Optimising the user experience design process for timeous systems development: A South African case study

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Dedication

Ad majorem dei gloriam (for the greater glory of God).

Abstract

User Experience (UX) design is the process of creating products that adequately meet users' needs and result in user satisfaction. In the context of software development, the application of UX design practices has been linked to increased profitability in organisations. Despite the financial benefit organisations stand to gain by adopting UX design practices, previous studies have revealed a low rate of adoption. One key source of resistance to the adoption UX design practices is the perception that adding new steps to an organisation's software development process would prolong delivery timelines unnecessarily. Such resistance is compounded by the fact that a high proportion of software development projects already exceed their planned durations. The question therefore arises on how the UX design process can be optimised so that it has the least amount of impact on the speed of delivering software. It is this very question that this study answers.

In this study, the UX design processes from four case study organisations and six prominent international UX design approaches were reviewed and analysed. From these analyses, commonalities and optimisation opportunities were identified for each process, then synthesised into a proposed framework. This study's contribution to the Human-Computer Interaction body of knowledge is the proposed Graduated UX Design Adoption (gUXa) framework. The Innovation Resistance Theory (IRT) was used to explain the ability of the gUXa framework to reduce the barrier to UX process adoption due to its potential to optimise the design process for timeous systems development.

Keywords: User experience, user experience design, gUXa framework, software development, optimisation.

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Contents

List of figures

List of tables

Glossary of terms

Term	Definition
Waterfall	An approach to software development projects in which analysis, design, development and testing activities are conducted in a linear, sequential manner (Seno, Andryana & Iskandar, 2020). The waterfall approach is also known as the "traditional" approach to software development (Seno *et al.*, 2020).
Agile	An approach to software development projects in which cross-functional teams deliver working software in short, frequent intervals (Dingsøyr, Nerur, Balijepally & Moe, 2012).
Sprint	A timeboxed period within which analysis, design or software development work must be completed, usually between one and four weeks (Wang, 2019).
Product backlog	Prioritised list of features and enhancements to be developed by a software development project team (Moreira, 2013).
Front-end developer	A software development professional whose role is to create the user interface of an application (Laaziri, Benmoussa, Khoulji, Larbi & El Yamami, 2019).
Middleware and back end developer	A software development professional whose role is to develop the database and the components that enable retrieval of data from the database, for display on the user interface (Ghimire, 2020).
UX designer	A professional whose role is to ensure that the design of an application meets the needs of target users by including users in the design process (Barbosa-Hughes, 2019).
UI designer	A design professional whose role is to create prototypes that resemble the final user interface including colour, icons, buttons and how the screen objects respond to user activation (Pandian & Suleri, 2020).

