responses were short, and the overall conversations were only an initial comment and a response. Therefore, it shows that the longer character limit on Facebook is more encouraging to the post-activities in the model.

The use of the 'partial' code in response to does the comment match post the post indicates some of the post-activities users are participating in as its use generally occurred when a conversation started based on the content but veered slightly. This can indicate users 'exploring' the content, or 'using' depending on the exact nature of the conversation.

Analysis of the user comments using the toolkit is important as it allows for deeper understanding of what users are engaging with, and often why they are engaging, than simply relying on comment counts. This is especially notable in noting the differences between posts that have a lot of comments but commenters are repeating the same sentiment, for example the LoC birthday post where users are wishing the library happy birthday but no conversations or much personal recollections are being shared, and posts that do not have as many comments but have conversations and community building occurring in the comments, such as the NLA post discussing an historical event where commenters are discussing family members recollections of events and exchanging comments and adding details to others.

The analysis also allowed for determining where users are asking questions in the comments, allowing libraries to identify where they are not providing enough information or what kind of other details users are looking for. Additionally, it allows libraries to see if they are responding to these user questions, or are other users crowdsourcing answers, thus gauging how the public sees the library engagement, which has been shown previously to affect overall user engagement.

The toolkit analysis worked well for the research, enabling a deeper understanding of how comments related to the posts they were responding to, and while not all columns/questions were utilised in every comment analysis, the extra questions for context and anything else allowed for the observations of patterns that might not have been otherwise apparent, such as library responding to comments by liking them, tagged users responding to comments either in a comment or by a reaction, and the same user posting a string of comments or taking part in a conversation. Manually coding the comments also allowed for noticing trends such as comments in response to 'today in history' posts often having 'sharing relevant memory' as a motivation for commenting.

Future research to build on this research could apply the toolkit to more comments on different datasets. With differences such as different national libraries, different social media platforms, and newer timeframes, as well as other types of libraries or public governmental organisations, not only would the robustness of the toolkit be proven, but also differences in user behaviour across different platforms, libraries and over time could

be studied, allowing for more understanding of what content users respond to in different spaces and their motivations.

The analysis of the user comments shows there is clear scope for research that further investigates user motivations in addition to section 5.3 What ways libraries use Facebook and Twitter which mentioned conducting further research with users directly, whether in the form of surveys, interviews or diaries, to better understand their preferences to the content in the posts. Further and supplementary research should include ask users directly why they comment on the posts, why they tag other users as well as participate in conversations, what motivates them to post more involved comments, and what they do with the information in the posts after they comment. Answers could also be gathered from users being tagged to understand that if they display no public response, do they acknowledge the tag in another way. This would lead to understanding if the motivations or emotions coded in the analysis match up with what users describe, as well as what other factors influence them to comment. These could then be checked for alignment with the other factors noted in the conceptual model as affecting behaviour as well as allowing comparison with the different post-activities in the model.

5.7 How are libraries responding to users

Overall, the libraries were found to respond to users differently, with the LoC barely responding to comments or direct questions, and both the NLA and NLS liking comments and answering questions. The NLS also responded to other user comments such as user jokes about the material posted.

Analysis of the comments revealed that the three libraries responded differently to users. The LoC publicly responded to users the least, in many cases not even answering direct questions from users, while the NLA answered direct questions and often liked user comments, and the NLS responded most often, answering direct questions, liking user comments and responding to other comments.

Section 4.5.2 Library comments and responses gave some examples of the exchanges where libraries responded to users and the dual motivations present and indicated that not only

did the response rate between the libraries differ, the types of responses also differed. For example, the LoC responses on Twitter were mainly expressing 'gratitude', with the bulk of the comments saying thank you in response the comments saying congratulations or happy birthday on library birthday posts. On Facebook, the LoC tended more toward 'giving further detail' as a dual motivation, with four of the nine comments giving an update on livestream issues. This is in contrast to the NLA on Facebook, who with the same number of comments as the LoC, answered questions in half of their comments, one of three comments on Twitter were in response to user questions. The NLA did show one further dual emotion in the Twitter dataset, with 'like comment' appearing in the other two comments.

Meanwhile, the NLS in both datasets had a wider range of dual motivations for responding to comment, with the already mentioned 'giving further detail' used in both datasets to expand on post content, 'gratitude' expressed in response to birthday wishes, with much higher rates of 'answering question' and 'like comment' than either of the other libraries, something achievable with the higher number of comments from the NLS. Additionally, the NLS expressed 'excitement' in response to user comments and often responding with a joke, something the other libraries did not do, indicating a level of ease with users that seemed to encourage users to engage more.

The libraries did take advantage of the platform differences that allows Twitter users to respond to other social media by retweeting or quote tweeting user comments. These responses were coded in the thematic analysis of the posts since these responses appeared as Twitter posts and were coded as 'responding to other social media'. Like with other responses, the LoC hardly did this with just under two percent of posts in the sample responding to other social media in contrast to the NLA's 15 percent and the NLS's 29 percent, further proof of the NLA and NLS engaging more with users and being active in their social media monitoring.

Use of the toolkit, especially with the contextual component, to analyse comments worked well as it allowed further understanding of library responses beyond the simple presence of a comments. This mainly included noting what comments were liked by the libraries, with the occasional love reaction on Facebook, with a clear trend of the NLA and NLS often liking comments in cluster with later comments not always receiving the same response,

indicating there was time limits on the libraries monitoring. The toolkit of analysing comments in comparison to the post also allowed for other contextual signs of library responses to be noted. This included seeing user comments mentioning spelling mistakes or wrong links that by the time of the post analysis had been corrected, indicating that the library had seen the feedback and reacted accordingly.

It was these contextual responses that revealed the LoC was responding sometimes despite the lack of comments. Notably, the library often liked comments saying hello to the livestream videos of library events, indicating that while the events were taking place the social media posts were being monitored. Furthermore, in response to a comment asking about captions on videos, the LoC posted links in future posts to sites where captioned versions of the videos were available, further indicating monitoring of posts and awareness of user comments.

These results are important because it helps us understand how well national libraries monitor their social media and respond publicly to users, as well as what users see that may influence their decisions to comment on the posts. This is borne out by other research such as Beukeboom et al. (2015), Ihejirika et al. (2021) and Wang and Chen (2021) that shows increased interactivity and engagement with users increases the engagement and success of social media and further reinforces best practises such as recommended by Kietzmann et al. (2011). This is evident in the NLS datasets, as the NLS has a higher average comment per post count than the other two libraries despite being the smallest library and having the smallest population.

Additionally, the toolkit analysis of the library comments allowed for understanding the language of the library comments, as seen in that making a joke and like comment were dual motivations for library responses. These dual motivations were more present in the NLS datasets again, with the NLS noted as using some emojis in response. This informal language with emojis and playfulness seen in the jokes made by the library, corresponds with McShane et al. (2021) in finding that these factors increase the level of engagement a brand gets, offering another explanation for the NLS's higher response rates.

In contrast, the lack of comments or responses by LoC and to a lesser extent NLA make the posts feel more like the libraries are using social media more for announcements and not discussion, echoing both Aharony (2012) and Gintova (2018) of organisations treating social media as a bulletin board and rarely responding to users, and is a practise that the libraries, especially the LoC, should work to improve on.

Given these results and the alignment to other research, this researcher argues that the response to comments can form part of the perception factors in the conceptual model underpinning this research. In this instance, library responses appear to be informing users attitudes to interacting and encountering information posted by national libraries on social media, with increased library responses creating a positive attitude and increasing encountering. Furthermore, on Twitter, increased responses to comments from libraries also increases the visibility of library posts due to the previously mention way Twitter places comments in user timelines, further increasing the chances users will encounter the national libraries on social media.

This research shows that future research would be warranted to understand the differences in response rates. This future research would involve interviews with staff members to understand why they are or are not publicly responding, such as is it a matter of time or staff resources, is it something the libraries are aware of or working on, or is it a deliberate hands-off approach? Do they have policies in place for what they respond to, beyond the mentions of removing offensive comments that are now on some of the websites.

5.8 Currency of research

Some time has passed since the data was collected, which in the fast-paced world of social media, can mean that behaviour has possibly altered. To combat this, recent literature by national libraries on performances though lockdowns and closures was examined, and a random sampling of posts and the associated comments from the three libraries were analysed to determine if behaviours had changed.

There are multiple cases where physical locations were closed but web traffic, including website, catalogue and digitised documents, increased, and libraries made more material

available online and accessible including the NLS (Lammens, 2021, Scally, 2020, Weir, 2020). Libraries also moved events to virtual locations and reached wider audiences (Keating, 2020, Mangold, 2020, McDonald, 2020) while also using social media to offer cultural services to users (Mercurio, 2020). and stay connected with them (Allen, 2020). Roberts and Tudur (2020) highlighted the increased awareness for libraries to understand their audiences and user alternate means to deliver services and engage with users, echoed by McDonald (2020) stating that social media use by libraries increased and libraries became much more deliberate in its use. Furthermore, Scally (2020) stated that social media was the 'most effective medium for having conversations with the pubic and sharing links to resources' (p194) and Mangold (2020) found that may who used the virtual offerings provided by the library had previously been unaware of them.

So clearly the mandate for national libraries using social media to interact and engage with users is still present and arguably stronger due to the closure of physical locations, meaning understanding libraries and users' behaviour is just as important.

A brief snapshot of current behaviour by the libraries involved in this research was analysed to see if the behaviour differed from the earlier time period. Five recent posts from each of the three libraries were randomly selected from Facebook and Twitter (data was collected on the 8th July 2022 and every third post was collected) and analysed using the same content and thematic analyses and their comments analysed using the thematic discourse analysis toolkit developed.

The analysis revealed that posting behaviours of the libraries was similar for the LoC and NLA, with the NLS slightly different on Facebook which may account for the fact that the small sample had no user comments. The same codes for the three analyses on the posts were still applicable with the same preference for posting internal links and library focused themes and responding to other social media on Twitter.

The main difference in NLS behaviour on Facebook was the images used, with most of the images subordinate to the text and very generic rather than the complementary or more relevant subordinate as in the original research. Analysing the text for the thematic analysis also showed the small sampling did not use the same range of informal language as the

original research, or even on Twitter. These differences and the resulting lack of comments indicate that community building and engaging behaviour and the tone of posts do indeed have an effect on user responses as suggested previously by the research.

What users were responding to and their motivations were again similar to the original research, with liking content and sharing relevant content common, some tagging of other users, with almost all comments responding to the content. Conversations also occurred in the NLA Twitter comments between users and the libraries.

As for library responses to users, the LoC was still not responding to user comments in the samples, while the NLA was still liking comments, and responded to more comments in the small Twitter sample. A higher number of comments were seen in the NLA Twitter sample than seen in the previous Twitter dataset, adding strength to the argument that engaging and responding to users increases user engagement. The lack of comments on the NLS Facebook posts mean the research is unable to determine if the libraries responses differ. The NLS Twitter dataset only has two comments on posts originally by the library instead of in response to a post the library has shared, and this is too small a sample to generalise if the lack of response is something widespread or just comments missed. However, further investigation into comments on NLS tweets show responses liked by the library, suggesting that NLS behaviour on Twitter is similar to the original research.

Overall, this small sample suggests that the research is still valid and relevant, as most of the library and user behaviours have not altered drastically in the time since the initial data collection, with the literature and global situation suggesting that more resources have been utilised by national libraries for their social media in the same time frame rather than less, meaning the findings are just as important so as to not waste those resources.

5.9 Implications for practice

The study findings can be used to help inform the libraries' social media practises, with a focus on responding to users and using informal language and tone to create user engagement. The study also created a toolkit that can allow practitioners to analyse their own datasets.

The toolkit used to analyse comments revealed that simply using comment counts as a measure of engagement is not the most reliable. Although the largest library the LoC had the highest number of comments on Facebook, analysis revealed that many of these comments only consisted of short sentences such as 'congratulations', 'hello' or 'like', often only showing a single motivation for responding rather than conversations amongst users, or comments that displayed dual motivations for responding. Conversations between users were revealed to take place more on the NLA and NLS social media platforms, alongside longer and more 'involved comments' that often contained more dual motivations such as liking the content and sharing relevant memories present. These factors can account for the fact the smaller NLS had a higher number of comments on Twitter than the larger libraries.

The toolkit is a major output of the research that allows libraries to understand what conversations are happening in their comments, and to possibly adjust their postings by finding what content sparks these conversations consistently rather than just on occasional outlier posts like those previously mentioned featuring Dolly Parton or milestone library birthdays. These conversations can help spread the national library material further online, thereby increasing audiences for the national library. The understanding of what starts conversations also provides feedback on whether the libraries are meeting their stated responsibilities to provide access to their nation's cultural history, as users sharing relevant memories or content, or asking questions about the material can act as a gauge for public general knowledge of the content. The toolkit also provides a new form of evaluation, deemed as essential for social media use to successful (as mentioned in several places in the literature review) that can both inform the social media holders' practises and provide proof of the value of social media use, in this time when budgets are tightened and internet use has increased as physical spaces have shown to be vulnerable. This is especially notable in the flexibility and ease of use of the toolkit, with the main resource needed to perform the analysis being staff time, therefore it is recommended that staff use the toolkit, especially the LoC, to better understand where they should be responding to users and what users are responding to, especially in comparison to other libraries or competitors. This aligns with the advice from Kietzmann et al. (2011) to be cognizant of other accounts and the social media landscape in general.

Two of the biggest takeaways from the analysis of user comments is that the tone national libraries use in their posts and engaging with and responding with users is key to increasing national libraries' social media engagement with users. Treating social media as simply a bulletin board for announcements both by not responding to users and by using more formal language and not using personable themes, such as the NLS's 'weather updates' or the more general 'responding to other social media', resulted in less users commenting and engaging, most notably in the LoC datasets, with this aligning with other research as mentioned in the previous section. The use of the toolkit to analyse user comments revealed that engagement between the libraries varied not only in comment numbers but by the levels on engagement, with those libraries that responded to users or joked with users such as the NLA and NLS had higher levels of more 'involved comments' and had a more apparent community in the user comments than the LoC which did neither of these. Additionally, carefully choosing material to accompany posts, such as the case of the NLA choosing images to accompany all posts including announcement posts, was found to influence users as NLA users were found to engage with images in these posts with the overall effect of decreasing the feeling of the social media simply being a bulletin board. This clearly indicates that spending the time to fully choose all parts of a post and to respond to users is worthwhile to increase engagement and community, answer user questions and widen access to the libraries' resources.

Analysis of the posts also revealed that all the libraries' in the study are not taking full advantage of their engaged users by asking users questions or for opinions (i.e. gathering knowledge), which could provide valuable information as well as making users feel more heard and trusted. The NLA and NLS did ask for some opinions on topics they posted such as favourite children's books or reading spots and family history stories, which generated some conversations and involved comments, indicating that users are indeed happy to respond to requestions for opinions especially when they feel their comments are listened to. The LoC did ask occasionally if users had a favourite item out of the linked collection but did not respond to user replies therefore giving users no incentive to respond in the future.

Unfortunately, the comparatively small number of libraries in the samples and the lack of statistical patterns in the relationships between content and number of responses mean

that more generalisation of national libraries behaviour on Facebook and Twitter is not possible at this time. However, advice about not spreading themselves too thin can be made from observations during this research. The two libraries that responded to users and had higher levels of conversations occurring in comments as well as more involved comments from users, the NLA and NLS had less accounts according to the connection/social networking page on each library website (Library of Congress, 2023b, National Library of Australia, 2023b, National Library of Scotland, 2023) suggesting that the LoC is possibly doing too much and responding to users is falling through the cracks. This is seconded by the fact that in the Facebook dataset, the LoC has a far higher number of posts than either the NLA or NLS and while the corresponding comment count is higher, many of these comments were simply saying hello or short comments saying they liked the content in contrast to the more involved comments in the NLA and NLS datasets. The use of Facebook as a noticeboard has been noted earlier, and gives the impression that the LoC is just using Facebook because it feels like it should to propagate information rather than properly engaging with users on it and using the full capabilities of the platform. Therefore, this study echoes other advice seen in the literature review in both the libraries and social media sections that the libraries should create strategies and policies to ensure that not only is there adequate coverage of the library's materials and activities but that users are responded to and that all aspects of the material are considered both with regards to the platform specifics such as ease of sharing and what it the main focus of the post, and what may attract users, i.e. not just using a generic link image just for the sake of having an image. While the study focuses on Facebook and Twitter, which are primarily text-based platforms, this general advice could apply to Instagram, Tiktok and other image/video or audio-based platforms. Posting on these can often be more time consuming due to the nature of creating images and videos and may require more resources but the responding to users, planning content to ensure coverage and taking advantage of the platform characteristics, and using a mixture of informal language and tone still applies.

