Digital Adoption Strategy: A Public Sector Ecosystem

Samantha Papavasiliou and Carmen Reaiche
Adelaide Business School
University of Adelaide,
Adelaide, Australia
e-mail: samantha.papavasiliou@adelaide.edu.au,
carmen.reaiche@adelaide.edu.au

Abstract—**The shift of public sector service provision to digital first, has had a considerable impact on how individuals interact with public sector entities. Therefore, this research argues for a systems approach to explore and understand different assistance-seeking behaviours. In particular, there is a need to understand the critical points within the system at which assistance is sought and the changing behaviours correlated to post assistance-seeking outcomes. Evidence for this research is presented through a case study on the Australian Taxation Office. Observations of the digital lodgement channel were undertaken to evaluate the components in which individuals sought assistance. Through the application of systems thinking and process mapping, this research highlights the critical points in which assistance was sought within the lodgement process. The results of this research lead to the recommendations that ongoing education should be provided for four years post first lodgement, and that education should occur at change of circumstances. Through the use of strategically placed self-help assistance throughout the lodgement process, it is anticipated that individuals will be less likely to seek assistance. However, this research demonstrates the importance of maintaining human interfaces for assistance-seeking to maximise an individual's capacity to interact with the system successfully.**

Keywords- Assistance seeking; Digital Ecosystems; public sector; digital lodgement.

I. INTRODUCTION

The ongoing attention on the importance of a successful public sector service offering, and to improve and enhance digital service adoption within the public sector, is based on the provision of a better client experience. To achieve this, public sector entities are putting increasing resources into understanding their clients and providing services to meet their expectations. This has had an impact on the manner in which services are designed, the manner in which data is used and shared to increase ease of use, and how entities plan future services. With the increased attention on the services, the next stage is to understand the human interaction components, which include assistance-seeking behaviours, why individuals seek assistance, and the points in the process that are more likely to require assistance. Since the shift to digital first service policies in the public sector, increased pressure has been placed on both the service user and provider to understand both the process and the digital environment [1]. Even with high adoption rates of digital services, there are still individuals not interacting digitally and those who require ongoing support and assistance once going digital.

The aim of this paper is to identify and understand public sector service users, which includes identifying the potential barriers to digital adoption, followed by understanding why various users seek assistance, and post assistance-seeking outcomes. This paper argues that mandatory public sector services need to be inclusive, including digital and non-digital options, this extends to how assistance is provided. This research forms part of a PhD and findings and recommendations are ongoing.

Research by the Australian Digital Transformation Agency (DTA) [2] indicates the necessity of further research of this type, to proactively address digital adoption, specifically increased use. In Australia the purpose of the DTA is to improve services for the community, expecting government to protect citizens personal data and deliver digital services [3], and to ensure that digital services keep up with ongoing technological change and development. Having an increased understanding of the issues facing public sector digital service users is of increasing interest in Australia, with ongoing service delivery changes from in-person/call centre (also referred to as analogue) to digital. With the growing complexities in the environment, the factors that impact why a service user may require assistance and their post assistance-seeking outcomes are becoming more influential in their perception of the digital services provided by government generally. Therefore, it is vital that research understanding digital adoption provides a more holistic view of the various issues facing service users, particularly focusing on understanding why they seek support. This paper seeks to address knowledge gaps that have been identified in the literature, including exploring what the barriers to digital adoption are in this specific case, why assistance was sought and how the assistance sought influenced their service use.

Through building and encouraging a user centric approach to researching the various interactions between individual public sector entities and users, the barriers to digital adoption will become more apparent. This is becoming increasingly more important due to regulatory changes in the public sector space as a result of the inclusion of 'digital first' policies, which have shifted mandatory

services online. These policies have fundamentally changed the manner in which service users interact with public sector services. For this research mandatory environments are classified as "Public Sector Organisations who must by legislation provide Digital Platforms for their services" [1] [4]. While mandatory interactions are defined as "Users who meet certain characteristics and must by legislation interact with the public sector service provider to meet these obligations" [1] [4]. Therefore, users must engage with providers, but under the digital first mandate expectations around how they do so has changed.

This paper focuses on a public sector case study – the Australian Taxation Office (ATO) – that was impacted by the introduction of the Australian Digital Continuity Policy 2020, which mandated the use of digital first channels for all public sector services [5]. Through the examination of previous literature, ATO corporate research, data analysis and responses from ATO staff, a gap was identified between what seems to be common knowledge about the mandatory digital service user and the profiles of the actual users who are required to use them. The impact of shifting mandatory public sector services to a digital first platform is still unknown. As digital first service provision is the way forward for all public sector organisations (especially in Australia), a holistic view of users is needed. This paper aims to provide this view. Research needs to support and assist users, improve services and inform policy to increase long-term voluntary compliance obligations in a mandatory service space.

This paper will review previous literature focusing on digital transformation, digital adoption, digital ecosystems and eGovernment to understand the background of digital transformation in Australia and the basis for digital adoption and eGovernment worldwide. At present, the standard methods used for evaluating government services are based on interviewing or surveying users about their opinions and experiences of services provided. However, this style of research often results in biased results, as users feel pressured to display expected behaviours [6-8]. As a result of this contentious and possibly flawed data collection, previous research appears to have ignored a number of factors which impact service adoption, and seems to have failed to identify the barriers to adoption within mandatory environments. There is also a gap in understanding how different experiences with digital services (both in the public and private sectors) can impact long-term adoption and the reasons for when and why users seek assistance. The focus of this research is on applying systems thinking and digital ecosystems theories to understand and validate the need for a holistic view of the users and the system, especially when seeking to understand assistance-seeking behaviours.

In this research, systems thinking, particularly a soft systems methodology, has been used as a way to understand the behaviours and actions in complex public sector environments. An important principle is the concept that each action within the system causes a reaction in the system. These reactions can lead to unintended consequences, ones which are critical to explore [9]. This approach has been used to explore the planning process the ATO undertook to minimise the barriers experienced by taxpayers when submitting their returns. Keeping in mind that a core aim of the research is to understand the connections within the system, and the way in which each part of the system influences and is influenced by other parts, systems thinking is considered the most appropriate method. Systems thinking seeks connections between solutions, systems and society, identifying components of systems and intended and unintended outputs of the system, providing a holistic view of the problem.