1. Introduction

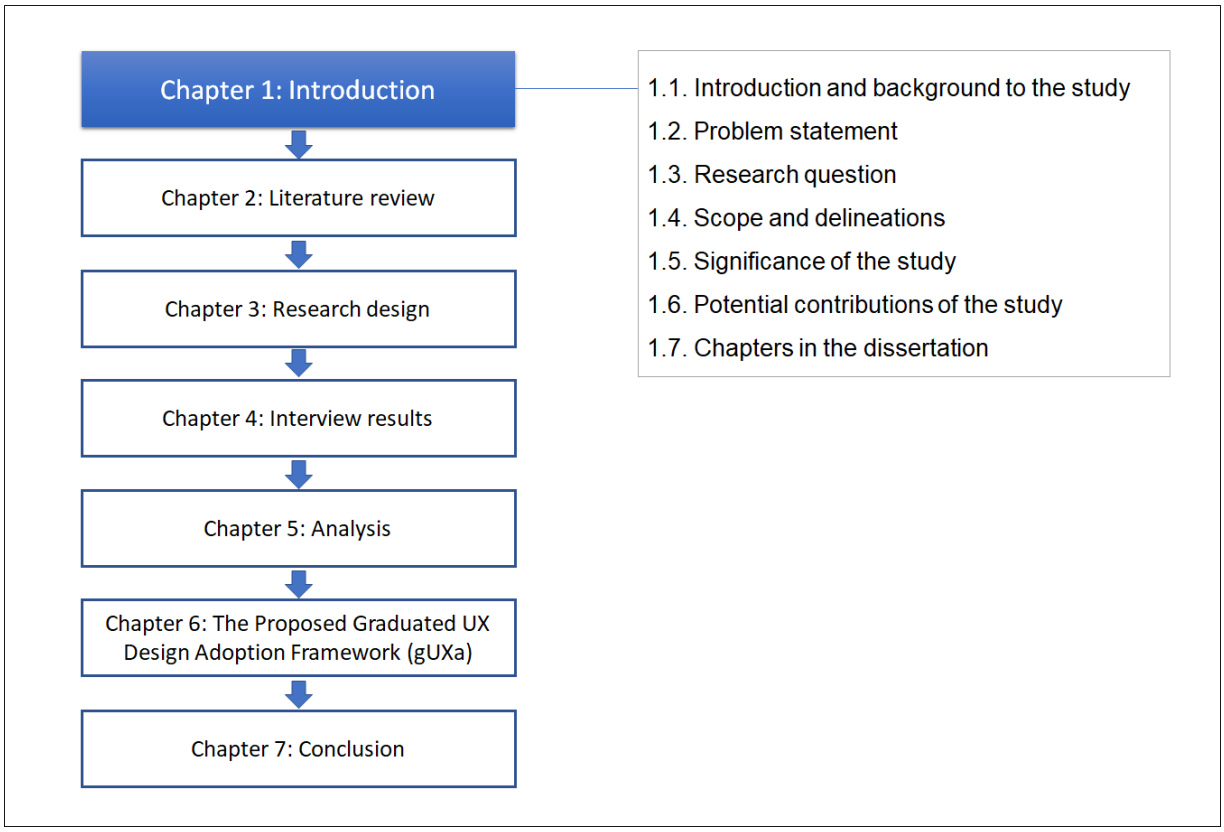

Figure 1.1: Outline of chapter 1

1.1. Introduction and background to the study

User interface design is an all-important aspect of systems development, as the user interface is the point of contact between the user and the system (Gkonos, Iosifescu Enescu & Hurni, 2019). Myers (1998) identified interface improvement as one of the key factors that drive increased usage of the Internet, as well as the proliferation of information systems. Over time, the increasing significance of a good user experience (UX) has manifested itself both in terms of research and practice.

From a research perspective, the increase in UX-related studies has culminated in the establishment of conferences and academic journals with focus on this area of study. These conferences and journals are testament to the increasing relevance of UX, with examples being the Australian Computer-Human Interaction Conference and the Journal of Usability Studies, respectively. Knowledge from various academic disciplines, most notably Psychology and Ergonomics, is interwoven into Human-Computer Interaction (HCI), the discipline that focuses on the “human” aspect of UX (Myers, 1998). Some universities have developed courses geared towards developing UX professionals and there is an emergence of UX-focused degrees, such as the Masters of Human-Computer Interaction offered by the University of Maryland (Pretorius, Hobbs & Fenn, 2015).

In terms of practice, an appreciation of the need for good UX has prompted business organisations to incorporate UX design practices in their systems development processes (Gray, 2014). Practitioners working towards the improvement of UX span across universities, government organisations and private sector organisations (Myers, 1998). A study conducted by Pretorius *et al.* (2015) reported the emergence of UX professionals with varying job titles. These practitioners have a shared objective,

namely, to ensure that system interfaces are designed in a manner that enables users to have a good experience on them.

With such a compelling case for good UX, one would justifiably expect most or all organisations to incorporate UX design practices in their systems development processes. Findings from a study conducted in South Africa by Pretorius *et al.* (2015) suggest that this is not the case. In a survey with 59 respondents, the top challenge experienced by UX practitioners was the difficulty in garnering buy-in for UX design and promoting it in the organisation. This problem was so common that 61% of respondents listed this as the biggest challenge they face. The second biggest challenge faced, which 36% of respondents identified as an issue, was the time constraint during projects. Time constraints impeded the application of UX design practices and the implementation of recommendations. Brosens (2017) also identified time constraints on projects as one of the key reasons for a low adoption of UX design practices in South African organisations. These challenges, among others, led to a more poignant statistic: only 45% of organisations incorporated UX design practices into their systems development process (Pretorius *et al.*, 2015).