Overall, the recommendations from other research are reinforced by this research, and it is recommended that institutions give staff time to stay current on social media trends, not just on creating content for the institutions accounts, as well as ensure policies are in place to both curate content that is adapted to the particular platform and audience and also

helps inform staff when to step into conversations and respond to users, and use a mixture of less formal language and images that are appropriate even for announcement posts.

5.10 Possible future research

The research provided an understanding of how users were actually behaving in response to national libraries' social media posts, but did not investigate the decisions behind why the libraries were posting what they were, or find the full motivations for users commenting or sharing leaving clear scope for future research to address these issues. Previous sections in this chapter have touched upon further research that would address these issues and provide a deeper understanding of national libraries' social media use and user engagement.

Semi-structured interviews with staff members from the libraries would provide insight into some of the decisions noted in this research, such as why some libraries were not responding to comments, as well as understanding the library policies behind choosing material to post to social media, both thematically as well as the specific images or links chosen. These interviews would also give the opportunity to gain more information on whether internal links in posts had any impact on library website traffic or other internal metrics.

There is further scope for several avenues of different research involving users, both online and offline, of national libraries. Surveying users who responded to the national libraries' social media posts would allow a deeper understanding of why they shared posts and felt motivated to comment with perhaps the opportunity to add more nuance to the 'like content' code and determine what users do with the information in the posts afterwards. This would also allow for further investigation of the more involved comments found in the datasets. Other useful information such as how did they first become aware of the library account as well as demographic and general social media usage information could be gathered that could help inform the libraries' outreach strategies.

Beyond that, surveys of visitors to national libraries' physical locations could inquire about the awareness of the libraries' social media presence, with opportunities to ask if that awareness impacted their decision to visit the library.

Reaching out to other users of social media could provide insight as to general awareness of the libraries' presence online as well as possibly catching users who do not interact with the libraries and understanding why not.

The research was exploratory in nature, with only three libraries analysed. Further expansion to other libraries or newer time periods would provide more information so as to be able to generalise more on behaviours as well as see if behaviours have changed any.

Further datasets, both from libraries' social media as well as other fields such as businesses, would provide more robustness for the toolkit used, as well as further explore the concept of the higher level of engagement of 'involved comments'.

The exploratory nature meant there were several iterative processes that took time to establish the most suitable procedures. This means that if the research were repeated for further libraries or time periods, it would proceed in a timelier manner with the established procedures.

5.11 Conclusion

This chapter has discussed the content and themes prevalent in posts from national libraries, usurpingly focused on library content and directing to library spaces. Images which were used to add visual activity to posts were used slightly differently across libraries. These results were compared to previously existing research, finding this research in alignment in the types of content that other libraries are posting. Image selection was found to have an impact on the user comments, with the LoC and its outsourced image selection from embedded links has shorter and less involved comments and conversations than the NLA and NLS which included archival images, images of the library and behind the scenes, and gifs relevant to the content, which echoes other photo-elicitation and marketing research.

The chapter discussed the developed framework and toolkit for analysing comments to better understand user engagement with posts such as what users are engaging with, where conversations are occurring and what responses users are getting. Its flexibility, ease of use, and no specialised equipment were shown to be strengths of the method, and although the approach is new, some of the codes used in the toolkit aligned with other research indicting its validity. This toolkit is one of the major outputs and contributions to knowledge of the research and is easily transferrable for use on other social media platforms with the flexibility of the questions enabling a wide variety of research possibilities for academics and an easy way of understanding engagement for social media practitioners.

The results from the analysed comments were also discussed in this chapter. Users were found to be mostly responding to the content in posts, with some users taking part in conversations on posts and others tagging other users to directly share the content. Motivations for users responding such as 'like content' were discussed with some variances of the comments across the libraries as well as noted trends such as users 'sharing relevant memories' in response to 'today in history' posts. Motivations were mostly positive across all libraries but the differences in conversations across the libraries and platforms were discussed. The motivations and emotions evident in the comments were then shown to align with other research on social media, and discussed in relation to the conceptual model, showing how user perceptions affected their interaction with the posts. The research did show variation in how engaged comments were, from short one-word comments simply liking the content through to longer more involved comments sharing personal memories or connections. These more involved comments were more often found in the NLA and NLS datasets showing the effectiveness of their posting practises, however, to date there is no real research to compare these findings to since currently comment analysis is usually sentiment, content or thematic based. The differences in comment motivations, length and conversations were linked to some of the differing posting strategies by the libraries, such as careful image choice, informal tone and most importantly responding to users with the NLS and NLA showing better performance at these. This reiterated the value of the time spent by the libraries on the social media activities as the increased engagement was linked to improved reach for the library, increased word of

mouth for the library information as well as increasing user's opinions of the libraries and possibly visits to the libraries' physical or digital locations.

Library responses to user comments were discussed, with not only the differing rates of responses but the different types of responses. The LoC and NLA responded least, though the NLA did like more comments. The NLS responded most, and with a range of emotions and motivations including making jokes and using emojis, all factors other research found to increase social media engagement.

The currency of the research was also discussed, with links to literature stating the use of social media was important during the lockdowns of the Coronavirus pandemic, with recent library posts on Facebook and Twitter analysed to check if behaviours had changed. The small sample of analysed posts suggested that behaviours both by libraries and by users had not altered much, with an exception for a slight decrease in behaviour by the NLS on Facebook, and that the research and findings were still relevant.

The chapter also discussed the implications for practise, another major output of the research, in that in line with other areas of social media research, the tone of posts can influence user engagement, as well as increased engagement from the national libraries increasing user engagement. The toolkit developed for analysing comments, the other major output of this research, was also discussed as a valuable tool for practitioners to allow them to see beyond response numbers to what social media users were actually engaging with and having conversations about with other users. The research also echoed other research in recommendations for staying up to date on social media trends and competitors' performance, and having strategies and policies in place to ensure that the libraries' are providing coverage of relevant material in a way appropriate to the specific platforms as well as when and where to respond to users so as to not spread themselves too thin across multiple platforms and multiple posts just for the sake of posting or being on the platform.

The chapter also detailed further research that could build upon this research with details such as interviews with library staff to uncover the choices behind content chosen, posting policies and reasons for the behaviour of responding to users, as well as interviews or

surveys with social media users to gain their perspective on the content posted, why they follow and why they interact. Interviews or surveys with users of the national libraries who are not following them on social media could understand why they are not, what could entice them. Also, future research on other libraries, and social media platforms could give more datasets to analyse and more datasets to expand and be able to more generalise behaviours of national libraries on social media.

The next chapter will conclude the thesis and provide an overall report of the research.

Chapter 6: Conclusion

6.1 Introduction

The previous chapter discussed the results of the analyses presented in chapter 4, providing observations and reflections on both of the content analyses, the thematic analysis and the thematic discourse analysis. The chapter then linked those results to existing research and highlighted the connections to the conceptual model underpinning the research. The chapter also discussed the toolkit developed in the research to better understand user engagement. The chapter drew together the results to answer the research questions, uncovering how national libraries used social media and responded to user engagements, and how users responded to national libraries posts. The chapter then discussed the implications for practice and possible future research.

This chapter will provide a summary of the research, key findings, contributions to knowledge and limitations and further research.

6.2 Summary of research

The research sought to understand the behaviour of national libraries on social media and users' responses to that behaviour, using the research questions,

1. In what ways do national libraries use Facebook and Twitter?
2. How can user engagement be analysed beyond response numbers?
3. In what ways do social media users respond to national libraries posts?
4. How do national libraries respond to user engagements?

A literature review of existing research into national libraries revealed a gap in the knowledge of social media use by national libraries, so literature into other types of libraries such as academic and public libraries was considered to understand what they were using social media for and the theme of their posts. Social media research in general was also considered, with a focus on factors affecting user engagement and user motivations for interacting with social media.

The Jiang et al. (2015) model of online information encountering (see Image 1 An integrated model of online information encountering by Jiang et al (2015)) was used to underpin the research. Content and thematic analysis, using an open coding approach, was performed on posts collected directly from Facebook and Twitter from the main accounts of Library of Congress, National Library of Australia, and National Library of Scotland. This revealed the theme of the posts on the library accounts, as well as where the libraries were linking to in these posts and the relationships between the text and images in the posts. Statistical analysis was performed using the codes generated in the above analysis against the traditional metrics of comment counts, number of likes and shares, and then thematic discourse analysis was performed on the comments in response to the posts, which revealed what users were responding to, their motivations for responding and conversations that occurred.

6.3 Key findings

6.3.1 National libraries social media behaviour

No previous research exists to understand the behaviour of national libraries on social media which means the results of this research are a key contribution to knowledge.

No overall pattern for the three national libraries in the study emerged in the content and thematic analysis results, although libraries were mostly linking to their own webspaces, using images that complemented the text in some way and were focusing on library news, events, resources and collections. The code set of themes that emerged from analysis of the posts were in line with research into other types of libraries social media posts. While analysis of the links and image-text relationships did not feature in other research, some research did indicate that marketing managers tried to direct most of the traffic from social media to their own websites, which is in alignment with most of the links in this research being internal.

Statistical testing revealed the libraries on Facebook had a similar distribution of where they were linking to while on Twitter the libraries differed in where they were linking, especially apparent in the large number of NLS tweets that contained no link (65 percent) and the

large number of tweets linking to the library websites in the LoC and NLA tweets (50 percent and 37 percent). The LoC was also found to embed more links than the others, especially on Facebook.

The embedding of links impacted the image-text relationship variance across the libraries and platforms. LoC had more of the image and text independent relationships on Facebook because of embedding, meaning the images were not always chosen for the content or directly related to the text. On Facebook, the NLA and NLS image-text relationships varied, with the NLS mostly using complementary image-text relationships while the NLA had an even spread between independent, complementary and image subordinate to text, where the images were used as a general image to make the post more visually appealing. On Twitter, the libraries generally used images that were complementary with the text, using the images to extend or enhance the information in the post, with small numbers having the images subordinate to text, often gifs that added visual appeal or logos of the events taking place.

While the themes of the posts were primarily focused on library related topics, the exact percentages varied between libraries and platforms, with the LoC and NLA having statistically different distributions of codes between Facebook and Twitter, while NLS had similar distributions. The libraries all had different distributions of codes from each other on Facebook while the distributions were similar on Twitter. Notable trends were the appearance of the code 'responding to social media' only in the Twitter datasets, and the code 'weather update' only appearing in the NLS datasets. Collection or collection news were more predominant in the LoC and NLS datasets, while library project or resources were more prominent in the NLA datasets. The LoC had a higher percentage of 'today in history' posts than the other libraries, while the NLS and NLA had higher percentages of posts for 'library event' and 'library exhibition'. Notably, the NLA did not post any job adverts while the other libraries did.

The differences in library and platform behaviours indicated the libraries were somewhat tailoring their efforts to their own populations as well as to the specific platforms. Some overall trends were noticed, such that 'today in history' posts either linked to the collection

(NLS) or to a blog with more information (LoC), and that 'collection' posts often had a complementary image-text relationship, with the text enhancing the image and vice versa.

The libraries were also found to respond differently to the user engagements. The LoC hardly responded to users via comments on either platform, even where users were asking questions, though some likes and the occasional comment was made to user comments during livestreamed events or on a post celebrating the library's birthday. The NLA liked most comments users left on both platforms and responded to user questions on a multitude of posts, with the NLS responded similarly, although the NLS did respond to more comments, not just those asking questions but sometimes making jokes with users.

6.3.2 Users responses to national library social media posts

With no previous research on national libraries' social media posts, there is also no research into users' behaviours in response, meaning the analysis of that in this research is a further key contribution to knowledge.

Traditional metrics revealed only a Zipfian distribution to responses. Statistical tests were invalid, possibly due to the sample size, meaning no statistical results were found by comparing these metrics to the codes generated by the content and thematic analyses therefore the research was unable to determine if the links, image relationship or theme of the post statistically affected user response rates.

The thematic discourse analysis revealed that users were mainly responding to the content of national libraries posts, and that user motivations for responding were mostly positive.

Most occurrences where users were not obviously responding to the content were either users using the comment to tag other users, a direct form of sharing, or users taking part in conversations.

The frequency of conversations varied across the different libraries. While conversations occurred in all datasets, they were less frequent in the LoC datasets, with comments in the NLA and NLS datasets often having secondary motivations for taking part in the conversation such as liking the comment, answering a question, sharing relevant content or

memories, and expressing gratitude to the original commenter. Comments in conversations in the NLA Facebook dataset also showed an awareness of the history around the content, with many conversations discussing famous historical events.

The same emotions and motivations for responding were present in all the datasets, though the proportions of the motivations varied as did the presence of dual motivations. Most of the motivations were positive, with only a tiny number of comments expressing negative motivations such as disappointment and disapproval, usually in response to closure announcements or divisive historical events. Liking the content was the most common motivation for responding, and the theme was evident in comments in all datasets. The other most common motivations include thought user tagged would find it interesting, responding to comments, gratitude and sharing relevant memories.

Dual motivations were more often found in the longer comments of the NLA and NLS datasets. There were comments with dual motivations in the LoC datasets, generally liking content and sharing relevant memory, gratitude, appreciation and admiration, often in the posts featuring famous musicians that received unusually high number of comments, with users expressing the secondary emotion about the musician. These same dual motivations appeared in the NLA and NLS datasets, with additional motivations with like content including excitement (NLA Twitter) and making a joke (NLS Twitter). Other notable dual motivations included sharing a relevant memory and answering a question in the post (NLA datasets), and making a joke specifically in response to the content (NLS datasets).

Table 9 Motivations and dual motivations for users commenting displays the full list of emotions and motivations for responding found in the comments, alongside what dual motivations occurred and the datasets in which they occurred.

Findings from the analysis of user responses indicated alignment with existing research, especially in the emotions and motivations for users responding, the responding to content as well as the presence of outlier posts with large numbers of comments. One notable difference from some existing research is the near absence of negative emotions or motivations in this study.

6.4 Contributions to knowledge

The above key findings were a valuable contribution to knowledge alongside the following points.

6.4.1 Comment analysis toolkit

The toolkit developed to analyse social media comments provides an easy and rigorous method for fuller understanding of user engagement, including what users are responding to, where conversations are occurring and what motivates users to respond. The five questions that make up the toolkit:

1. What is the comment responding to?
2. Does the comment match the content of the post?
3. What emotions or motivations for responding are present?
4. Is there any context to the comment?
5. Is there anything else that affects how the comment could be interpreted?

are generic and flexible enough to ensure that the toolkit can be any social media platform that users can comment on. Applying the five questions to the comments being studied can reveal if users are commenting on the content of the posts, sharing it with others, having a conversation, or using the post as a means of communication with the account owner, while also showing the motivations for responding such as sharing memories or asking questions that can show what material users are engaging with and how deeply. The contextual element of comments is considered and allows account owners to track their responses to comments as well as repeat commenters and if the sharing of posts by users is effective. Furthermore, the toolkit requires no specialist software or training to use, making it easily accessible to practitioners or academics in any field, allowing for deeper understanding of user comments and engagements.

6.4.2 Advice for practitioners

Traditional metrics such as comment counts and post shares were revealed to not always be reliable as a true measure of user engagement with content, as seen with the higher

comment count on the LoC Facebook dataset than the other libraries but upon examination many of these comments were simply one or two words compared to the longer comments and conversations occurring in the other library datasets.

Despite the differences in national libraries from other types of institutions, the same social media advice was found to apply. Responding to users, both by commenting in response to comments or liking or retweeting the comment, is a vital means of creating a community and increasing user engagement. Creating more personable posts, such as posting about local issues or weather updates, or responding to other social media, as well as having a more informal tone such as joking and sharing personal stories also increased user engagement, not only in terms of comment numbers and comment lengths, but also in the number and length of conversations taking place in the comments and users sharing personal memories. Libraries were also encouraged to take full advantage of the interactivity of social media and engage users to ask questions in posts and gather more knowledge and opinions.

6.5 limitations and further research

The research only analysed the behaviours displayed on public social media by libraries and public users. This meant exact motivations and user opinions were not part of the study. The study only analysed the social media use and responses of three national libraries, giving a small sample size that consisted of industrialised countries, leading to a limited about of generalisation from the results.