This research explores the assistance-seeking behaviours of individuals when they are lodging their income tax returns with the ATO. The purpose is to understand the impacts of assistance-seeking on lodgement outcomes. Of the over 3 million individuals who lodged in July 2018, 5.3% sought assistance at some point throughout the process. The aim is to understand the different drivers of assistance-seeking behaviours within a mandatory system. Therefore, this research addresses two primary research questions:

1) What are the critical points in the lodgement process/system that are causing individuals to seek assistance?
2) What are the potential policy implications of understanding assistance seeking behaviours?

In applying a systems lens to these two questions, we ultimately seek to understand how and why the system as a whole functions as it does.

We have adopted a mixed methods approach to data collection and analysis with systems thinking to support the end-to-end research. That is to say, identifying who is most likely to contact the ATO for support and the critical points of assistance-seeking, and understanding post assistance-seeking behaviours and outcomes.

The overall approach applied to this paper incorporated multiple stages to provide the greatest depth of analysis and provide a holistic understanding of the assistance-seeking behaviours within the case study. First, systems thinking was used to assist with determining links between the different components, and understanding the different elements within the system and the effects each element could have on the outcome. Second, a thematic analysis was used to outline the common themes within the assistance-seeking behaviour, and understand the points in the system requiring the most assistance. Finally, a statistical analysis was considered appropriate to determine the behaviour of the actors within the system. Specifically, summary statistical methods was used to explore the population and understand who may be more inclined to require different kinds of assistance, in an attempt to provide policy recommendations for self-help prompts provided to individuals who meet certain characteristics.

This paper is divided into six sections. Section one contains the introduction, section two presents the literature review, section three presents the conceptual model, section

four outlines the research methods undertaken, section five highlights the results and addresses the research questions, and section six offers policy recommendations.

II. LITERATURE REVIEW

Previous research demonstrates that the purpose of undergoing a digital transformation in the public sector is to increase access to provided services, including through digital services [10]. This is achieved through a better understanding of citizens and service users to improve their outcomes, making digital services easier to access, and improving the client experience [10]. An interesting challenge for the public sector, however, is to overcome the clashing expectations over private versus public services, which are personalised, modern and responsive. Therefore, the public sector must consider the end-to-end digital services in line with the private sector. Through the application of advanced analytics, governments are able to leverage the data collected from users to improve the services provided. The purpose of transitioning to digital services is to provide public sector services more effectively and efficiently to increase public value. For this research public value is ensuring that all mandatory public sector services provided are inclusive with both digital and non-digital options, ensuring equal access for all.

It is important to consider the variety of challenges facing public sector digital services. Firstly, the public sector takes advantage of technology that is popular within other industries; however, they do not have the time or finances to compete with the services provided by private sector entities. Secondly, governments are not always able to engage with citizens and service users to provide products and services in the manner expected. Finally, there are numerous regulatory restrictions which complicate the process. Therefore, digital technologies provide an opportunity to explore new channels for service provision, to improve resource management, increase access for users, and boost accountability and trust. Digital technologies deliver benefits across the economy and society [11], however, government services need to keep pace with the opportunities that digital transformations provide (including increased value for money for the community).

Digital transformation has empowered users and providers, making it possible to choose how services are accessed or delivered, how to communicate, when to engage on policy areas or issues, which social groups to join or business areas to invest in, and how to participate more actively in local, national and global challenges [12]. Research demonstrates that governments need to understand that going digital is no longer an option, but rather an imperative maintaining their legitimacy [12]. The adoption and use of digital technologies requires applying data more efficiently as part of their strategic components to modernise the public sector. Technologies are increasingly being used to digitise existing government processes and to offer public services online [12]. There has been a shift from a government-led to a user-driven administration, which is focused on end users and citizens expectations [12]. There are numerous challenges facing digital transformation, specifically around improving the digital experience. These include citizen security, cultural barriers to engaging with digital services, regulatory and legislative barriers (including those that restrict data sharing between government agencies), resource barriers and capability barriers (both public sector employees and users).

Research shown in Figure 1 outlines the progression towards digital transformations in the public sector [12]. The process started as analogue, which focused on in-person service delivery and paper-based processes. The second stage was eGovernment, which was the first stage of digitalisation, with the progressive inclusion of digital processes and procedures, including services provided to the users. The final stage in the progression is digital government, which is predominately based on digital first service provision, maximising user-driven approaches and citizen centric designs. This iteration highlights the value of inclusion, whereby exclusion from the digital world can exacerbate other forms of social exclusion such as unemployment, low education and poverty [11]. Every Australian should benefit in the shared digital future, which means that every member of the community provides insights into how they would like the service designed. This includes incorporating the user's views in the designs of processes and interfaces. The incorporation of users views, expectations and requirements into the design ensures that provided digital services take into account the different life stages and level of digital ability of users [11]. The application of systems thinking can assist in providing a different viewpoint of the potential barriers and their effect on digital adoption.

FIGURE 1. PROGRESSION TOWARDS THE DIGITAL TRANSFORMATION OF GOVERNMENTS [12]

A. Digitalisation

The evolution from traditional analogue services to electronic government services, to digital societies of interconnected and multichannel digital services has placed increased pressure on governments to provide high quality and easy to access public sector services [13]. This includes overcoming the challenges of meeting service user expectations, who commonly benchmark all services provided by public sector entities against those of the private sector. Users expect convenience and diverse communication channels with tailored information [13]. The development of digital services has impacted society considerably, specifically with the creation of eGovernment platforms, the shifting expectations to provide efficient, transparent and effective services, and to include open data (and transparency) and cross channel service options. With this shift to digital, the aim of public sector entities utilising these channels should be based on creating more efficient governments which offer service user's better services, enhancing the services already provided and aiming to increase all citizens' quality of life [14]. This is not a simple process, however; the use of digital processes and organisational change is the first step to ensure the successful implementation of digital first policies. It is shown that in countries that have successfully implemented digitalisation (e.g. Estonia), the government is able to provide services that meet the expectations of users, empower users, and increase their engagement with government [14].