The purpose of this study was to propose a combination of UX design practices and the sequencing thereof, that organisations could incorporate into their systems development processes without compromising the speed of project delivery.

This chapter provided a background to the study, followed by a statement of the research problem. The research problem informed the statement of the research question and the scope and delineation of the study. The chapter also highlighted the significance of the study and its contribution. The chapter concluded with a summary of how the remaining chapters in the dissertation are structured.

1.2. Problem statement

Numerous studies have investigated the benefits of incorporating UX design practices in systems development processes. For example, Donahue (2001) and Kolbeinsson, Lindblom and Thorvald (2020) found that organisations stand to increase profitability by incorporating UX design practices in their systems development processes. Aleryani (2020) identified a broader range of benefits such as building the right product for users, reduction of call centre volumes and increased customer loyalty.

Despite the number of studies that have linked the integration of UX design practices into systems' development processes with increased profitability, Pretorius *et al.* (2015) and Brosens (2017) assert that there is still a low number of organisations that incorporate UX design practices into their systems development processes. Business decision-makers are even more reluctant to support the incorporation of UX design practices into systems development processes. This is because systems development costs are often seen immediately whereas the benefits of UX design practices are often intangible (Kuusinen & Väänänen-Vainio-Mattila, 2012). Innes (2011) identified a further complication that makes business decision-makers complacent in the low adoption of UX design practices: some organisations that ignore ease-of-use have managed to succeed commercially. However, the same author asserts that the market conditions that make it possible for organisations to succeed without focusing on ease-of-use have changed with the proliferation of applications. Organisations therefore need to make ease-of-use a focus in their systems development.

In this study, I investigated the problem of low uptake of UX design practices in systems development processes. Following the investigation, I developed a UX design process that could enable organisations to incorporate UX design in their systems development process without compromising the speed of project delivery.

1.3. Research question

With the research problem in mind, the following questions arose:

Table 1.1: Research question and sub-questions

Main Question	How can the user experience design process be optimised to ensure minimal impact on overall system development time?
Sub-question1	Which UX design practices are predominantly used by UX practitioners in South African organisations?
Sub-question2	How do organisations in South Africa incorporate UX practices into their systems development processes?
Sub-question3	How can return on investment (ROI) in UX practices be measured?
Sub-question4	What emerging UX design practices are currently not being used by organisations in South Africa?
Sub-question5	What combination of UX design practices and sequence of UX design practices can enable organisations in South Africa to incorporate UX design in the software development process without compromising the speed of project delivery?

1.4. Scope and study limitations

Given the time constraint placed on completing this research, I limited the scope from two perspectives: country and research participants. The research was conducted in South Africa, with the findings applicable to the country's context. References were made to findings from research conducted in other countries, but these were used to provide a broader context to this research. Within South Africa, the research was narrowed down to a set of organisations selected using the purposive sampling technique. Lastly, the research participants were limited to UX team leads, UX practitioners and participants that worked closely with the UX-related roles within the participating organisations.

As will be discussed in section 4.2, 33 people from four case study organisations participated in the study. As such, the results cannot be generalised to all South African organisations. However, the study provides a research-based framework that

organisations that wish to incorporate UX design into their development processes could tailor to suit their needs.

1.5. Significance of the study

The output of this study was a UX design process that is geared towards minimising the impact of UX design practices on the total duration of systems development projects. The reduced impact of UX design on total project duration could reduce the level of resistance to the adoption of UX design. This in turn, could help increase the adoption of UX design by organisations in South Africa.

1.6. Contribution of the study

The practical contribution of this study was a UX design framework. The framework, called Graduated UX Design Adoption (gUXa), was developed based on a combination of literature review and results from the case studies conducted. With the gUXa framework, organisations that intend to adopt UX design have a process that they can incorporate into their development processes, without compromising the speed with which they can complete their systems development projects.

1.7. Chapters in the dissertation

This dissertation has seven chapters, namely the *introduction*, *literature review*, *research design*, *interview results*, *analysis, the proposed graduated UX design adoption framework* and *conclusion*. Each of these chapters is briefly described below.