Future research could expand the libraries studied to enable more generalisation of behaviours, analyse further posts for content and thematic analysis to determine if those affect user engagement levels, as well as interview or survey social media users who currently engage with the libraries and library staff to understand the decisions to post or interact with material. Surveying other social media users or users at the libraries' physical locations could also provide insight into visibility of the national libraries' social media pages and barriers to user interacting. The toolkit could be further checked for robustness by analysing a wider variety of datasets, which would also allow exploration of the concept of 'involved comments'.

6.6 Conclusion

This chapter provided a summary of the research alongside the key findings and contributions to knowledge as well as limitations and further research possibilities.

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Appendix 1: R code

Facebook data collection

```
library(Rfacebook)

library(RCurl)

fb_oauth <- fbOAuth(app_id="xxx",app_secret="xxx")

page <- getPage("username", token, n = 5000, since='year/month/day', until='year/month/day')

write.csv(page, file = "page.csv")
```

For example, LoC collection:

```
library(Rfacebook)

library(RCurl)

fb_oauth <-
fbOAuth(app_id="433204767122906",app_secret="00e7fa15010604392b1fa4f4334fb6ed")

page <- getPage("libraryofcongress", token, n = 5000, since='2018/01/29', until='2018/04/24')

write.csv(page, file = "page.csv")
```

Twitter data collection

```
install.packages("twitteR")

library(twitteR)

consumer_key <- "xxx"

consumer_secret <-"xxx"

access_token <- "xxx"

access_secret <- "xxx"

setup_twitter_oauth(consumer_key, consumer_secret, access_token, access_secret)

loc_tweets = userTimeline("librarycongress, n=3200")

ut <- userTimeline('librarycongress', n=3200)

loc_table <- twListToDF(ut)

write.csv(loc_table, file = "loc.csv")
```

For example, LoC collection:

```
install.packages("twitteR")

library(twitteR)

consumer_key <- "1BowjSlmYodehXdDsZ9NgrQpL"

consumer_secret <-"SH6uq4jgRKy9wUofpMr8WYLWJhE33dFj5llmnKqPWl2yZCWdlW"

access_token <- "988419950762188801-SJ02FTDBdOr0cSiUbTbVZvX772SEGkc"

access_secret <- "QLGpTDXXs7Z5P5h1646i2HJHx5R3UG2ZIqWZj0EOZ9igx"

setup_twitter_oauth(consumer_key, consumer_secret, access_token, access_secret)

loc_tweets = userTimeline("librarycongress, n=3200")

ut <- userTimeline('librarycongress', n=3200)

loc_table <- twListToDF(ut)

write.csv(loc_table, file = "loc.csv")
```

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Appendix 2: Content analysis codes

Link codes

Table 10 codes generated by link content analysis

external - archive
external - archive - embedded
external - event
external - news
external - news - embedded
external - social media
external - social media - embedded
internal - blog
internal - blog - embedded
internal - collection
internal - collection - embedded
internal - project
internal - project - embedded
internal - shop
internal - shop - embedded
internal - social media
internal - social media - embedded
internal - website
internal - website - embedded
none

Notes: project includes library exhibitions

Image-text relationship codes

Table 11 codes in image-text coding scheme

Code	Usage
image and text independent, exposition	using this for embedded links or post shared on fb (i.e. no control over image)
image and text independent, text more general	when image gives examples of text
image and text independent, image more general	
image and text independent, extension	
image and text independent, enhancement	
image and text independent, locution	
image and text independent, idea	
image and text complementary, exposition	Text identifies image i.e. weather updates
image and text complementary, text more general	
image and text complementary, image more general	
image and text complementary, extension	where the image or text is giving new info about the other
image and text complementary, enhancement	using for video links such as livestreams where text qualifies/explains video, also for links where image is chosen and shown (i.e. not embedded)
image and text complementary, locution	
image and text complementary, idea	
image subordinate to text, exposition	
image subordinate to text, text more general	
image subordinate to text, image more general	used when image is used to accompany post
image subordinate to text, extension	
image subordinate to text, enhancement	
image subordinate to text, locution	
image subordinate to text, idea	
text subordinate to image, exposition	
text subordinate to image, text more general	for text images i.e. quotes where image is main part
text subordinate to image, image more general	
text subordinate to image, extension	
text subordinate to image, enhancement	
text subordinate to image, locution	
text subordinate to image, idea	
no image	

Appendix 3: Thematic analysis codes

Table 12 codes generated during content analysis

article by library
collection
collection news
exhibition news
issues relevant to library
job advert
library business
library event
library exhibition
library news
library project
library resources
media coverage of library
responding to other social media
Today in history
weather update

Notes: library business includes subjects such as shop, closures, grants and selling items; library project includes subjects such as books published by library.

Appendix 4: Comment analysis toolkit

Beyond Response Numbers
A toolkit for analysing user responses
Jennifer Hamilton

BACKGROUND

User engagement with social media posts are often numbers based but this does not always give a full picture of how users are interacting with posts. This toolkit will enable you to analyse user comments to understand what they are really interacting with, such as the content of your posts or other users, and what is motivating users to respond.

WHAT YOU NEED

You'll need the comments in response to the posts, and a spreadsheet for easy analysis.

HOW TO GET COMMENTS

Comments can be retrieved from your social media accounts in two ways. (Ensure that comments are from a public forum and stored securely with no identifying information.)

- API access (search online for further guidance) can be quicker but more difficult to set up especially since platforms change access requirements constantly.
- Copying the comments manually can be more time consuming but allows you to become familiar with the comments and notice conversations and formatting.

HOW TO FORMAT COMMENTS

Give each comment its own row in the spreadsheet or table alongside the columns in the image below. This enables easy analysis. For further ease of use, use a new table or sheet for each set of comments.

comment	what is comment responding to?	does the comment match the post?	what emotions /movitations are visible?	comment context	anything else relevant?

Examples of codes generated by comment analysis:
- responding to organisation
- responding to content
- matches post
- amused by content
- aware of history around content
- like content
- sharing memory of content
- responding to comment
- comment liked by other users

HOW TO ANALYSE COMMENTS

The framework asks five questions of each of the comments:
1. What is the comment responding to? (such as the content or your organisation)
2. Does the comment match the content of the post? (yes, no or partially eg if a conversation started on topic and then wandered)
3. What emotions or motivations for responding are present? (such as liking content, amusement, gratitude, asking a question, making a joke)
4. Is there any context to the comment? (such as replies or likes to the comment, same user as other comments?)
5. Is there anything else that affects how the comment could be interpreted?

HOW TO REPORT RESULTS

Note trends such as whether users are responding to your content or communicating with you. Do they have emotional connections to the content? Are they showing multiple motivations for responding and showing more involved comments? Are they sharing their opinions? Participating in discussions? Are you responding to your users?

Appendix 5: Thematic discourse analysis codes

Question 1: what is the comment responding to?

Table 13 codes generated for toolkit question 1

Content
Library
Tagging (content)
Comment above
Earlier comments
Users
Not sure
Specific users
Other user
Content and library

Question 2: does it match the post?

Table 14 codes generated for toolkit question 2

Yes
No
Not sure
Partial

Question 3: emotions or motivations for responding

admiration of person in content	pride
amused	providing feedback
annoyed by content	providing historical context for content
answering a question	religious
answering question in post	reminding users of policy
Appreciation	responding to comment
asking a question	responding to content (a very general response)
Aware of history around content	
Bot	saying goodbye
celebrating (i.e. when just saying congratulations)	Saying hello
	saying hello to users
Directing people to working resource	seeking details
disappointed	sharing content
disapproval	Sharing event details (to entice others)
doesn't like content	Sharing links to content/event
Excitement	sharing memory of library
Giving further detail	sharing relevant content
Gratitude	Sharing relevant memory
In-joke	spam
like comments	Suggestion from friend
Like content	talking about discrimination
like library	think content is important
Making a joke	thinking about content
mansplaining	thinking about image
Moved by content	Thought interesting
not sure	Thought user tagged would find it interesting
offering services	
Patriotic	Trying to make post more visible
Political agenda	Want expansion of content

Question 4: context to comment

Table 16 codes generated for toolkit question 4

No of likes/reactions (including any tagged users or library's themselves)
Not sure
user tagged hasn't publicly responded
user tagged responded
same user as comment (comment number here)
responding to being tagged
user commenting was tagged elsewhere
language of comment if applicable
like enough to share
no public response
received no answer
responded to by library
library responding
referring to medium of content rather than content directly

Question 5: anything else

Table 17 codes generated for toolkit question 5

feedback for library
possibly also saying hello
like enough to visit
seems to be a declaration of surprise
like enough to order book
not sure if they are replying to correct post
good memory
not happy with memory
could be argued as responding to content as well
seem to be responding to being shared by someone
same commenter as above
can't decipher acronym
library responded

Appendix 6: Emoji codebook

Table 18 Emoji definitions

Graphic	Name	Alternate names	Definition using
👋	waving hand		using as hello in context of responding to a live stream, saying responding to library rather than content
❤️	red heart		"love" unsure when alone – but on a post making the decision that it refers to the content – think people would more likely give this to the library elsewhere – also saying it matches the post.
	coloured hearts		love as well but sometimes specific to colour e.g. green jealous heart
💙	blue heart		mainly love but also with a touch of sadness
💖	sparkling heart		love, often enthusiastically
😍	heart eyes	smiling face with heart eyes	I love it' refer as to content
😵	dizzy face	crossed eyed face	Can refer to being dizzy from shock/ moving in circles
😠	angry face	grumpy face or angry	What it sounds like
😱	face screaming in fear	screaming face	scared/shocked or surprised (usually in a negative way)
📚	pile of books	stack of books or books	generally a positive indication of wanting to read this or books in general
🙂	slightly smiling face	slightly happy or this is fine	not to be confused with smiling face – has no eyebrows or cheeks. Can be used passive aggressively or as a this is fine or as a basic smiley face
🤔	thinking face	thinker/chin thumb	pondering/thinking about something. Can vary in tone from thoughtful to sceptical or mocking

Graphic	Name	Alternate names	Definition using
🤣	rolling on the floor laughing	ROFL	very funny, can't stop laughing, rolling about with laughter
US (letters when flag not supported	American flag	USA Flag	relating to US - varies widely in exact tone and meaning according to context
😄	grinning face with smiling eyes	grinning face with open mouth and smiling eyes/ happy face/grinning face	split between happy and sarcastic smile/grimacing
👏	clapping hands	applause/clap	multiple implies a round of applause
😮	face with open mouth		wow/surprise or shock. Milder than screaming face
😉	winking face	wink	joking/flirting Same as in offline basically
🙋	women raising hand (happy)	person raising hand	asking a question, nervous, sometimes happy or hello
🙏	folded hands	prayer/thank you/ high five	high five is less common. As name suggests
🌺	hibiscus flower		Hawaii state flower, basically adding colour/pretty flower
🌴	palm tree	coconut tree/tropical island	somewhere tropical/holidays/beach
🌊	water wave	ocean wave/sea/waves	water/ocean/surfing (based off wave painting so sometimes associated with that)
💗	growing heart	multiple/triple heart	very positive emotion, loves more than can express
☘	shamrock		something Irish
😳	flushed face emoji	blushing/embarrassed	shock surprise, embarrassed, did something they didn't mean to
😊	smiling face with smiling eyes	happy face	smiling/happy
👍	thumbs up emoji	like	approval, cheering
🤬	serious face with symbols covering mouth	sweary face	angry, swearing
😝	squinting face with tongue		playful/excited/happy

Graphic	Name	Alternate names	Definition using
🙌	raising hands emoji	two hands/ arms in the air	celebrating / joyous / success
☀️	sun emoji		implies sunny/hot/good weather
💌	love letter	love note	love/cute/like it
💡	light bulb	idea	I have an idea
💭	thought balloon	thinking/thought bubble	thinking/having thoughts
😇	smiling face with halo	angel/halo	trying to appear innocent after a joke or a good person
😙	kissing face with closed eyes	kiss face	love/ expressing affection
💕	two hearts emoji	small hearts	love of any kind/happiness
😢	crying face	crying/tear	sad news/to make someone sad
🎼	music score	treble clef	talking about something to do with music
🎤	microphone	karaoke/singing	either singing something or making something louder
🌎	earth globe Americas	earth/globe/planet/world	talking about something global/ the planet (other variations such as Asia)
🦗	cricket	grasshopper	either insect or silence of uninterest/disapproval
☝️	index pointing up	pointing up	pointing up at a previous message, usually in agreement
🚂	steam train	locomotive	a train
🎩	top hat	formal wear	top hat
🐱	cat	housecat	cat
🕎	menorah	candelabrum	Jewish faith/Hanukkah
😻	heart eyes cat	smiling cat with heart-eyes	cute/adorable and happy
📖	open book	book or novel	book
🎂	birthday cake	cake with candles	birthday/celebration
🎆	fireworks	explosion	celebrating / joyous / success
🏅	medal	sports medal	winning/congratulations
🤤	drooling face	drool	like what you see
😲	shocked face	astonished face	shock, amazement, disbelief
🎈	red balloon	balloon	congratulations/celebration
🍰	cake	shortcake	cake/delicious

Graphic	Name	Alternate names	Definition using
🎁	present	wrapped gift	a present/birthday
🎉	party popper	celebration	celebrating / joyous / success
🌷	tulip		sending love/appreciation, Dutch
🥂	clinking glasses	champagne glasses	celebrating
🌟	glowing star	shining star	shiny/excellent/really like

Appendix 7: Reaction Count Graphs

Facebook

Like

Figure 1 number of like reactions on LoC Facebook posts
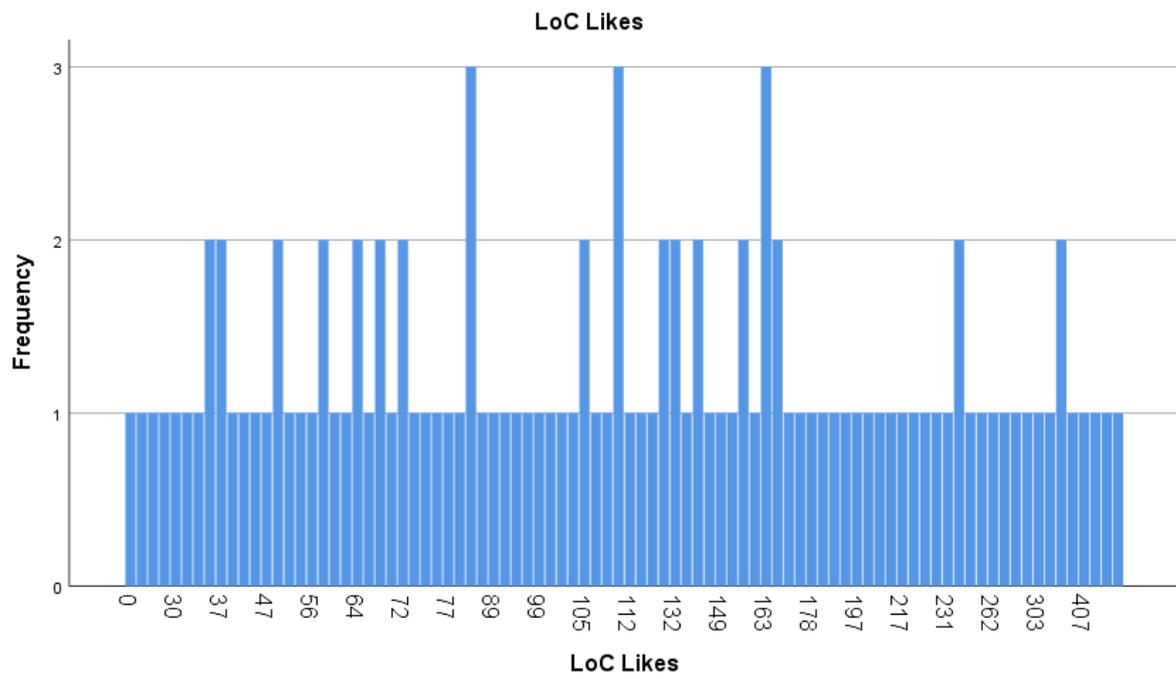
Figure 2 number of like reactions on NLA Facebook posts
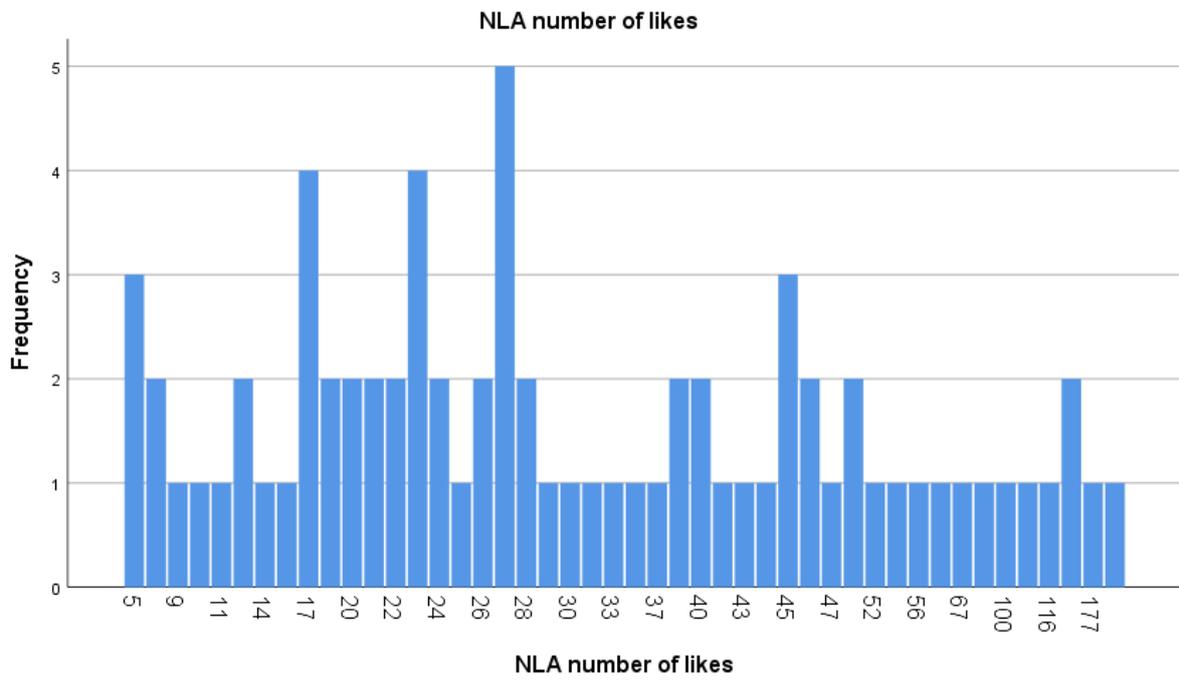
NLA number of likes