The literature suggests that technology holds the key to shaping the world around us, as it enhances governments', businesses' and individuals' opportunities to integrate themselves within the global digital society, and enhance ongoing inclusion [15]. However, to become a high functioning digital government within the global digital society, digital adoption needs to be high, therefore, a key factor requiring consideration is the user's perspective. The most common determinants of eGovernment and digital government services adoption include the level of awareness and level of satisfaction of eGovernment services, both linked to intention to use [13]. Awareness relates to the extent users are aware of the eGovernment services [16] [17]. User satisfaction is being used to assess the continual use of eGovernment services and the success and failure of new eGovernment platforms [16] [18].

Digital or e-government adoption is most commonly defined as the continuous use of a digital service or innovation [19]. Therefore, for adoption to be achievable and sustainable, the digital service needs to be both appealing and useful [20]. This requires consideration of how a user may perceive the level of usefulness, ease of use, security level and reliability [21]. Furthermore, not all online activities are deemed to be of equal importance to an individual, especially when they are considering their personal level of human, social and financial capital [22]. Research suggests that there is a strong relationship between a person's level of education and the type and frequency of digital services utilised [22]. It is important to understand, when considering inclusivity of services, that technology access does not determine an inequality alone, whereby increased experience, exposure, digital participation and digital literacy are vital [22].

Previous research has identified four key barriers impacting digital access: (1) lack of basic digital experiences due to lack of interest, (2) no computer access, (3) lack of digital skills, and (4) lack of opportunities to use digital services [23]. Additional barriers impacting digital access include lack of access to internet, lack of awareness, language barriers, user-friendliness of websites, levels of trust and security fears [24]. Therefore, the digital divide is still an area that requires understanding and consideration when planning digital service provision in all contexts, including social, psychological, cultural and non-technological [23]. Thus, with the application of a systems view, a holistic understanding of these factors can be provided.

The challenges facing policy-makers going forward is understanding and determining the appropriate resources and functions necessary in digital services to provide a foundation for and to support positive user behaviour [25]. This requires ensuring the creation of digitally inclusive services. Digital inclusion ensures that all individuals and groups (including the disadvantaged), have access and the skills to use information and communication technology (ICT), and are thus able to participate in and benefit from the growing reliance on the digital knowledge and information society [26]. Thus, digital inclusion encourages increased access to information and communication technology, with the aim of increasing social and economic benefits. Digital inclusion links back to the digital divide, which is the gap between people who have effective access to digital technologies and those who have limited or no access. Access and cost become barriers impacting digital inclusion, however individual factors associated with engagement and confidence are affected by digital literacy, relevance, motivation, trust and safety. Therefore, the aim of eGovernment and digital government services is to provide information and public services to citizens in an easy to access manner that encourages platform participation [25]. This highlights the vital importance of understanding the users of services, the application of systems thinking to break down the different interaction points, potential barriers and so forth, so that services that meet the needs of the users can be provided. It is also important to consider the digital ecosystem impacting the users, which includes where the services fit within the broader environment, including public and private sector services. This links back to the importance of understanding different factors impacting the user's ability or willingness to utilise a digital service provided by the public sector.

B. Digital Ecosystem

When exploring the impacts of digitalisation on public service adoption, there are multiple components that need to be understood and these elements are commonly identified

within the digital ecosystem. There are multiple definitions of digital ecosystems, however one of the most widely used defines a digital ecosystem as an "open, loosely coupled, domain clustered, demand driven, self-organising agents' environment, where each species is proactive and responsive for its own benefit or profit" [27, p. 3]. Therefore, each species or user who works within or utilises a digital ecosystem, is a participant who uses the system with a specific goal in mind [28 –30]. Therefore, a digital ecosystem can be characterised as consisting of organisational interactions, connected digitally, which are enabled by modularity, and are not managed by a hierarchical authority. Regardless of the definition, ecosystems are large, and they encompass numerous interactions between producers, suppliers, innovators, customers and regulators, shaping a collective outcome [31].

An ecosystem therefore emerges as a result of digitalisation, and through this process it becomes possible to connect a broad set of users together through the delivery of a singular digitalised customer solution. Thus, demonstrating the importance in understanding the creation of digital ecosystems within this research. As to ensure multiple external factors influencing user's ability are understood and incorporated into the design and planning of public sector digital services and policy.

There are two definitions applied by this research. The first defines a digital ecosystem as "an interdependent group of actors (enterprises, people, things) sharing standardised digital platforms to achieve a mutually beneficial purpose" [32, p.1]. The second definition defines a digital ecosystem as, "a network of digital communities consisting of interconnected, interrelated and interdependent digital species" [33, p. 249]. Both definitions include the stakeholders, institutions and digital devices situated within an environment, that interact as a functional unit and are linked together through actions, information and transaction flows. These definitions imply that all of the connections made by service users to achieve their specific goals within a digital platform are incorporated within the digital ecosystem. Therefore, digital ecosystems are shared communities, with scalable resources used to pursue challenges of specific goals and objectives [34]. Finally, the level of complexity within a digital ecosystem can be attributed to the differences between the participants taking part in the system and their objectives [35] [28].

The different components relevant to the inner workings of a digital ecosystem are outlined in Figure 2. At the base are the users, who are the people, businesses and entities. They consume the services from the available channels (through digital platforms, directly or through other channels) [36]. The first level is the government, which includes the federal, state and local authorities who influence policies and legislation, as well as departments, organisations and entities that implement policies and provide services to fulfil mandatory obligations [36]. The second level is the market, which refers to the non-government entities (e.g. academics, not-for-profits), intermediaries (such as health providers, tax agents), service providers (such as technology companies) and industry (such as banks, commercial entities) [36]. Finally, the third level is the environment, which includes the social norms, cultures, societal interactions and the access to the information and technology made available by the other levels [36].