The *introduction*, discussed in this chapter, provided context for the study by describing the problem statement, research question, scope and delineations, significance of the study, contribution of the study and describing the chapters in the dissertation.

The *literature review* chapter provided an overview of extant literatures that were relevant to this study. The chapter looked at the definition of UX, UX design and UX design practices. This was followed by a discussion of emerging trends in UX design. Lastly, the chapter provided a brief overview of how Return on Investment (ROI) from the adoption of UX design practices into software development processes could be measured.

The *research design* chapter provided a description of the theoretical framework and research methodology applied to this study. The chapter started with a description of the research theory upon which the research was grounded. Following the description of the theory was a description of the research paradigm that I adopted, the research strategy, how the research data was collected and how the data was analysed.

The *Interview results* chapter provided a summary of interview responses from participants.

The *Analysis* chapter provided a description of the themes derived from the interview results.

In the *Proposed Graduated UX Design Adoption Framework* (gUXa) chapter, each component of the proposed framework was described. The proposed framework was also evaluated in this chapter.

The final chapter, the conclusion, provided a summary of the study. The main research question and sub-questions were re-visited in this chapter, with a summary of how they were answered. The chapter also highlighted the contribution of this study to the HCI body of knowledge.

2. Literature review

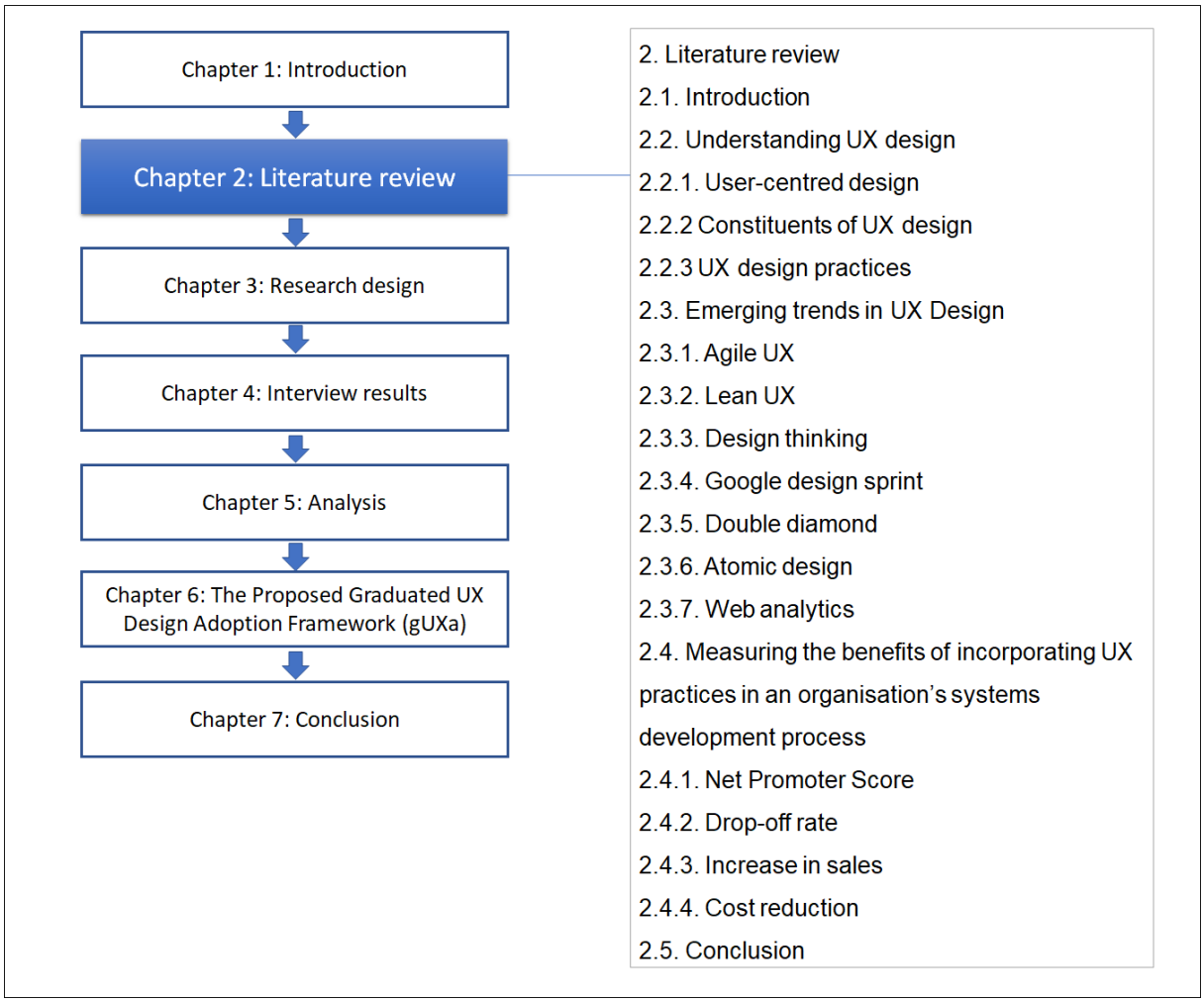

Figure 2.1: Outline of chapter 2

2.1. Introduction

Numerous researchers have investigated the need for improved UX. For instance, Sundberg (2015) and Downey and Rosales (2012) discuss the need for improved UX to users, such as increased accuracy, increased job satisfaction, and reduced stress levels. Other researchers such as Donahue (2001) and Kolbeinsson *et al.* (2020) highlight the benefits of improved UX to an organisation, such as increased profitability, customer loyalty and improved brand image. Existing publications have varying focus areas spanning across UX design practices, UX design approaches and ROI in UX design (Bannon, 2011). This literature review chapter covers the three categories of research, with a special focus on UX design as a strategy for the design of highly usable interfaces. The chapter begins with a discussion of UX design in systems development, followed by a discussion of emerging approaches in UX design. Lastly, the chapter covers the measurement of the benefits of incorporating UX design practices in systems development processes.