Figure 3 number of like reactions on NLS Facebook posts

NLS number of likes
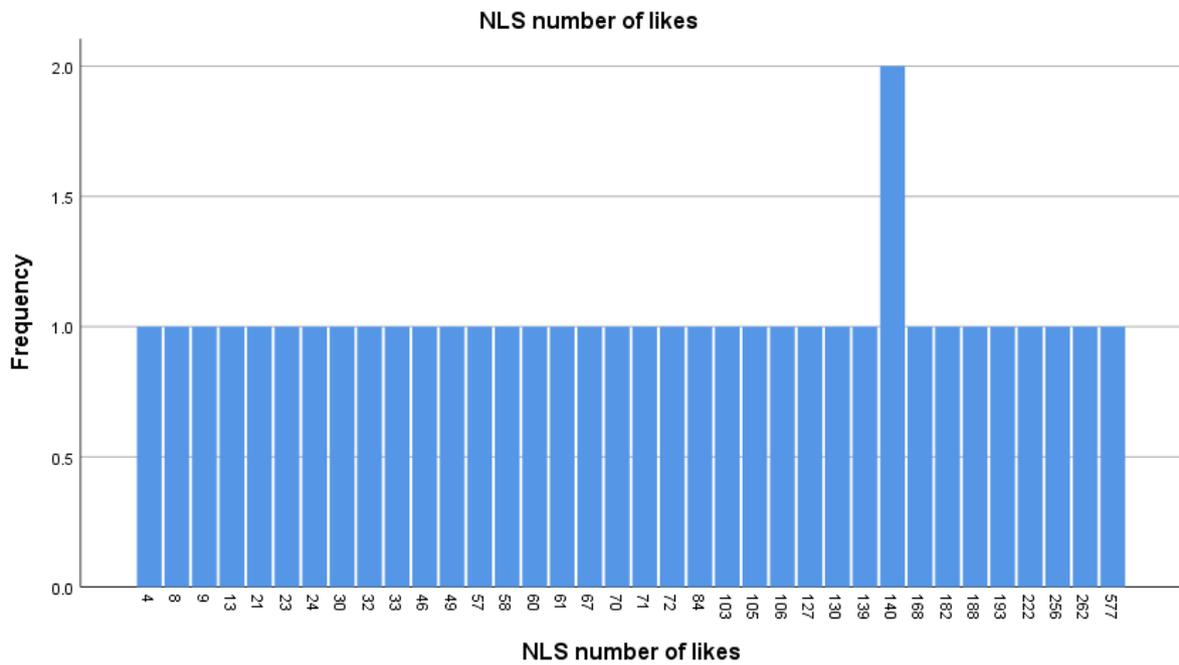
Love

Figure 4 number of love reactions on LoC Facebook posts
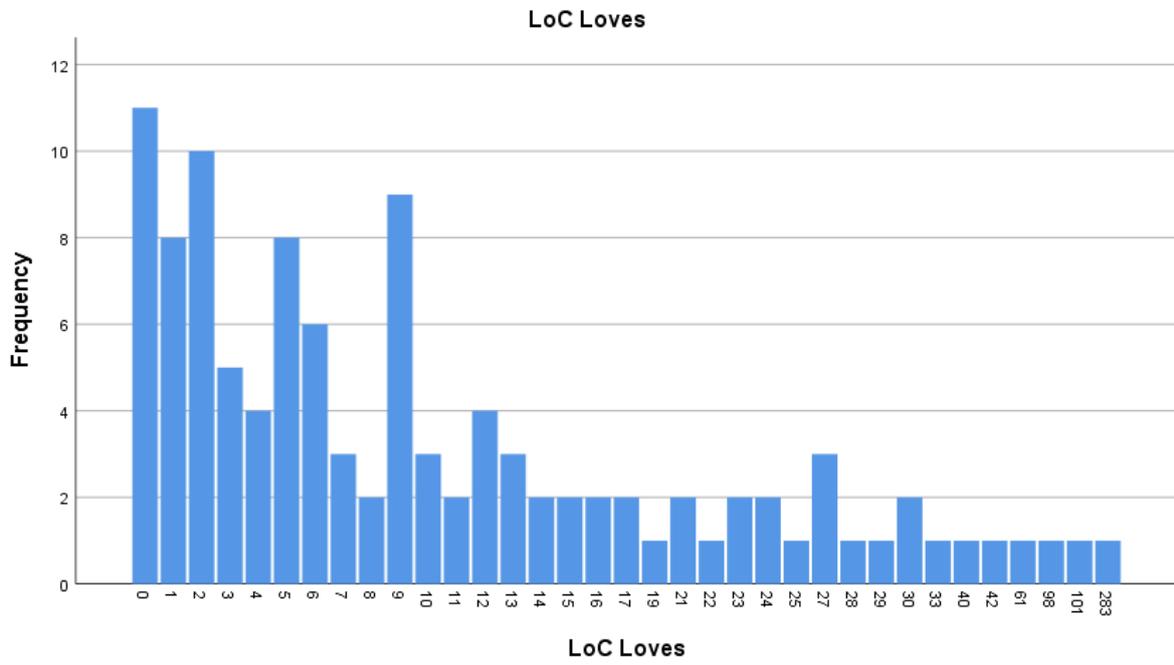
Figure 5 number of love reactions on NLA Facebook posts

Figure 6 number of love reactions on NLS Facebook posts
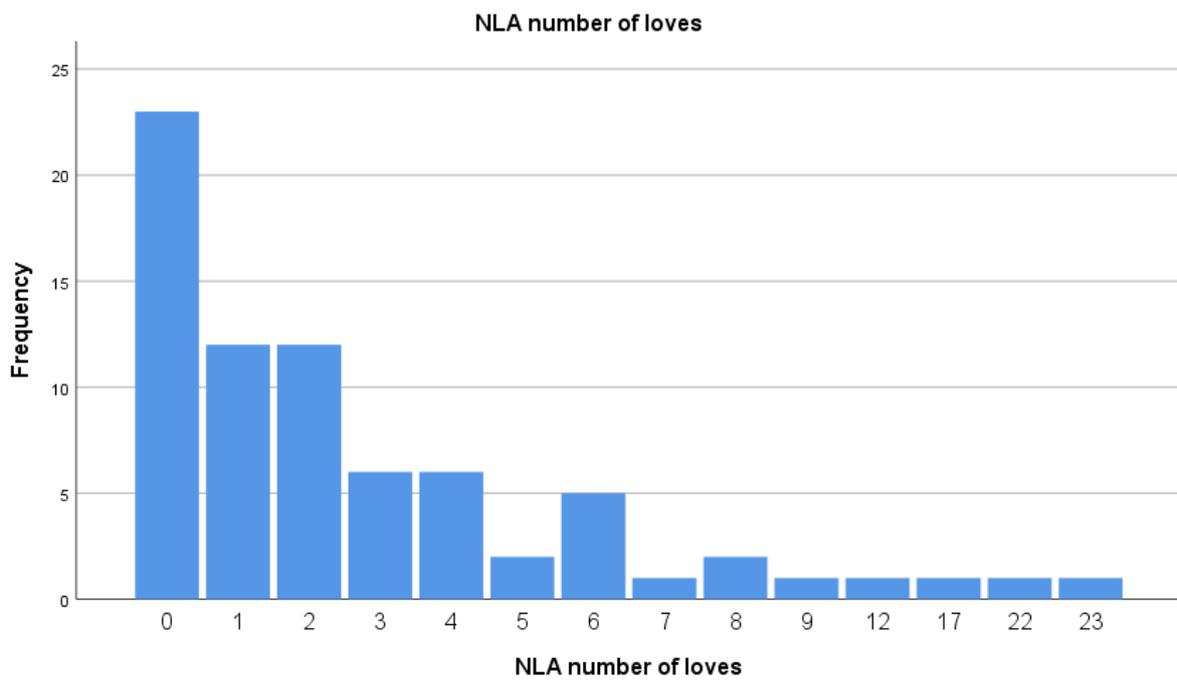
Figure 6 number of love reactions on NLS Facebook posts
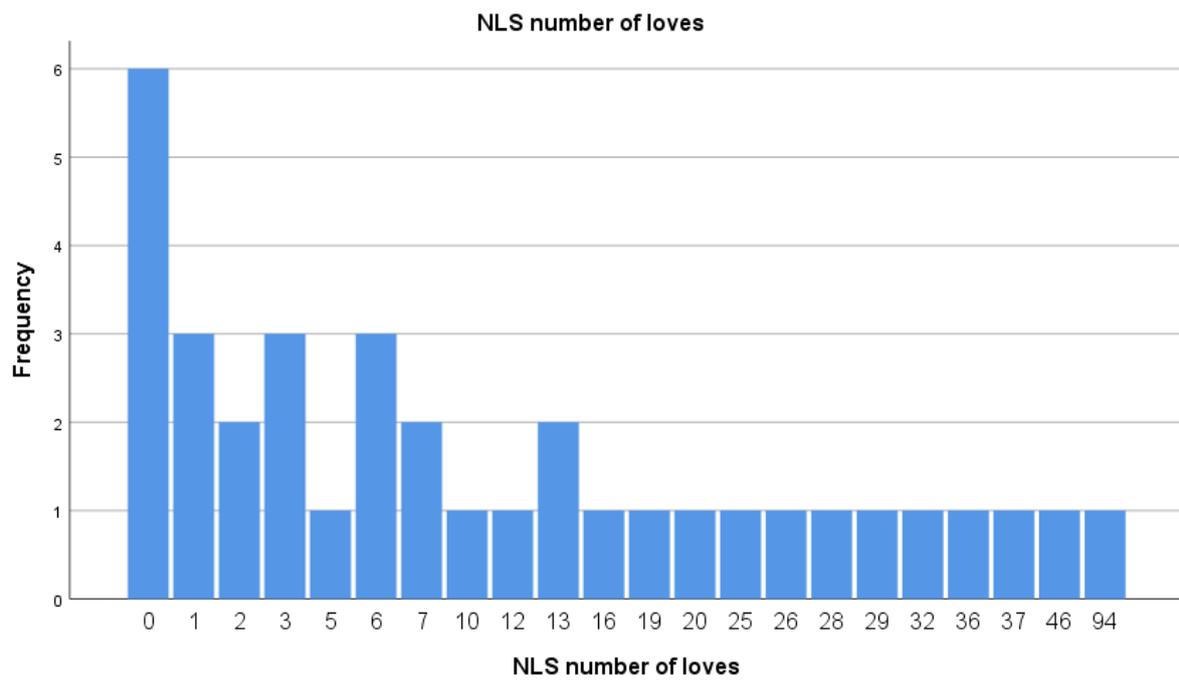
Haha

Figure 7 number of haha reactions on LoC Facebook posts
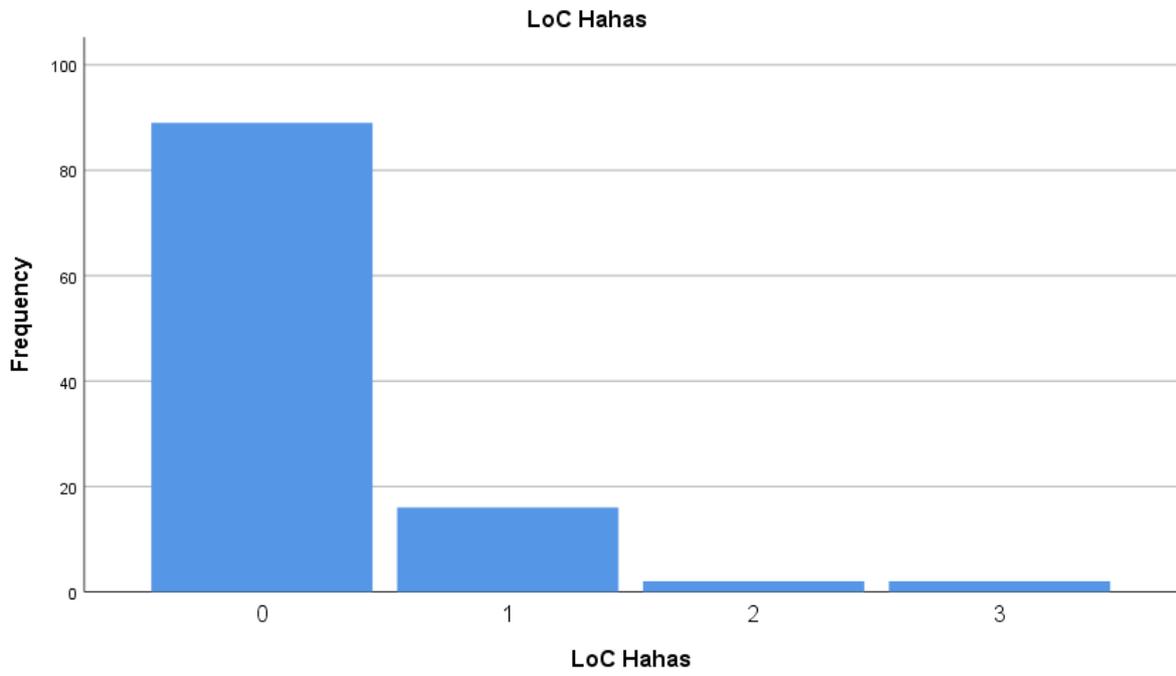
Figure 8 number of haha reactions on NLA Facebook posts
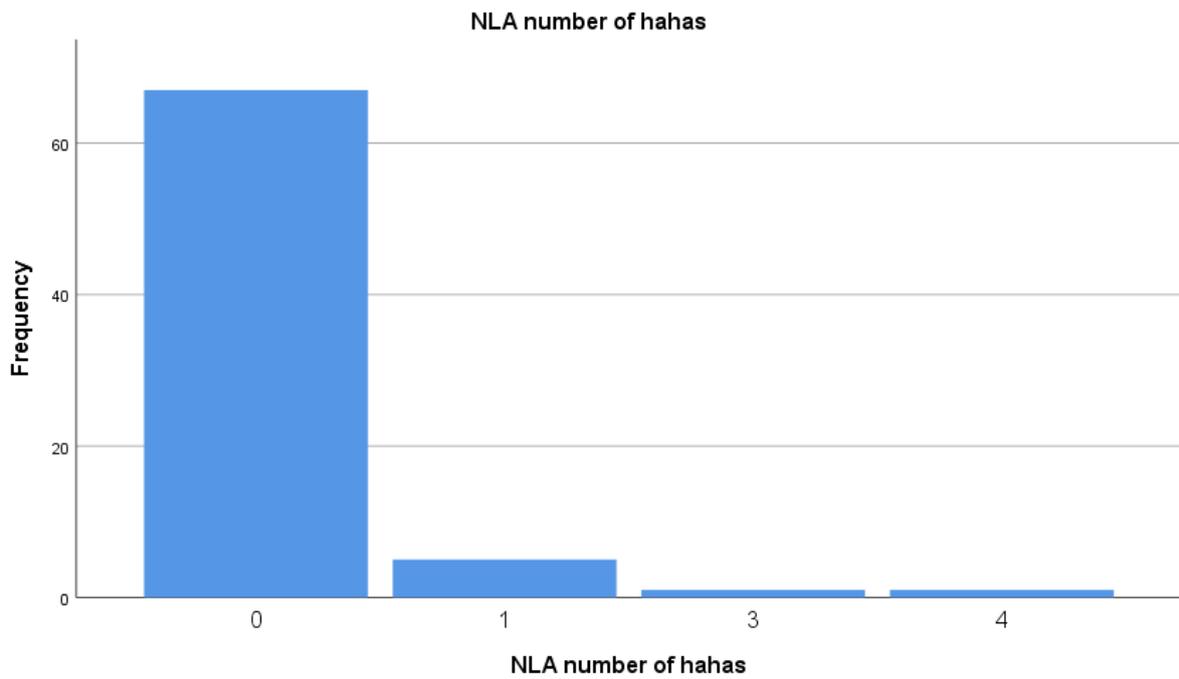
Figure 9 number of haha reactions on NLS Facebook posts