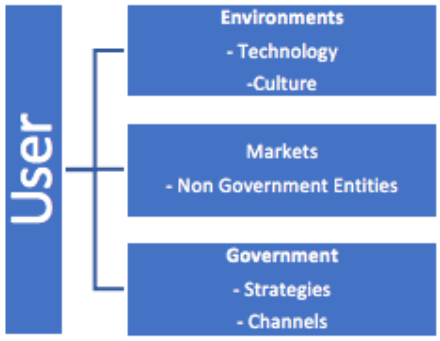

FIGURE 2. COMPONENTS OF A DIGITAL ECOSYSTEM [36]

Considering the different levels and the elements within the digital ecosystem under exploration, assists in ensuring a holistic understanding of the problem or situation under exploration. Through the exploration of the specific digital ecosystem relevant to a mandatory system, a testable conceptual model was created.

III. CONCEPTUAL MODEL

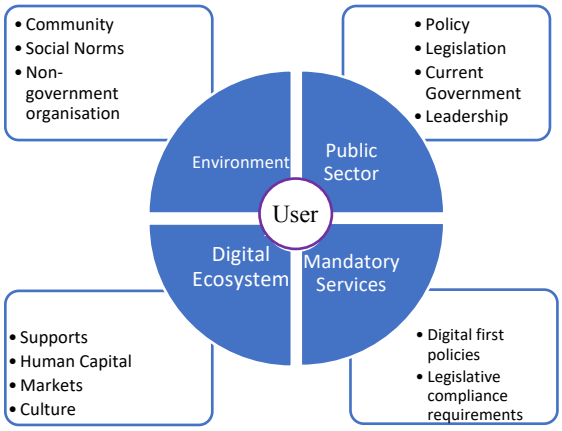

FIGURE 3. CONCEPTUAL MODEL WITH THE USER AS THE CENTRE FOCUS [3] [4]

A testable conceptual model was designed as a result of the analysis of digital, business, technology and innovation ecosystems. The purpose of the model is to provide user-centred research to guide policy and better support and understand the different users. Previous research does not focus of factors which impact a user's ability to adopt and participate within a mandatory digital ecosystem. The existing research provides minimal discussion on how digital

adoption can differ in mandatory and voluntary environments. Through a thorough literature review, a number of factors within a user's environment were identified as having considerable impact on willingness or capacity to adopt mandatory digital services.

This research is focused on understanding the Digital Ecosystem quadrant in Figure 3, to explore the elements of supports and human capital within this quadrant, to determine what impact different elements components have on the Mandatory Services and Public Sector quadrants.

IV. METHOD

The motivation for this study originated from a desire to understand barriers to digital adoption in the public sector. A comprehensive literature review of research centred on environmental ecosystems [1] [4] has revealed that there is a lack of inclusiveness in the current mandatory system. The method outlined below outlines how the analysis provided the rationale for the proposed conceptual model: A Digital Ecosystem Quadrant (see *Figure 3*).

A. Case Study

The use of a case study method has been applied to this research to understand the different issues affecting digital adoption in the Australian Public Sector environment. The ATO case study was selected for numerous reasons. Firstly, the ATO is the lead in the public sector service provision (as the first Australian Public Sector (APS) organisation to adopt the digital first policy in Australia) [37]. The ATO collects considerable amounts of data, including interaction level data and mandatory interaction requirements data. The purpose of undertaking a case study is to explore and understand the uniqueness of a single case, while also understanding how findings from a specific case links to similar organisations or situations facing similar issues [38][39]. The use of a case study encourages greater in-depth exploration of the complex issues impacting digital adoption in that case. Therefore, by understanding the distinctiveness of the specific entity and users within the case under exploration, further research can also determine similarities to other cases (and their users and entities) [38] [39].

A mixed methods approach was applied to this research, which was appropriate for ATO case study. Therefore, the application of mixed methods encouraged the integration and interpretation of qualitative and quantitative data. This research carried out exploratory summary data analysis, text mining and thematic analysis, and hypothesis testing based on experimental design, to understand results from the data collection. This approach was applied to obtain an understanding of the key barriers impacting digital adoption and how they could be overcome. The starting point for this research analysis involved a qualitative method to explore and understand the different meanings and themes individuals or groups link to a problem [40]. An inductive approach was applied to this research, which involved a process of searching for patterns within observations, which was then used to develop explanations or theories, and from which a series of hypotheses were created [41] [42]. The application of a combination of mixed methods and inductive approaches, allowed for the emergence of research questions to assist in the identification of themes within the results. A pilot study was conducted in 2017, in order to validate the umbrella research questions and guide future research directions. This included informing feasibility and testing the research design. The purpose of the pilot study was to identify the potential problems and thus assist with designing and undertaking a larger and more informative study [1] [4]. The pilot data and analyses [1], informed a number of research questions and hypotheses as part of a larger study completed in June 2018. This data collection focused on quantitative data (both experimental and survey conditions). The application of a quantitative approach has been used for testing objective theories, through the examination of the multitude of relationships between the variables [39].

Data collection for this study occurred during a 4-week period at the beginning of 2018 Tax Time. This included a survey form which consisted of questions, both qualitative and quantitative, designed in a manner to explore different components and characteristics of a random assortment of callers (n = 3,990). The survey queried the reason for call, the caller's demographics, and why assistance was sought. To achieve randomisation, the survey collection was provided to 11 call centre operatives. All assistance-seeking phone call data was also collected. This information included what type of assistance was being sought, basic demographic information and post call outcomes. The total call centre population (n= 188,971) provided a large sample to complete further quantitative data analysis.

Post data collection, data was anonymised and categorised based on areas of interest and demographics. The first analysis utilised descriptive statistics (e.g. mean, median, proportions) to identify and understand the features within the sample population. Furthermore, through a thematic analysis of collected qualitative data, the different reasons assistance was sought were identified. The study findings address specific factors in relation to the purpose, timeframe, lodgement behaviour and number of individuals seeking assistance at various points of the lodgement process. The key questions used to collate the collected data are provided in Table 1.