2.2. Understanding UX design

2.2.1. User-centred design

Poorly designed user interfaces (UI) can result in slow task completion times and negative user emotions such as frustration and anxiety (Sonderegger, Uebelbacher & Sauer, 2019). In cases where users have no obligation to use a particular application, they tend not to return to applications whose usage results in a negative emotion (McCurdie, Taneva, Casselman, Yeung, McDaniel, Ho & Cafazzo, 2012). User-centred design (UCD) is an approach to system design that emphasises the involvement of potential users of a system in system design activities, to ensure their needs are catered for (Gulliksen, Göransson, Boivie, Blomkvist, Persson & Cajander, 2003). UCD follows four principles, namely the active involvement of users, the clear

distinction and allocation of function between user and system, iterative design and multi-disciplinary design teams (Gulliksen *et al.*, 2003).

2.2.1.1. Active involvement of users

Involving users during system design requires a selection process that identifies different user groups and enrols them for participation in the design process (Gulliksen *et al.*, 2003). According to Gulliksen *et al.* (2003) users should be included in both the design and development processes. In cases where the users are not accessible, the design team can identify representatives of user groups to involve in the design process (Abras, Maloney-Krichmar & Preece, 2004).

2.2.1.2. Clear distinction and allocation of function between user and system

As a means to leverage the qualities of systems and humans, design teams should distinguish tasks best performed by a system from tasks best performed by humans during systems design (Maguire, 2001).

2.2.1.3. Iterative design

Iterative design entails repeatedly designing, evaluating and improving design solutions (Maguire, 2001). Users can evaluate various artefacts such as paper prototypes and screen designs of varying levels of fidelity (Maguire, 2001).

2.2.1.4. Multi-disciplinary design teams

UCD is a collaborative process that benefits from multiple perspectives and skill sets typically found in systems development project teams and stakeholders that provide them with information, support and resources (Maguire, 2001). A project team may include UX specialists, end users, software developers, business analysts, testers, product owners and UI designers (Maguire, 2001).