NLS number of hahas

Figure caption: Histogram of NLS number of hahas. X-axis labels: 0, 1, 2, 3, 18, 56. Y-axis "Frequency" ranging 0 to 40.
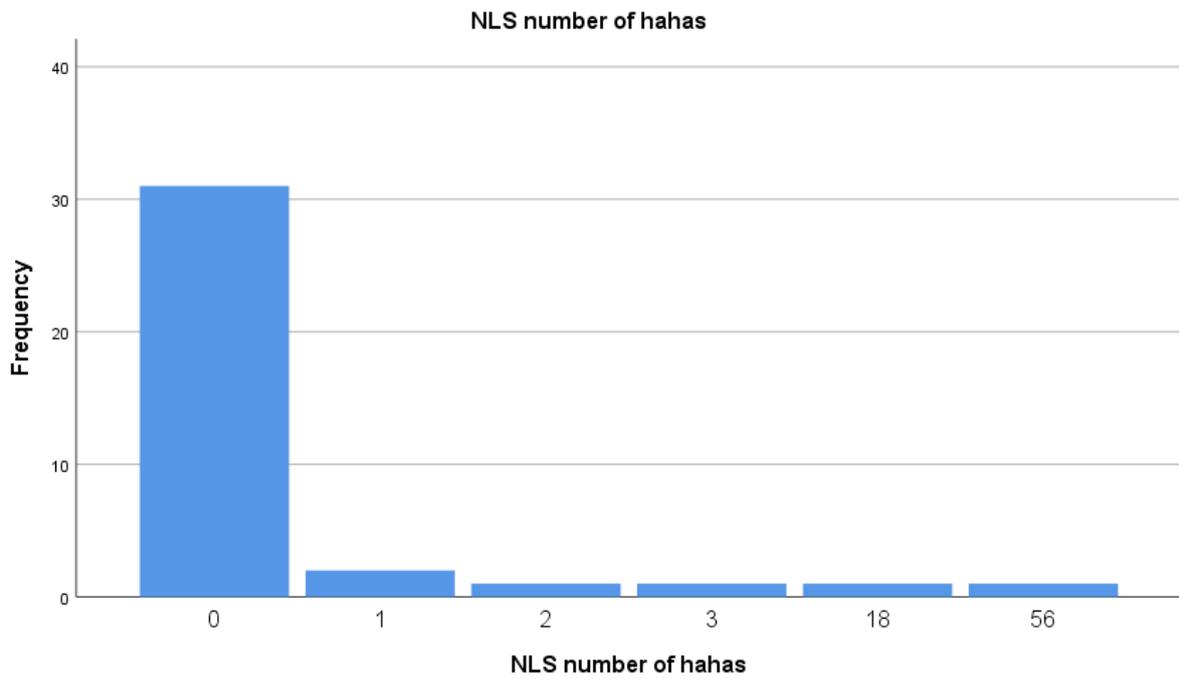
Wow

Figure 10 number of wow reactions on LoC Facebook posts

LoC Wows

Figure caption: Histogram of LoC Wows. X-axis labels: 0, 1, 2, 3, 4, 5, 6, 8, 9, 10, 13, 16, 20, 21, 22. Y-axis "Frequency" ranging 0 to 50.
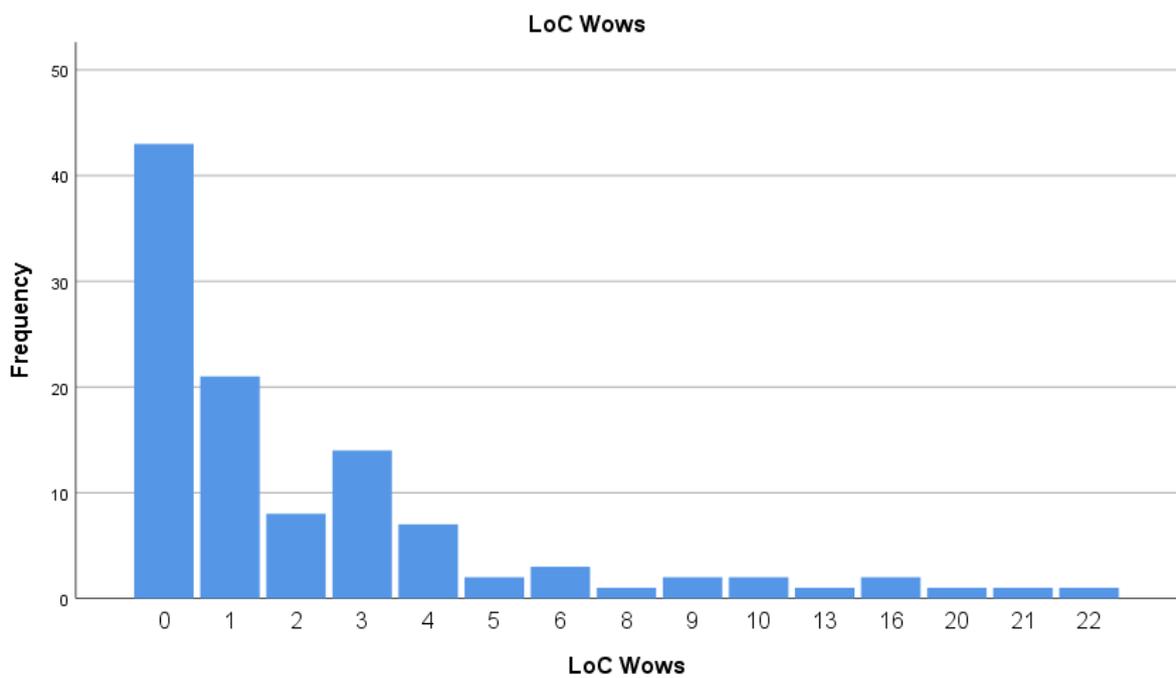
Figure 11 number of wow reactions on NLA Facebook posts
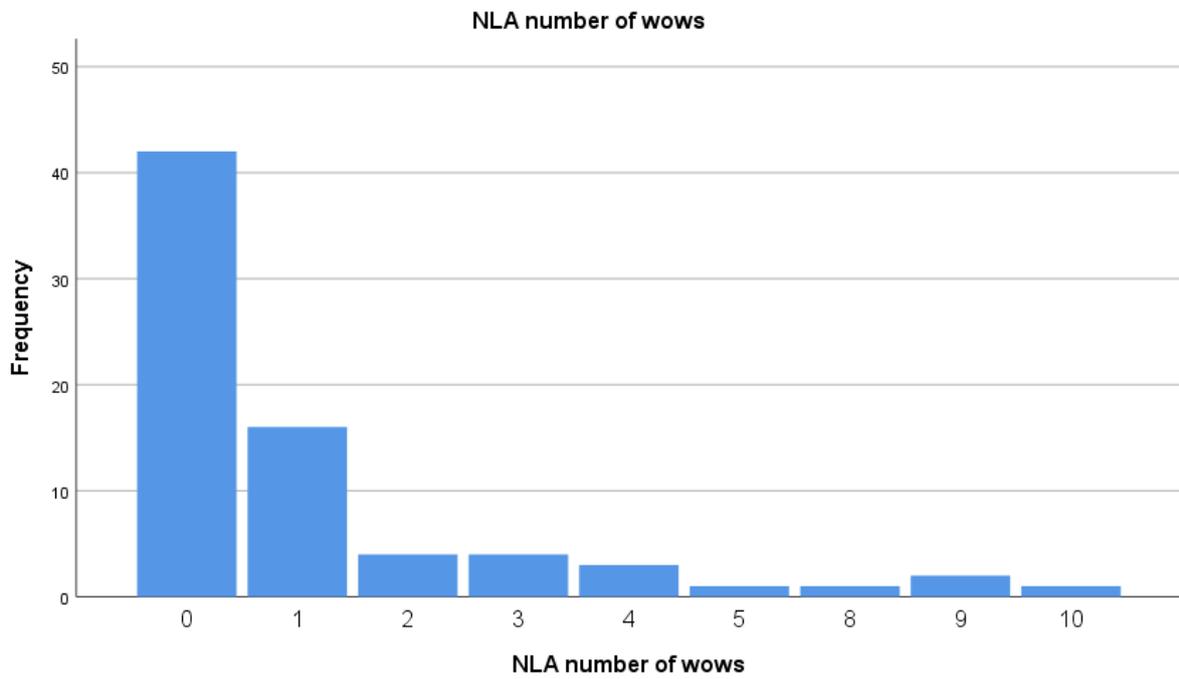
Figure 12 number of wow reactions on NLS Facebook posts
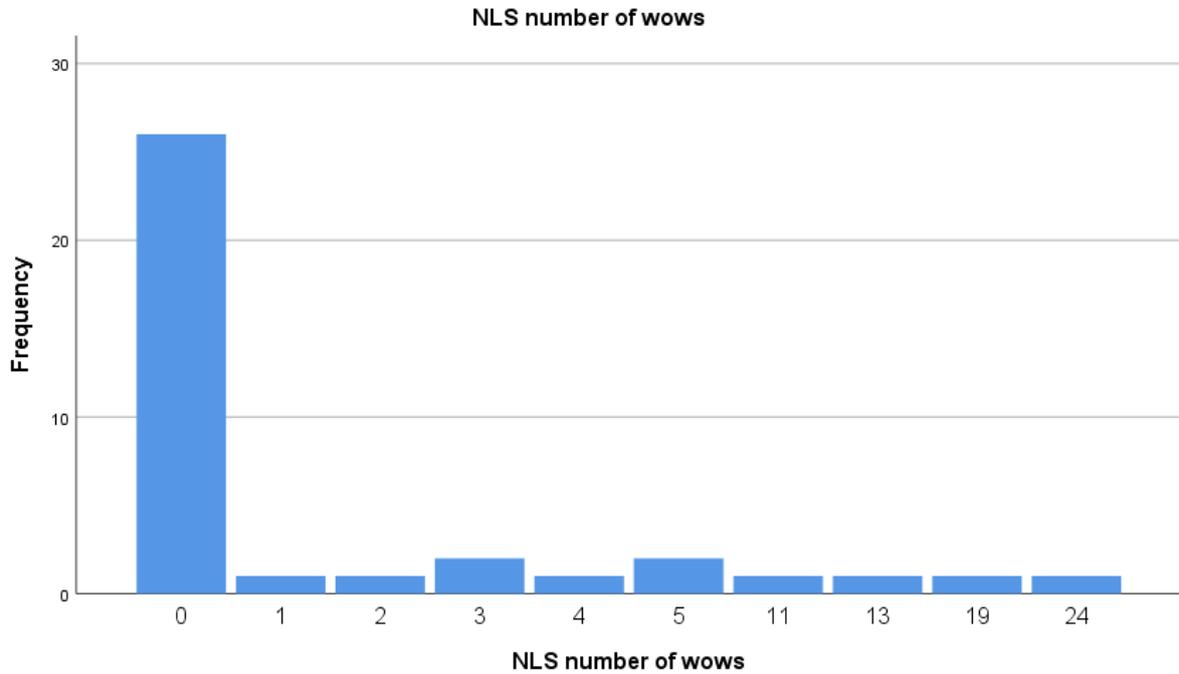
Sad

Figure 13 number of sad reactions on LoC Facebook posts
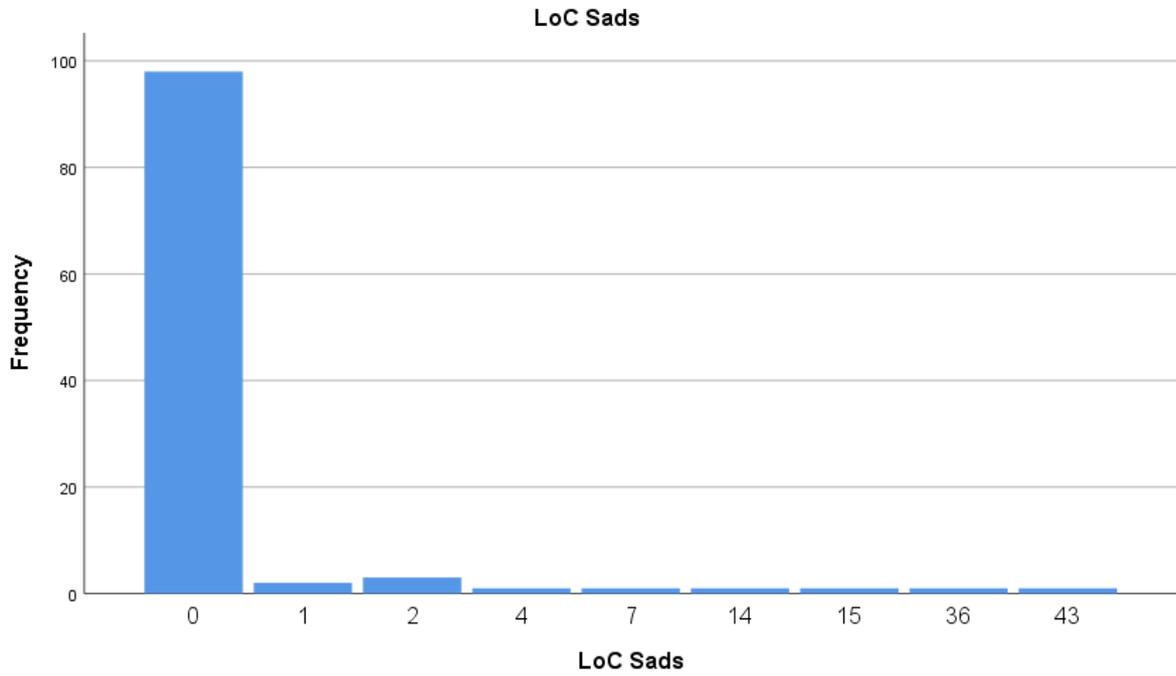
Figure 14 number of sad reactions on NLA Facebook posts
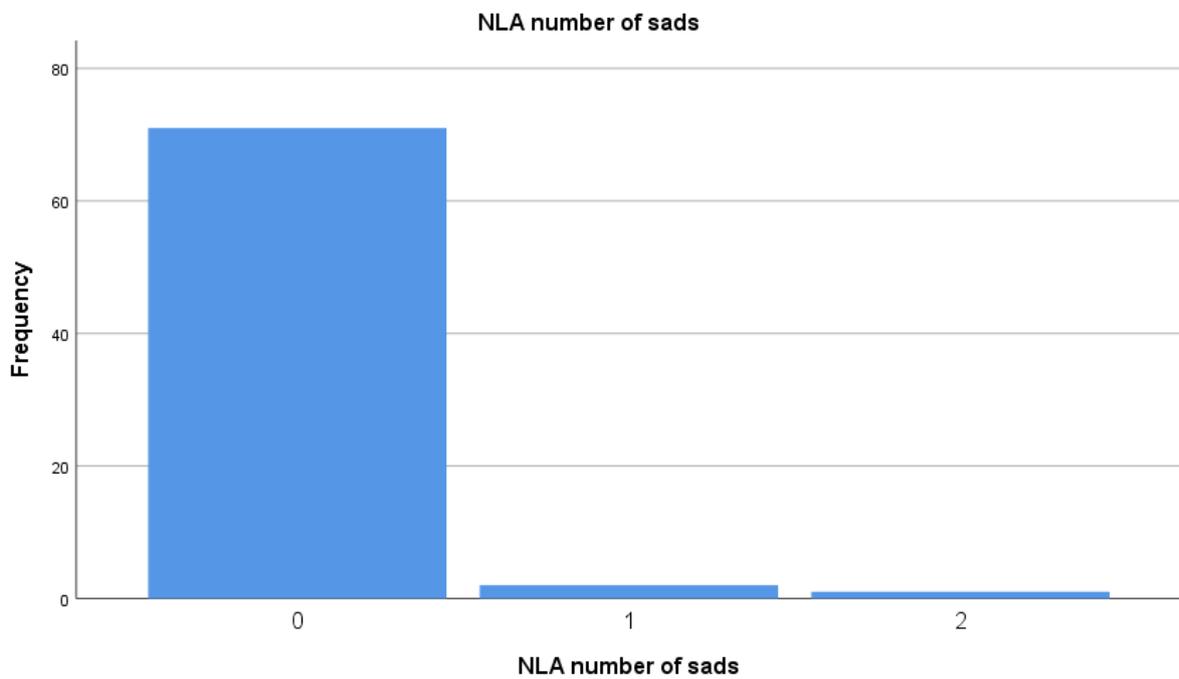
NLS number of sads