TABLE 1. EXAMPLE OF THE QUESTIONS USED TO COLLATE THE DATA

Questions	Themes Factors
Why do individuals seek assistance from the ATO?	Assistance Seeking/ purpose/ intentions/ motive
Within the lodgement process where do individuals seek assistance?	Assistance seeking/ lodgement behaviour/ source of support

How many questions were asked per call? How many individuals contacted the ATO more than once?	Types of queries/ individual profile/ assistance seeking behaviour
What are the effects of assistance-seeking on lodgement timeliness?	Lodgement behaviour timeframe
How did they lodge post assistance-seeking?	Prediction adoption behaviour

B. Thematic Analysis

A thematic analysis or topic modelling was conducted on the qualitative data collected within the survey. The analysis was conducted utilising Python statistical software and the Natural Language Toolkit (NLTK) package for natural language processing. Through the use of this toolkit, the different themes or topics were identified and grouped together to create broader categories [43]. An extension of the standard approach to Gioia analysis was undertaken utilising statistical software to validate the process (see [4] for the initial Gioia analysis). When conducting the Gioia method for qualitative rigour [44] [45], the researcher categorised the accounts into three separate phases (first, second and third order), however these steps were conducted out of order. The first order, 'Concepts', is the 'voice of the user' (also known as 'voice of the customer'). The second order, 'concerns and statements', identifies specific sentences from participants which are then grouped together to discover the themes and patterns in events and accounts. These create themes that are more generalised underlying explanatory dimensions, to test consistency and patterns [44] [45]. Finally, the third order 'aggregate dimensions', identifies the generic themes encompassing all of the first and second order data [44] [45]. Significance was measured through counting occurrences of first, second and third order elements to identify themes and patterns throughout the different accounts. The patterns in the text were then linked by connections, highlighting key features and emergent concepts or themes that require further analysis.

Starting with the third order or 'aggregate dimensions', generic themes and topics were identified by word frequency through the application of Latent Semantic Analysis (LSA). LSA is based on the use of a distributional hypothesis, whereby words and expressions occurring within similar parts of text have similar meanings [46]. The significance of each of these themes was tested in the following stages of analysis, whereby counting occurrences identified themes and patterns throughout the different accounts. The second order was completed next, which seeks 'concerns and statements', which identify key sentences or phrases through the use of Latent Dirichlet Allocation (LDA) to understand themes and patterns within the accounts. LDA utilises mathematical probabilities to help define the unknown words that represent a known topic, by mapping the known elements to the unknown elements in a way that provides the probability of a word belonging to a particular topic [47]. These were used to create themes which are generalised underlying explanatory dimensions that demonstrate consistencies and patterns within the data [44] [45]. Finally, the first order 'concepts', or 'voice of the user' were identified, through the use of Text similarity Metrics. Jaccard Similarity calculates how similar two sentences are by determining the size of the intersection and the size of the union of two sets, identifying the number of words in common between sentences and providing a numeric output [48]. This identification process was simplified by the application of information obtained in the LSA and LDA processes. The patterns in the text were linked together manually to identify connections, and to highlight key features and the emergent concepts or themes not picked up by the analysis.

The results were validated by another independent researcher, who conducted their own analysis of the data provided and obtained equivalent outputs.

C. Systems Thinking

Systems Thinking analysis was applied to systematically identify and order findings into their respective components of the process [49]. This helped to identify the points within the process and system that are causing the most issues and where support can be implemented. Systems Thinking was used to visually convert the findings into simplified figures that highlight key emergent findings.

Process mapping and systems thinking principles were utilised to understand the relationships between the different steps of the lodgement process and where the different assistance-seeking behaviours sit within that process. The application of systems thinking, broken down into four key steps, was used to assist in providing a clearer understanding of the situation. Firstly, how people seek assistance to meet their mandatory ATO lodgement requirements was explored. This recognised and explored the role of digital systems, non-digital systems and assistance seeking in the process. Secondly, analysis of the assistance-seeking behaviours was conducted to understand the decisions and user in greater detail. Thirdly, a process map was drawn, which outlined the system and how assistance-seeking fits within it. Finally, the process map was used to inform the research question idea. This final part was an iterative process that was altered and added to as understanding about the users experience emerged. Process mapping is used to demonstrate, using a pictorial representation, the sequence of actions and responses between the start and end of a process [49]. This is commonly used to determine where there might be issues, inefficiencies or opportunities within the current process [49].

V. RESULTS

Results from this research demonstrate that there are multiple reasons why individuals seek assistance when undertaking their annual tax lodgement, including both digital and non-digital queries. As indicated in a previous pilot study [4] many taxpayers would have been unable or would have struggled to lodge their tax return without obtaining assistance.

A. Individuals Seeking Assistance

Firstly, there is no unique type of individual who seeks assistance – they differ in age, gender, income, occupation and even how many times they have lodged previously. As for age, as shown in Figure 4, 49% of individuals were aged between 18 and 29 years old, demonstrating that younger people are more likely to seek assistance to complete their tax return. The least likely age group to ask questions were those above 65+ years. In most of the comments from the phone contact, the individuals in both age groups, only sought assistance due to a change in their circumstance or because they were attempting an online lodgement for the first time.

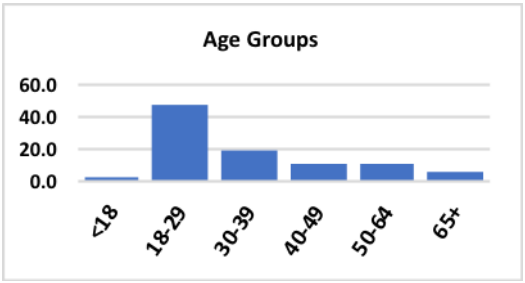

FIGURE 4. ASSISTANCE SEEKING BY AGE GROUP

Interestingly the overall the distribution of genders is relatively similar, with slightly more females (48.8%) than males (45.1%) seeking assistance overall, as shown in Table 2.