2.2.2. Constituents of UX design

To understand UX design, it is necessary to grasp the meaning of the phrase “user experience.” Various authors have defined the phrase differently, with one particularly succinct definition being provided by Hassenzahl (2008:2) as “a momentary, primarily evaluative feeling (good-bad), while interacting with a product or service.” UX design is defined as “a holistic, multidisciplinary approach to the design of user interfaces for digital products” (Benyon & Resmini, 2017). UX design is a combination of eight fields, namely information design, visual design, interaction design, information architecture, usability design, copywriting, marketing and communications and computer science (Hobbs, Fenn & Resmini, 2010). Figure 2.2 depicts the constituents of UX design and the following paragraphs describe each constituent.

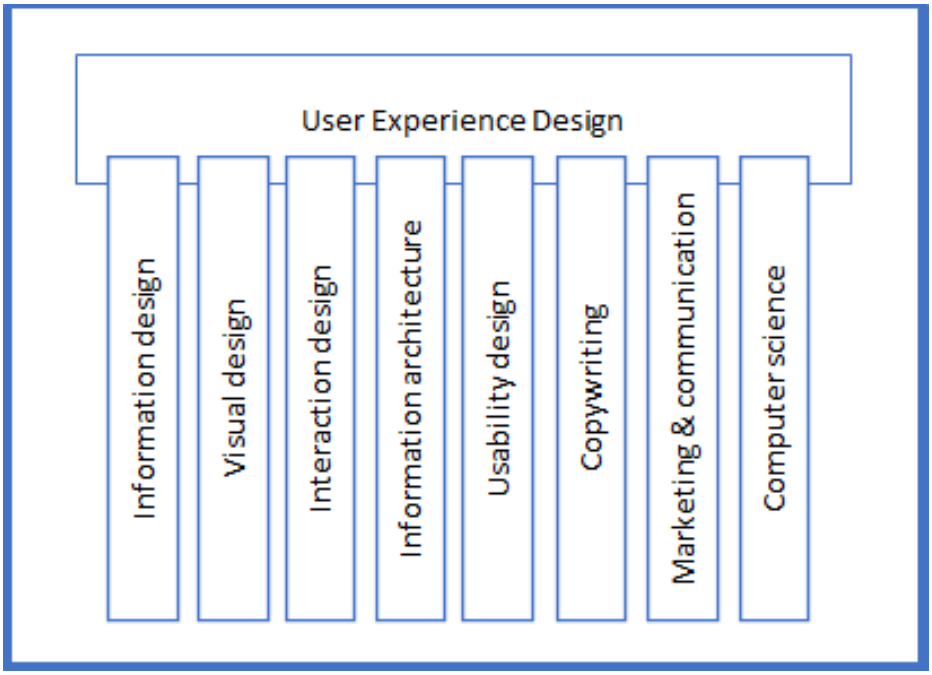

Figure 2.2: Boersma’s T-Model of UX design [adapted from Hobbs et al. (2010)]

Information design is the discipline that focuses on the analysis and design of messages containing information, with the goal of presenting the information in a way that message recipients can understand effectively (Pettersson, 2002).

Visual design is the discipline concerned with identifying and applying a combination of visual elements such as fonts, colours and buttons, that is most appropriate for target users (Watzman, 2003).

Interaction design is the discipline that focuses on identifying the appropriate responses that systems should provide to users, such as motion and sound (Löwgren & Stolterman, 2004). Examples of interaction design outputs are the perceived suppression of a button when a user clicks on it and the sound produced when an error message is displayed for a user (Löwgren & Stolterman, 2004).

Information architecture is the discipline that focuses on making it easy for users to find content or functionality they are looking for on a system, by designing the appropriate labels, navigation, organisation and search mechanisms (Morville & Rosenfeld, 2006).

Usability is defined in ISO 9241-11 as “the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use” (Jokela, Iivari, Matero & Karukka, 2003:1). Nielsen and Norman (2017) made a distinction between UX and usability, highlighting that UX encompasses usability. Usability design is the discipline that focuses on ensuring that users can achieve their system usage goals efficiently and effectively (Göransson, Lif & Gulliksen, 2003).

Copywriting is the discipline that focuses on the selection of the appropriate text for users to read as they interact with a UI, such as labels, notifications and messages (Shaw, 2012).

Marketing and communication is the discipline responsible for deciding the messages to send to users and the medium through which to send them, both digital and non-digital (Weiner, 2006).