Figure 15 number of sad reactions on NLS Facebook posts
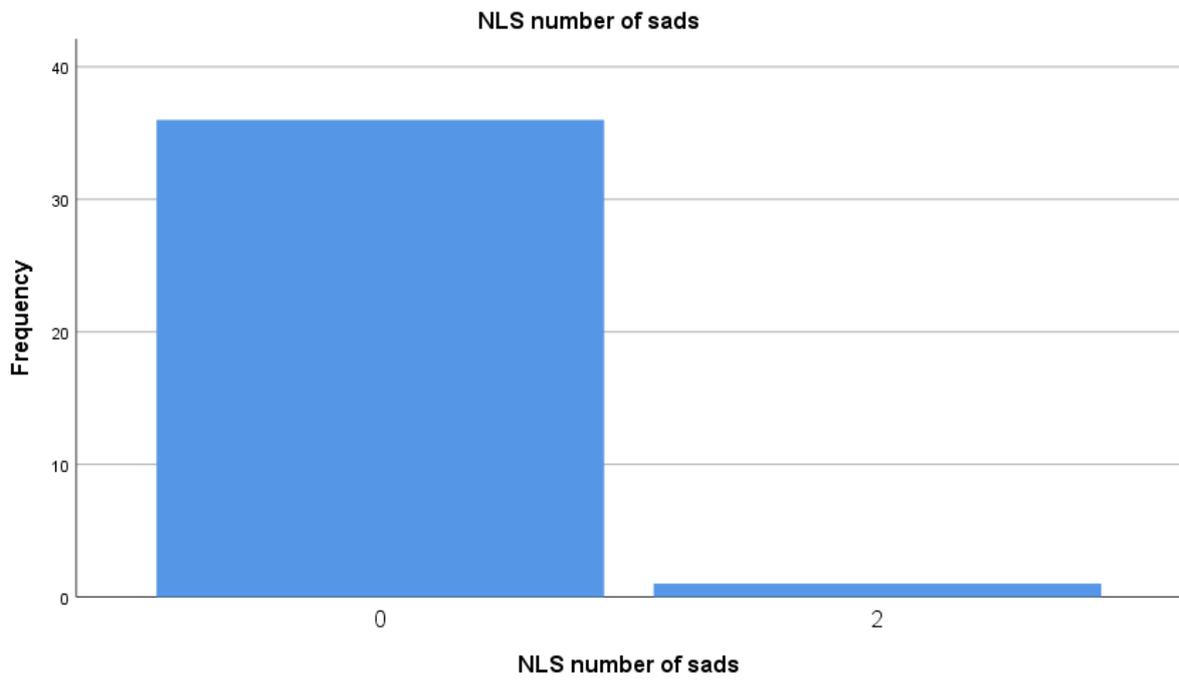
Angry

Figure 16 number of angry reactions on LoC Facebook posts

LoC Angrys
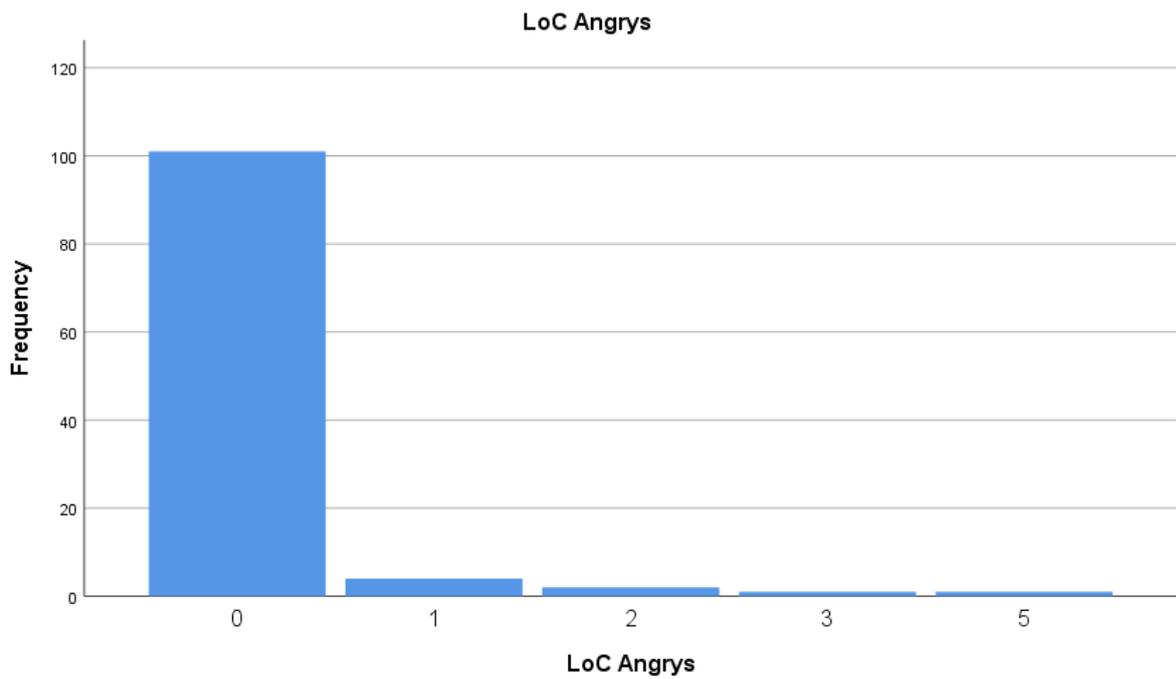
Figure 17 number of angry reactions on NLA Facebook posts

NLA number of angrys
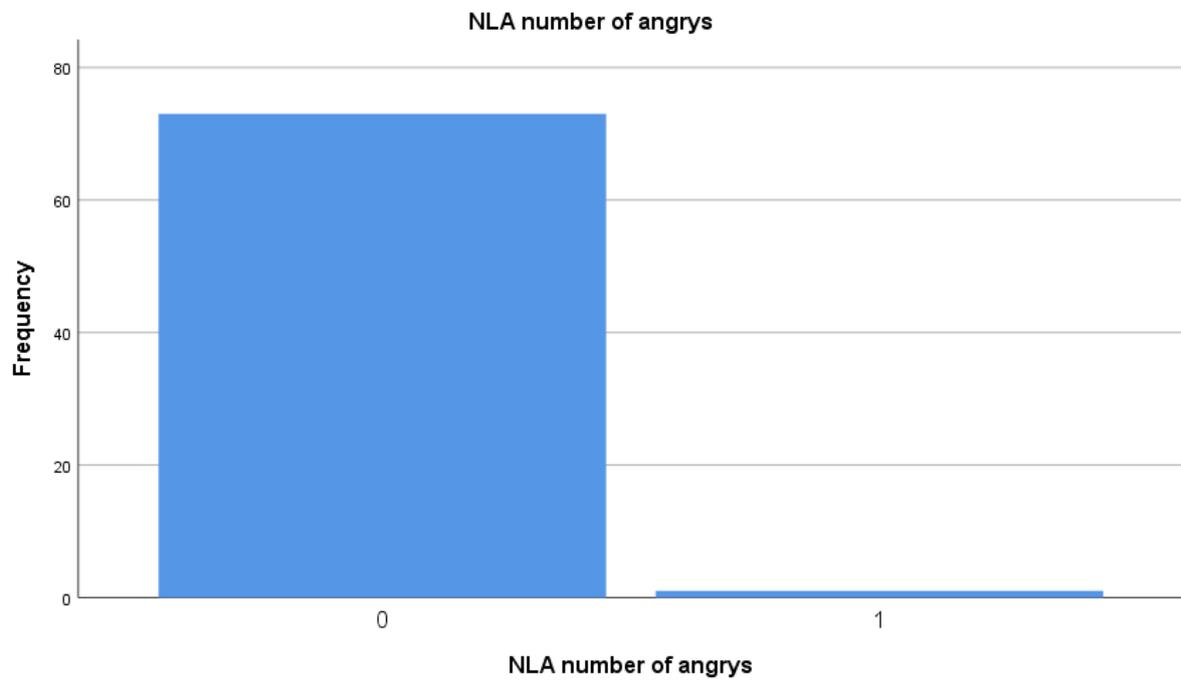
Figure 18 number of angry reactions on NLS Facebook posts

NLS number of angrys
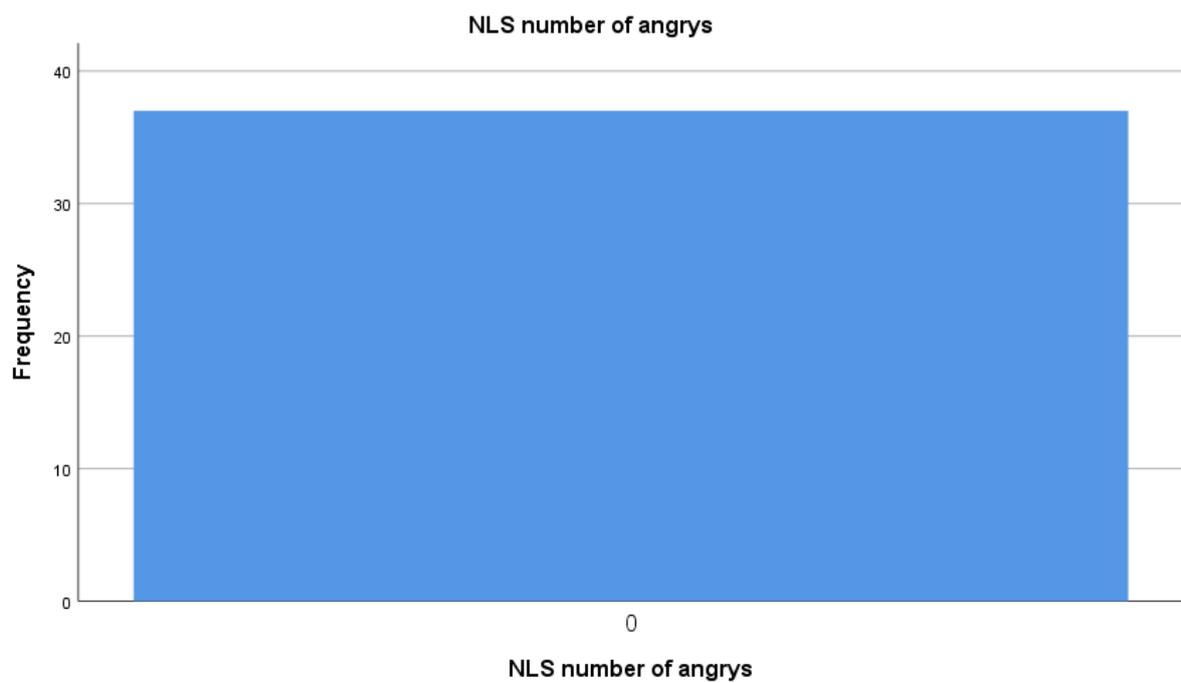
Comments

Figure 19 number of comments on LoC Facebook posts
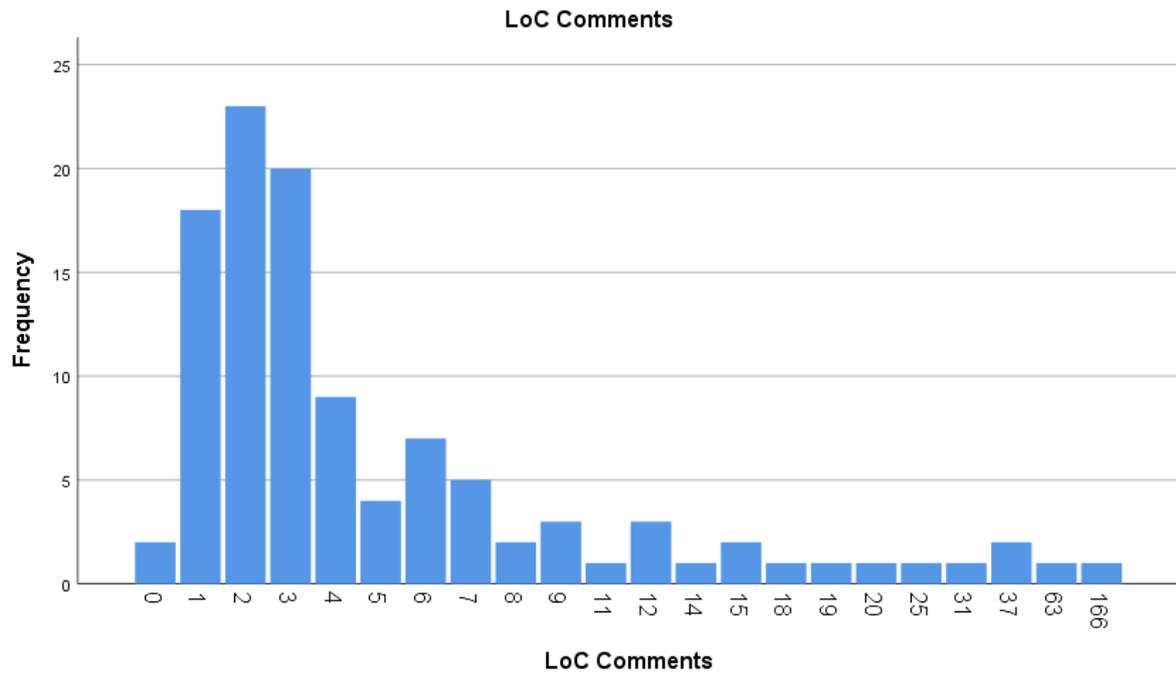
Figure 20 number of comments on NLA Facebook posts
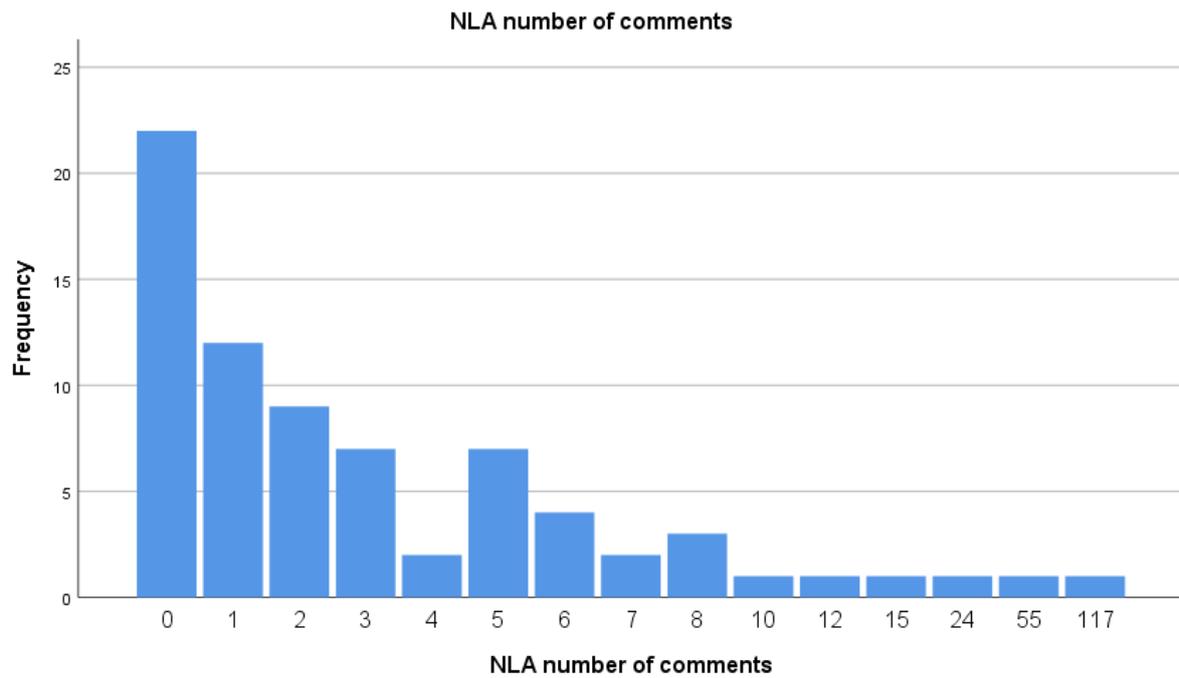
Figure 21 number of comments on NLS Facebook posts