TABLE 2. AGE DISTRIBUTION

Female	Male	Undisclosed
48.8%	45.1%	6.1%

In the breakdown of the population by occupation codes in Table 3 [50], individuals who indicated being Community and Personal Service Workers (10.8%) and Labourers (13.1%) sought assistance most frequently. In comparison, Trainees, Apprentices and other related workers (3%) and Machinery Operators and Drivers (4%) sought assistance less frequently than other individuals.

TABLE 3. OCCUPATION CODES

Occupation	%
1 - Managers	4.7%
2 - Professionals	9.2%
3 - Technical and Trades Workers	5.2%
4 - Community and Personal Service Workers	10.8%
5 - Clerical and Administrative Workers	7.1%
6 - Sales Workers	7.8%
7 - Machinery Operators and Drivers	4%
8 - Labourers	13.1%
9 - Trainees, Apprentices and other related workers	3%
? – Not stated	35.1%

TABLE 4. INCOME RANGE

<$18,200	$18,201-$37,000	$37,001-$90,000	$90,001-$180,000	>$180,001	?
28%	21%	21%	4.4%	1%	34.1%

As per the ATO income tax brackets [51], the income range of individuals who sought assistance is demonstrated in Table 4. The majority of individuals who sought assistance earned less than $90,000 in the previous financial year.

TABLE 5. LODGEMENT

First Lodgement Year	Under 5 years	Greater than 5 years
7.7%	27.6%	64.7%

Table 5 demonstrates the number of years individuals who sought assistance had been lodging their tax return. 7.7% were undertaking their first lodgement, and 27.6% had been lodging their tax return for under five years. Interestingly, the majority of assistance was sought by individuals who had been lodging for greater than five years. The analysis was used to determine whether there was a relationship between the first year of lodgement, and how many people sought assistance.

B. Reasons For Seeking Assistance and Source of Assistance Seefiking by Individuals

Through the use of a Gioia and thematic analysis, the common themes as to why individuals sought assistance were identified. As shown in Figure 5, the results demonstrate that the majority of individuals (83.7%) sought assistance for utilising digital services (including platform support and technology support from the ATO). 10.3% of individuals sought tax advice (including system education, platform awareness and advice). Additionally, 2.9% contacted the call centre to obtain paper forms. In most cases individuals sought paper forms due to lack of computer skills, a preference for utilising paper and language barriers. Finally, 3.1% of queries were not related to lodgement of tax returns (including pre-lodgement and post-lodgement related queries). The thematic analysis demonstrates that at multiple points of the process individuals would not have been able to lodge their tax return without assistance.

Once the analysis was completed, a process map was created to outline the multiple interaction points within the system and where the different assistance-seeking points fit within it, shown in Figure 6. The diamond shaped points are decision points, rectangles are points of the process, and the oval shapes are outcomes. There are four key decision points where assistance is commonly sought. Contact point 1 is commonly where digital service support is sought. This is the first component of successfully interacting with the mandatory system. Without the appropriate access and support, some individuals who are not able to continue the digital process or who need to obtain a tax agent or request a paper form, do not lodge. Contact point 2 is where individuals contact the ATO for assistance in obtaining paper forms (publication ordering). Contact point 3 is referred to as the component when individuals require tax advice during their lodgement process.

There is a feedback loop associated with this contact point (which forms contact point 4) when an individual requires additional assistance either for the same or a different issue and contacts the ATO again for assistance. The other options for obtaining tax advice is to source the information through a google or ATO website search or obtain from a tax agent.

C. Number of Queries Per Call

As highlighted in Table 6, even though the majority of callers asked one question on average, in 48.4% callers had multiple questions. Interestingly 8.3% had four or more questions. For individuals who asked more than one question, in 92% of cases the questions theme changed. In 78% of these instances, the question was not one that had been prepared.

TABLE 6. NUMBER OF QUESTIONS PER PHONE CALL

1	2	3	4+
51.6%	26.8%	13.3%	8.3%

D. Repetitive (Returning) Individuals

Of the individuals who contacted the ATO seeking assistance, 38.7% did so on more than one occasion within the one-month period of data collection. Of those individuals, 69.9% contacted the ATO twice, 19% three times and 11.1% four or more times. Interestingly only 1.2% proceeded to lodge through paper forms. Of those remaining, 29.2% shifted to the use of a tax agent or intermediary, 32% lodged digitally and 37.6% had not yet lodged by October 31st 2018.

E. Impact and Effect of Lodgement Timeliness and Lodgement Process Post Assistance-Seeking

TABLE 7. POST ASSISTANCE SEEKING INTERACTION/LODGEMENT CHANNEL

	Total
Not lodged	23.7%
Digital lodgement	51.7%
Tax agent or intermediary	22.7%
Paper	1.9%

TABLE 8. POST ASSISTANCE SEEKING INTERACTION/LODGEMENT CHANNEL BY ASSISTANCE TYPE

	Digital	Advice	Other	Publication ordering
Not lodged	11%	24%	80.7%	32.5%
Digital lodgement	67.7%	31.1%	11.7%	9.4%
Tax agent or intermediary	20%	43.5%	6.6%	23.2%
Paper	1.3%	1.4%	1%	34.9%
Total	100%	100%	100%	100%

Individuals may lodges their tax return in Australia via a number of avenues. If an individual chooses to self-prepare they can lodge at no cost, through the Digital myTax channel, via a paper form and in some cases over the phone. If they choose, however, an individual can obtain an intermediary or tax agent to lodge on their behalf. Individuals who choose to complete their lodgement this way, pay for the service. The results of the thematic analysis demonstrate that assistance-seeking fit into four key categories: Digital Services, Tax Advice, Publication Ordering and Other non-lodgement queries. As shown in Table 7, of those who had sought assistance 76.3% had lodged within the expected timeframe, and 23.7% had not lodged on time. On-time lodgement indicates that an individual has lodged their income tax return prior to October 31st 2018, as per legislative requirements. The results of the thematic analysis demonstrate key elements outlining why individuals sought assistance.