Computer Science is the discipline that focuses on the development and improvement of computer hardware and software components (Newell & Simon, 2007).

According to Hobbs *et al.* (2010) UX design practitioners are skilled in each of the eight disciplines, but with varying levels of proficiency in each fields.

2.2.3. UX design practices

A UX design practice is an activity that is undertaken to improve the experience of users on a system, in line with UCD principles (Brosens, 2017). As stated in section 2.2.1, UCD principles are active involvement of users, clear distinction and allocation of function between user and system, iterative design and multi-disciplinary design teams (Gulliksen *et al.*, 2003). Table 2.1 provides brief overviews of common UX design practices, namely user research, personas, user journeys, user stories, service blueprint, use cases, competitor analysis, heuristic evaluation, concept testing, sketches, prototypes and usability testing.

Table 2.1: UX design practices

UX design practice	Description of UX design practice
User research	In the context of UX design, user research is the process of gathering insights about the thought patterns, attitudes and behavioural patterns of end users (Baxter, Courage & Caine, 2015). UX designers use techniques such as interviews, surveys and focus groups to engage end users (Baxter *et al.*, 2015). An accurate understanding of end users can lead to an improvement in the quality of design decisions (Goodman, Kuniavsky & Moed, 2012).
Personas	A persona is a description of a fictitious end user (Nielsen, 2019). A persona is typically given a name, age, habits, goals and a description of when and how they would use the system (Kelle, Henka & Zimmermann, 2015). The objective of a persona is to communicate the traits and goals of end users in a manner that is

	easy to remember and to evoke empathy towards users (So & Joo, 2017). A persona is derived from user research (Kelle *et al.*, 2015). In cases where systems development project teams have a limited budget or time allocation to conduct user research, they develop proto-personas, which they validate through research as a project progresses (Gothelf, 2013). A proto-persona is a persona created by UX designers based on interviewing individuals that possess knowledge about end users, but are not themselves end users (Pinheiro, Lopes, Conte & Zaina, 2019). Examples of interviewed individuals are representatives from the Marketing department and each business unit responsible for a segment of end users (Pinheiro *et al.*, 2019).
User journeys	A user journey map is a depiction of the interactions a user has with an organisation while accessing a specific service (Kojo, Heiskala & Virtanen, 2014). User journey maps are documented from the customer's perspective, highlighting their thoughts and feelings as they progress through the activities involved in accessing the service (Kojo *et al.*, 2014). The insights depicted on a user journey map are derived from user research and used to highlight parts of the user's journey that require improvement (Lemon & Verhoef, 2016).
User stories	A user story is a description of functionality that is required by a user or purchaser of a system and the value to be derived from the functionality (Cohn, 2004). User stories are typically written in the format "as a (role) I want (functionality) so that (business benefit)" (Clarke & Kautz, 2014). User stories enable software development teams to plan and estimate the number of features to include in a sprint (Cohn, 2004).
Service blueprints	A service blueprint is a depiction of the interactions a user has with an organisation while accessing a specific service, together with the organisation's internal processes that support the delivery of that service (Carlbring, 2020). A service blueprint can be viewed as an extension of a user journey map (Stickdorn, Hormess, Lawrence & Schneider, 2018). It is documented based on findings from user research and conversations with business units that support the delivery of that service to customers (Koljonen, 2019). Documenting a service blueprint ensures that a project team considers not only the manner in which a user interacts with a service but also whether the organisation's internal processes can support the service (Carlbring, 2020).
Use cases	A use case is a description of a user's interaction with a system, written from the user's perspective (Noda, Kishi & Fukuzumi, 2020). Use cases provide clear requirements to software developers (Chen, Chen, Wen, Jiang, Zeng, Shu & Hong, 2019).
Competitor analysis	Competitor analysis is the systematic search and documentation of existing solutions to a design problem, with the intention of identifying opportunities for reuse and innovation (Lebedenko, 2019).
Heuristic evaluation	Heuristic evaluation is a usability evaluation method in which usability expert(s) review a system's usability based on set criteria such as ease of navigation, page content, interaction mechanisms and