NLS number of comments
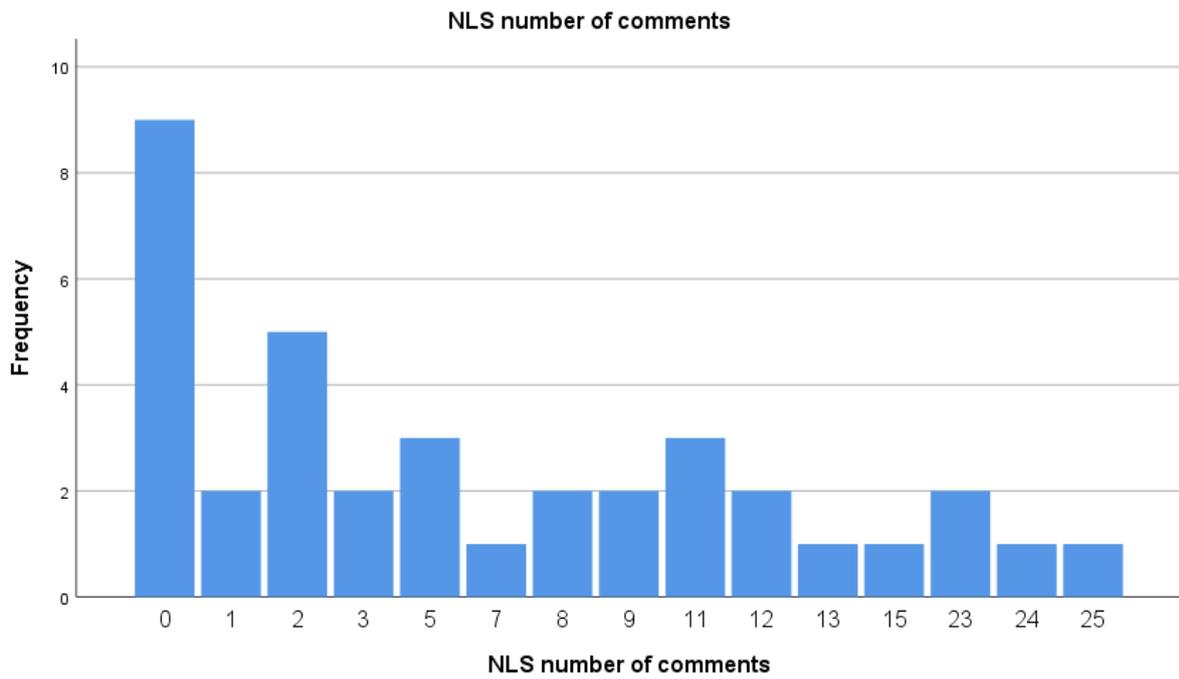
Shares

Figure 22 number of shares of LoC Facebook posts

LoC Shares
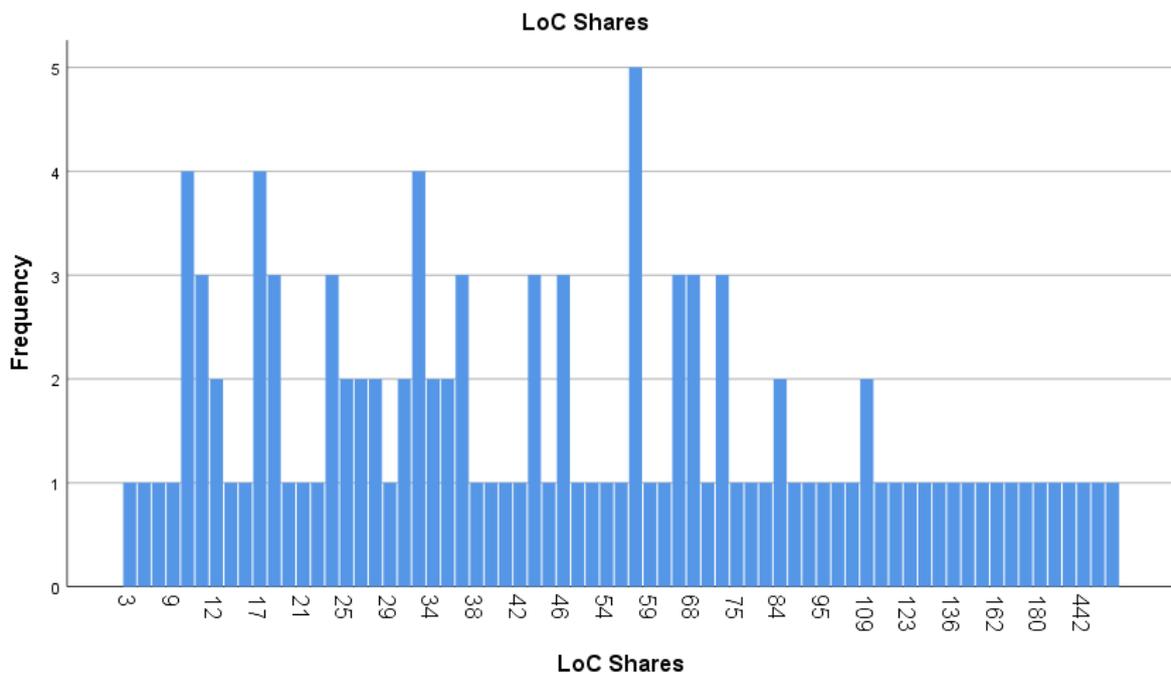
Figure 23 number of shares of NLA Facebook posts

NLA number of shares
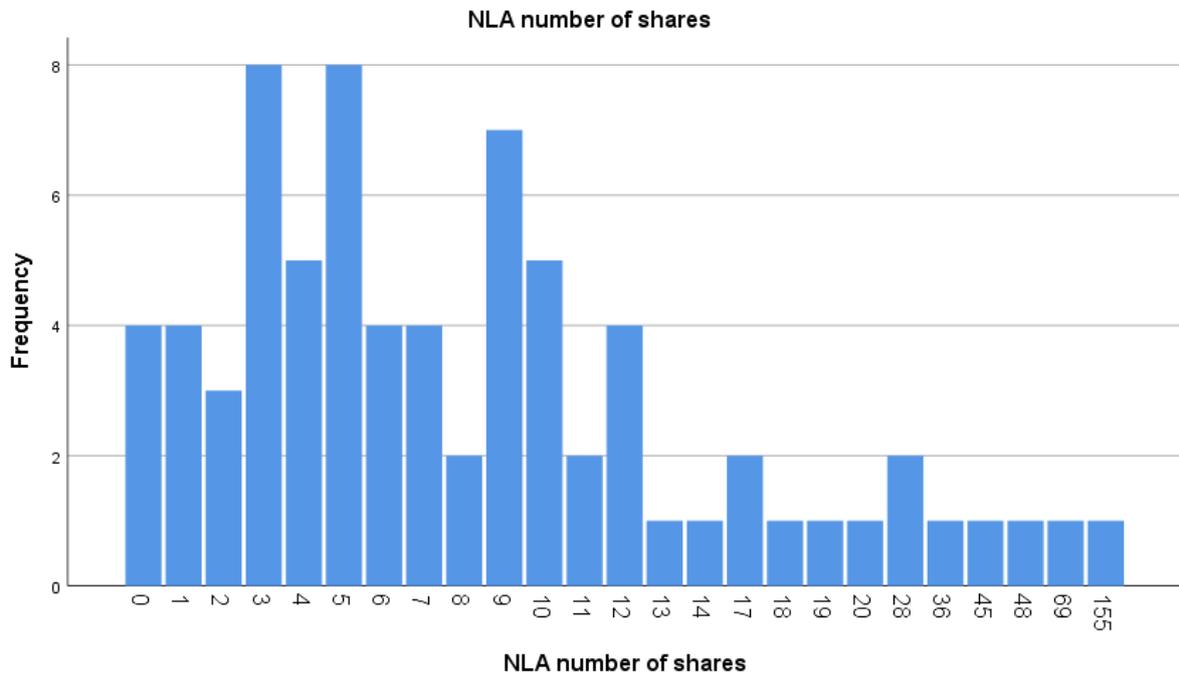
Figure 24 number of shares of NLS Facebook posts

NLS number of shares
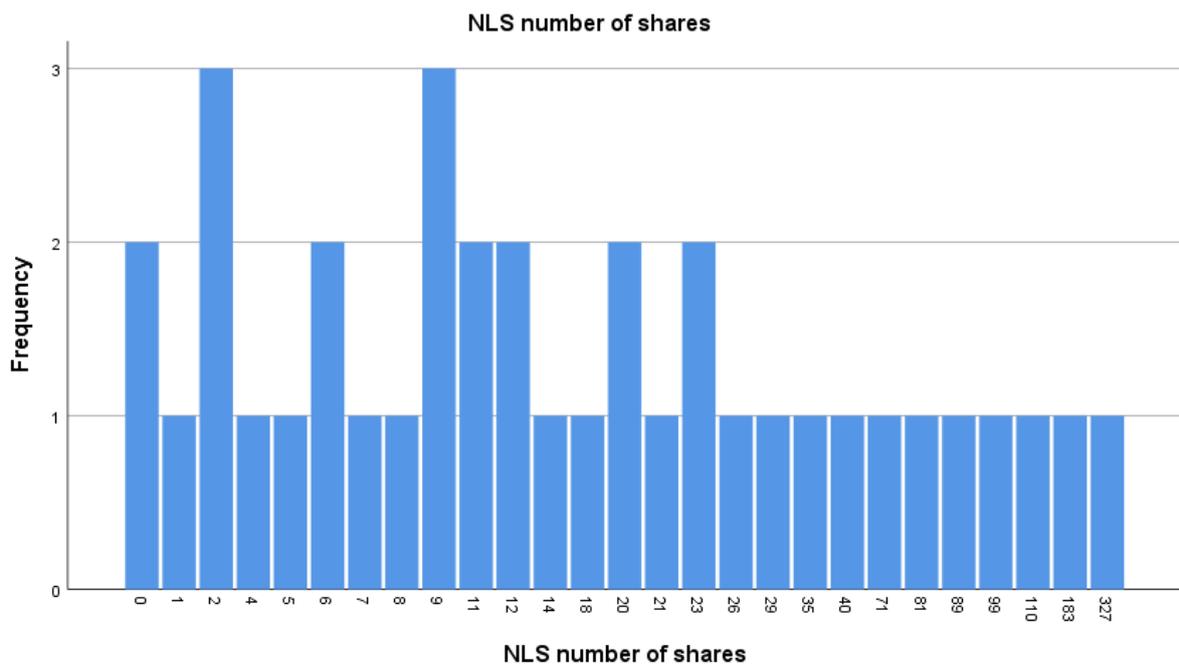
Twitter

Like

Figure 25 number of like reactions on LoC Twitter posts
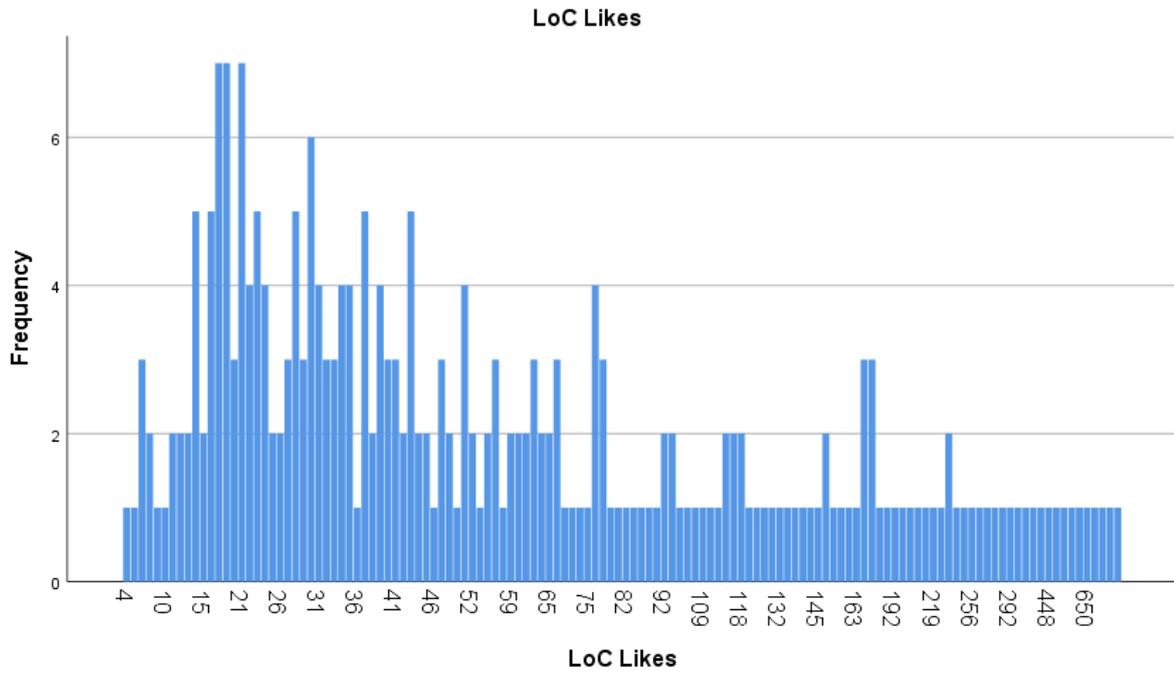
Figure 26 number of like reactions on NLA Twitter posts
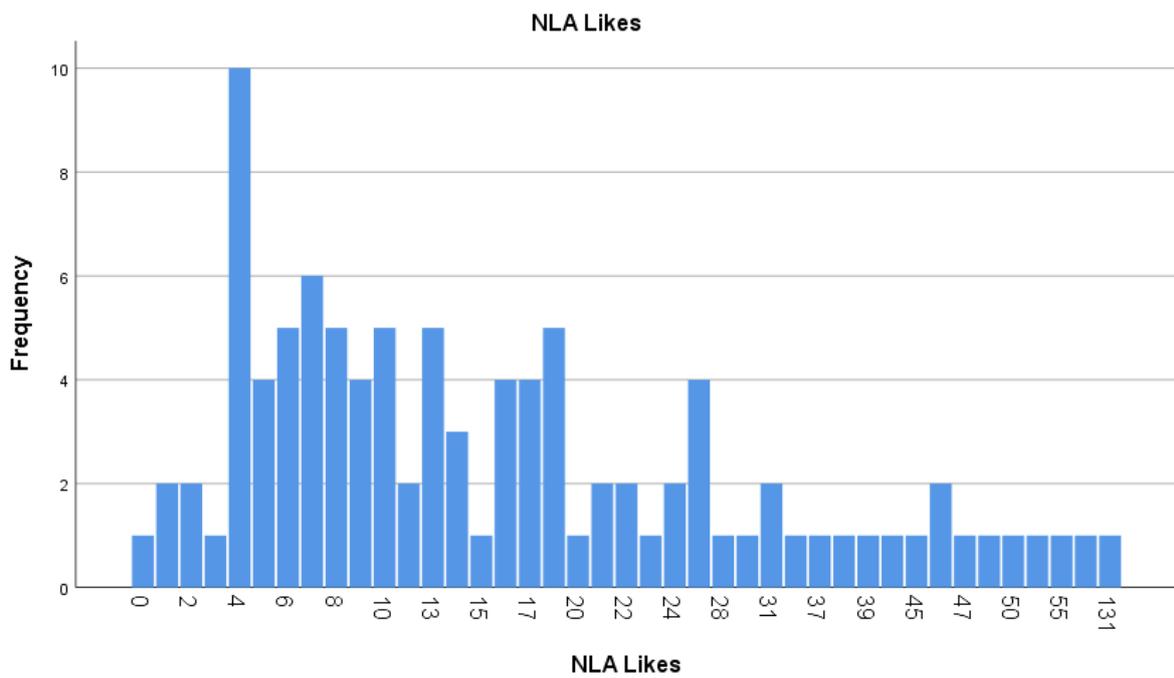
Figure 27 number of like reactions on NLS Facebook posts
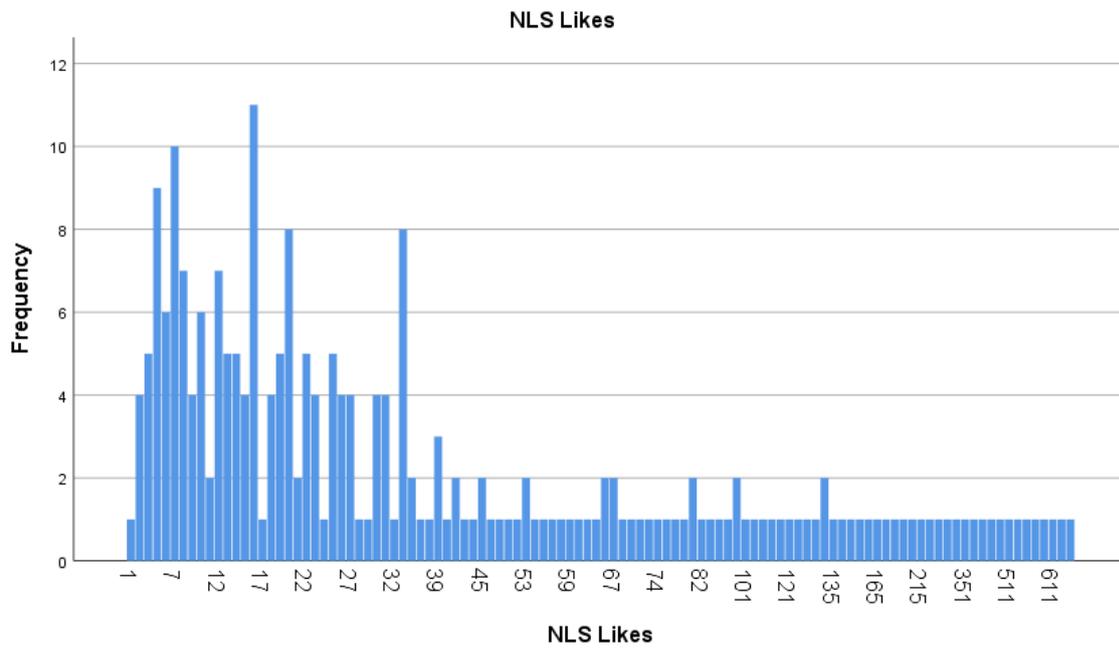
Comments