The majority of those individuals who had not lodged on time were seeking support on other non-lodgement related queries (including obtaining a tax file number, superannuation queries and deceased estates), and in many cases those individuals were not required to lodge a tax return at all. As highlighted in Table 8, the majority of assistance seekers (51.7%) lodged through the digital platform, and the majority of these individuals sought assistance for digital issues followed by tax technical advice. Interestingly, only 11% of individuals seeking advice on digital matters had not lodged on time; however, 21.3% lodged through non digital means, which could imply that they were not able to obtain a solution. In contrast, 24% of individuals seeking tax technical advice had not lodged on time, and the largest portion of these individuals lodged through a tax agent or intermediary. This could demonstrate a lack of understanding of the system and the confidence they obtained by seeking additional support. For those requesting paper forms, 34.9% lodged through that method, whereas 32.5% of those individuals requesting paper forms had not lodged on time. This could be attributed to the additional processing time required for a paper form

(approximately 50 days, as opposed to 14 days for digital and tax agent lodgements).

VI. Policy Implications and Recommendations

There are a number of potential policy implications and recommendations that have been determined within this research. However, it is important to add that this research highlights that assistance provided, no matter how well presented and in what format, may not provide the information in a manner that resonates with the individual seeking it. Therefore, it is important to provide a number of different channels for information, including different languages, the use of visualisations, and a combination of over the phone and in person assistance where needed. Furthermore, of all individuals who utilise the digital system, the number of individuals who sought assistance as part of digital system use is low, however we argue that this population is still important to understand and explore.

Our research found that the majority of assistance-seeking individuals were those who had been lodging for greater than five years. Therefore, the education provided to the individual regarding system use needs to be on a long-term basis, on an average of four to five years based on the evidence above. Training and policy design should also consider providing training to individuals when they have a change in circumstances or role in the system to ensure they have all information needed to successfully interact with the system. This falls into the concept of predictive adoption and assistance-seeking which will be explored in future research.

From the thematic analysis the majority of individuals sought assistance for digital advice, including system education and platform awareness. While the minority sought non-digital means for lodgement due to lack of computer skills and a personal preference towards utilising paper means of lodgement. This indicates that individuals require education systems that are accessible and relevant. Furthermore, incremental digital adoption requires system education at the point in time that the user requires it. The thematic analysis demonstrates that there are multiple points at which, without assistance, individuals would not have been able to lodge. Therefore, a critical aspect to consider for policy design is the identification and full systems integration of these key assistance trigger points. For policy-makers it is important to consider stronger investment of resources in support mechanisms at various points of lodgement (i.e. points identified with the system approach and thematic analysis. The process map shows where the different assistance seeking points fit within the system. Through this visual mapping process, it is possible to identify the correlations between where assistance was sought and the different stages of the lodgement process. These correlations highlighted the key points where self-help options or additional education could be provided, and this could assist in minimising the number of individuals who are required to contact the ATO for digital service issues.

Profiling individuals based on query behaviour will not be effective, as there is strong evidence to suggest that variations of queries and unpredicted types of questions emerge through the dialogue. This demonstrates the value of human interface (via phone, in person and chat windows) as these support services provide ongoing support and education. This research provides support for the notion that not everyone will adopt a fully digital system from public sector service providers. As highlighted, many individuals who sought assistance were able to determine multiple areas within the process that they required greater understanding, which was possible as a result of a dialogue with a human interface (or person).

This was demonstrated through the analysis of individuals who called numerous times, to obtain additional support from a human interface, even though additional information was available from other digital means. As a result of these human interactions, 32% of individuals who sought assistance more than once, shifted to digital lodgement from non-digital means the year before. Therefore, repetitive advice can be designed to target individuals needing reassurance of processes. This component of the research is still underway and will form part of future research. Finally, when understanding the individual's post assistance-seeking outcomes, the summary statistics demonstrate that additional research and profiling is required to understand in depth the different needs of the population. Future research will explore predictive adoption and assistance-seeking in post assistance-seeking outcomes.

The framework being developed within this research, which will result from more testing of the conceptual model, can be applied more broadly within the public sector digital services space. This research has explored in detail the Digital Ecosystem quadrant of the conceptual model, which outlines the importance of supports and human capital on digital service use. By providing public sector service designers with more information about the service users, the greater the level of understanding they will have which should lead to more inclusive services. This research framework has been applied more broadly to the adoption of digital health platforms, specifically exploring the different user views and support requirements to utilise and engage with these style services. This includes exploring how different types of assistance provided by an organisation, supports or hinders the use of a service, including available information, call operatives providing advice and other support services available outside of government. Understanding the broader implications of this research on other public sector services is underway and ongoing. Further research is being conducted to understand how the model fits within the social services space.

This research and the policy recommendations and implications are aimed at providing advice that encourages mandatory public sector services to be inclusive, utilising both digital and non-digital options, including the provision of assistance.

The policy implications from this study are fundamental and rich with possibilities for future longitudinal research. The most basic finding is that perceived human support is the main predictor of the intent to adopt a digital mandatory system, with relevance as the major constituent driver of perceived understanding of the digital government system.

VII. LIMITATIONS

This study has potential limitations. The first limitation is that this research is being conducted as part of a PhD. Therefore, the research is ongoing and progressive. The second potential limitation is the use of qualitative data and analysis may limit the generalisability of the specific findings within the research to other areas. The third potential limitation is the data collection was conducted within the period tax lodgements were due for the Australian Taxation Office, therefore some of the results are specific to lodgement of income tax returns. Lastly, the results of this research may not be completely generalisable. Additional research is underway to explore different public sector services and build a framework that is relevant across multiple channels and public sector services.

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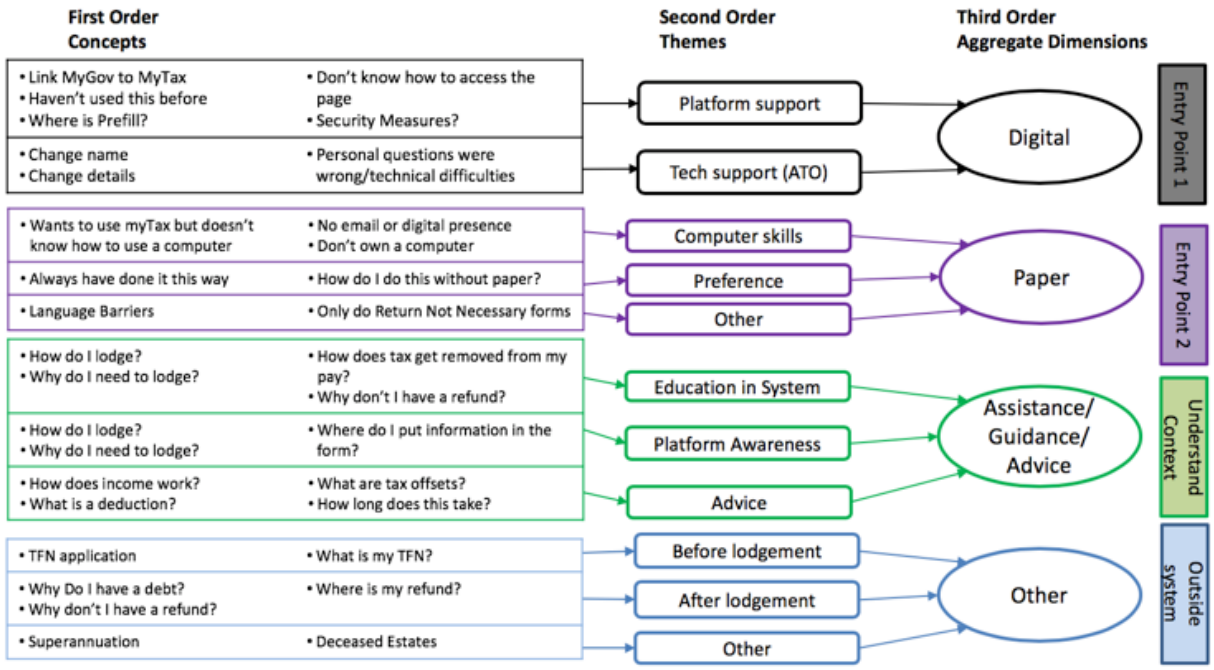

FIGURE 5. RESULTS OF THE GIOIA AND THEMATIC ANALYSIS

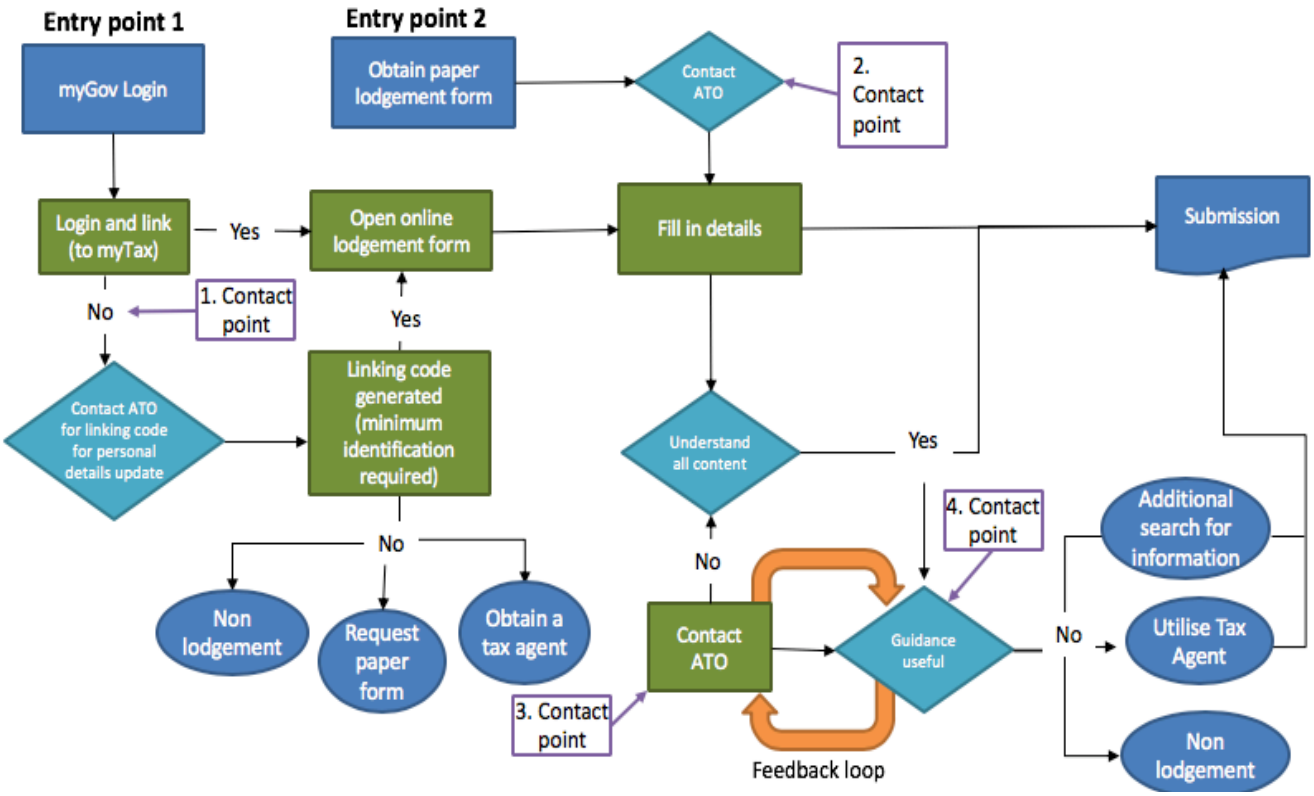

FIGURE 6. PROCESS MAP OF LODGEMENT PROCESS