Figure 28 number of comments on LoC Twitter posts
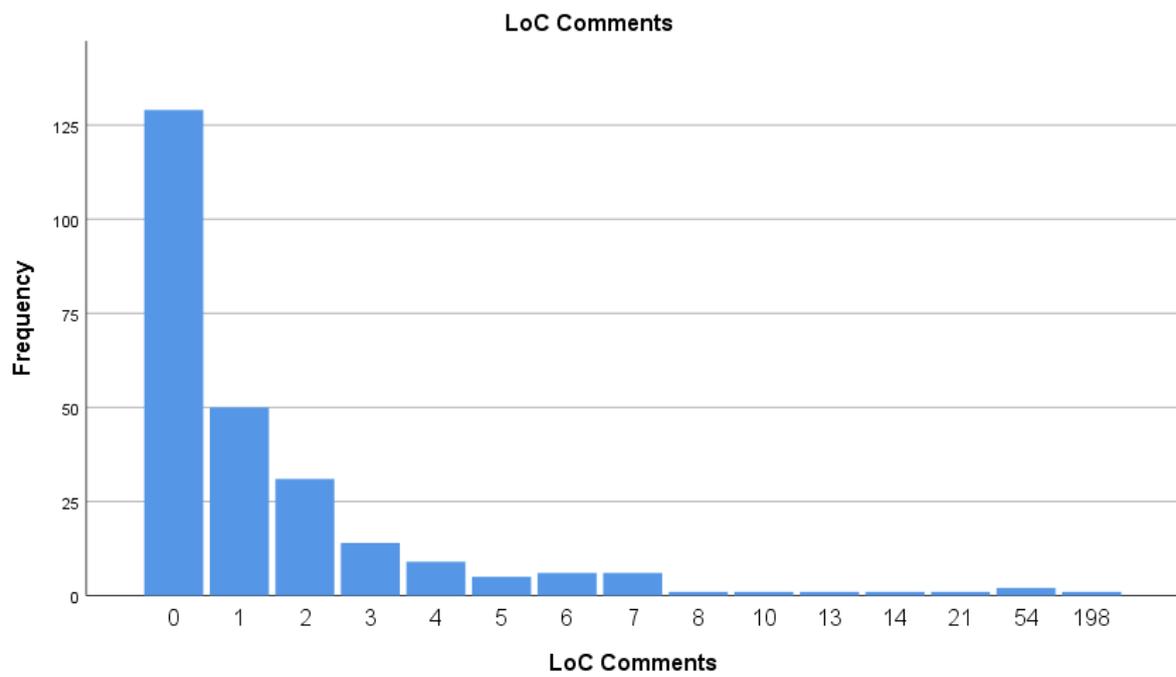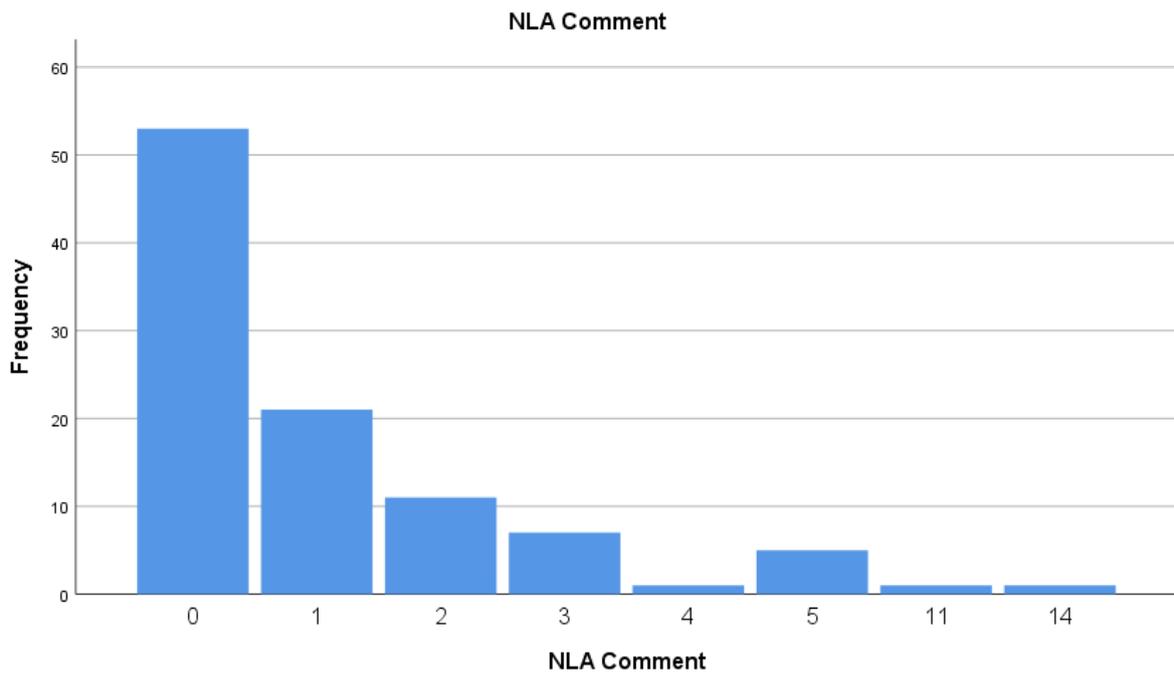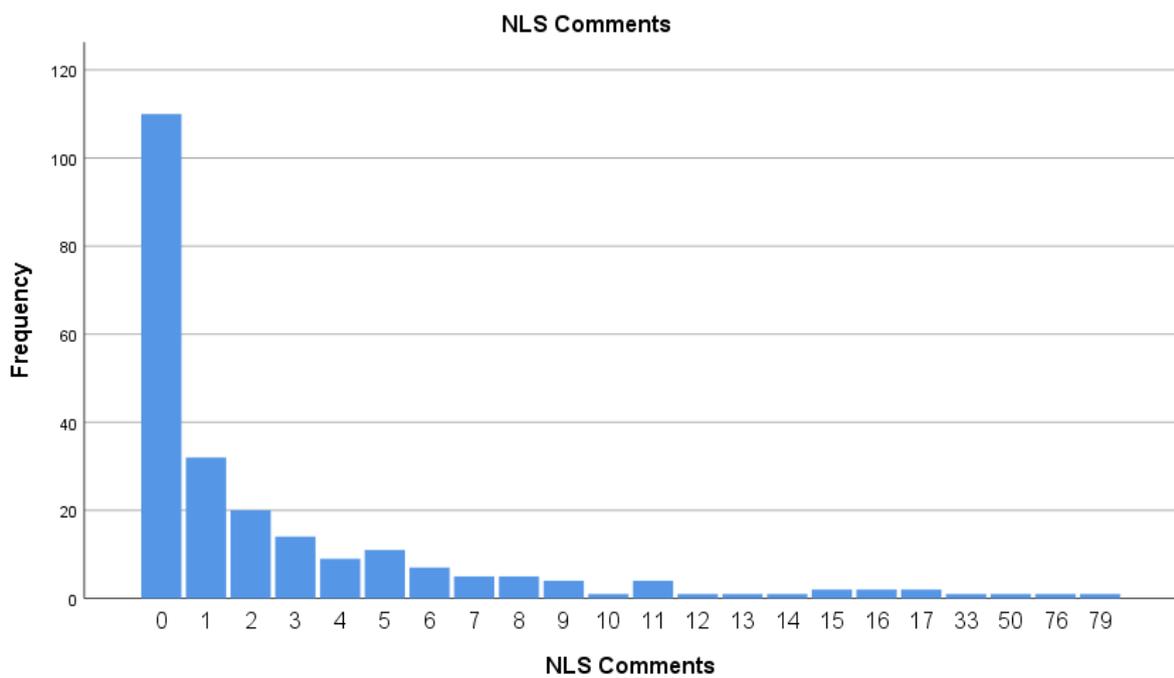
Figure 29 number of comments on NLA Twitter posts

NLA Comment

Figure 30 number of comments on NLS Twitter posts

NLS Comments

Retweets

Figure 31 number of retweets of LoC Twitter posts
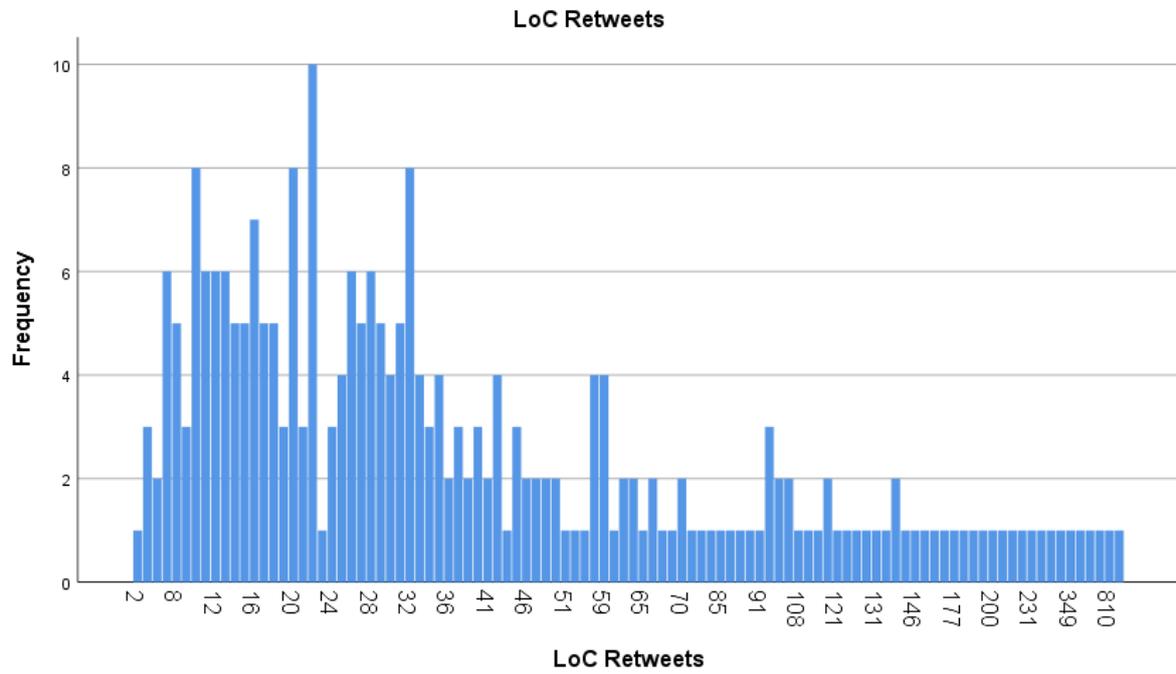
LoC Retweets
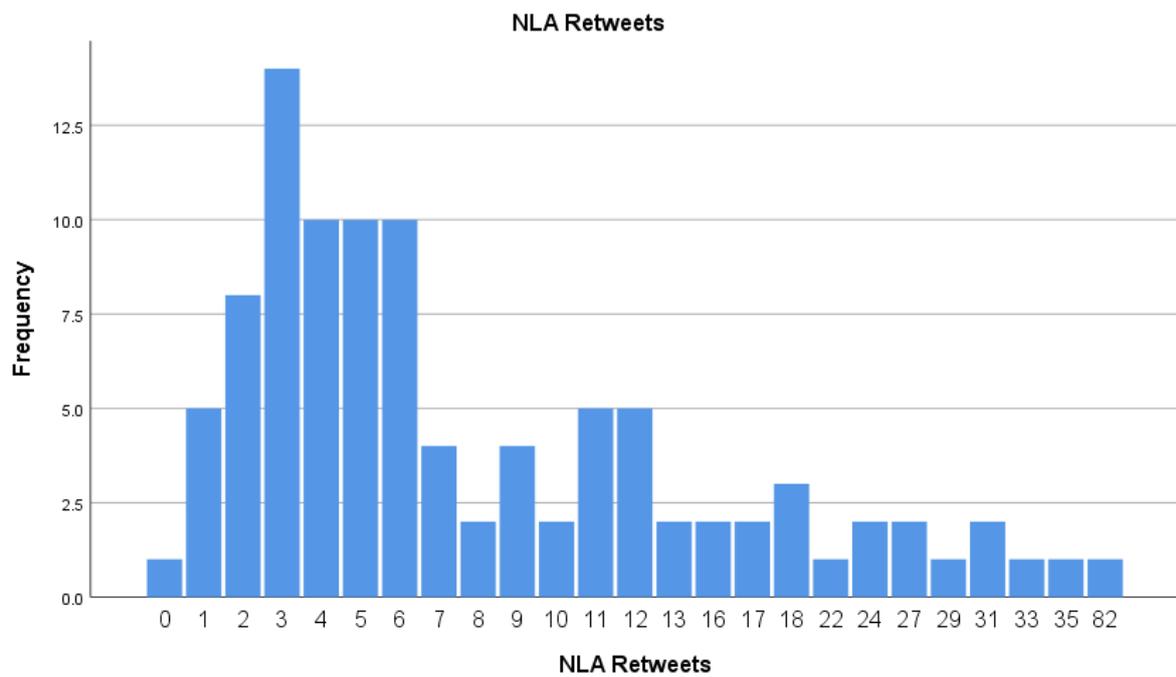
Figure 32 number of retweets of NLA Twitter posts

NLA Retweets

Figure 33 number of retweets of NLS Twitter posts

NLS Retweets