	presentation of content (Toribio-Guzmán, García-Holgado, Pérez, García-Peñalvo & Martín, 2016).
Concept testing	Concept testing is the process of engaging potential users of a system with the goal of establishing the likely demand and target market for a product (Varnes, 2019). The outcomes of concept testing are either the improvement of a concept based on user feedback, or the decision not to proceed with developing the idea further due to a low likelihood of success (Varnes, 2019).
Sketches	A sketch is the simplest visual representation of the ideas to solve a specific design problem (Humanfactors.com, 2014). Sketches are the first visualisations created in a UX design process, typically in a brainstorming workshop to explore ideas and narrow down options (UXmatters.com, 2020).
Prototypes	A prototype is a draft version of a product that can be presented to users for evaluation before investing resources in development (Usability.gov, 2020). High-fidelity prototypes closely resemble the likely final design and tend to allow users to click through some content (Humanfactors.com, 2014). Low-fidelity prototypes do not closely resemble the likely final design and can be in the form of paper drawings (Usability.gov, 2020).
Usability testing	Usability testing is the evaluation of the extent to which users can complete tasks efficiently and effectively on a system (Baxter *et al.*, 2015). In preparation for a usability test, a UX designer creates a set of tasks for users to perform on a prototype and observes the users as they perform each task (Lang & Howell, 2017). The results of usability testing are used to improve the design in an iterative manner (Baxter *et al.*, 2015). Given that usability is a key component of UX, usability testing is one of the UX evaluation methods used by UX practitioners (Vermeeren, Law, Roto, Obrist, Hoonhout & Väänänen-Vainio-Mattila, 2010).

Sections 2.2.1 to 2.2.3 facilitated a deeper understanding of the main area of research, namely, UX design. Identifying and describing UX design practices in Table 2.1 supported the investigation of research sub-questions 2 and 5 by identifying common UX practices, which are in scope for optimisation as part of this study. Without a clear understanding of UX design and UX design practices, a likely outcome would have been the optimisation of practices from other disciplines, such as quality assurance and software architecture.

2.3. Emerging trends in UX design

As with most fields in Information Technology (IT), UX design and UX design practices are constantly evolving (Allsteadt, 2017). Some of the emerging approaches to UX design are Agile UX, Lean UX, Design thinking, Google design sprint, Double diamond, Atomic design and Web analytics. This section contains a description of these approaches. Understanding emerging trends in UX design supported the investigation of research sub-question 4 by providing a basis upon which case study organisations' UX design processes could be compared.

2.3.1. Agile UX

In organisations where traditional software development approaches are followed, all UX design activities are conducted prior to commencing development (Kuusinen & Väänänen-Vainio-Mattila, 2012). In those organisations, UX design is typically run as a separate stream of work that happens outside the development (Kuusinen & Väänänen-Vainio-Mattila, 2012). A negative consequence of this separation is that business stakeholders are often willing to forego UX design, as it is portrayed as an optional extra that lengthens the project unnecessarily (Kuusinen & Väänänen-Vainio-Mattila, 2012).

The increasing adoption of Agile software development methodologies has prompted organisations to adapt UX practices to suit the more iterative software development processes (Lárusdóttir, Cajander & Gulliksen, 2012). The Agile community is generally against "big design up front" whereas UX practitioners traditionally prefer it (Lárusdóttir *et al.*, 2012). Thus, a new approach to UX design called Agile UX has emerged, with the objective of bridging this gap. Agile UX is a methodical approach to designing systems using Agile principles (Kuusinen & Väänänen-Vainio-Mattila, 2012). The following paragraphs describe the key elements of the Agile UX process.

Kuusinen and Väänänen-Vainio-Mattila (2012) outline a process for Agile UX. The involvement of UX practitioners ideally starts during project planning, with UX practitioners advocating the inclusion of relevant UX practices to ensure users have a good interaction with the software. Once the involvement of UX practitioners is secured, user research is conducted, then initial sketches are drawn for review before any user story is documented. The initial sketches are then used by the development team, including the product owner, to plan the product backlog. Once the product backlog is complete, the development team informs the UX practitioner on what will be developed in the next sprint. At that point, an iterative process is triggered, where the UX practitioner details and refines the design for the upcoming sprint before development for that sprint is started. Once designs for a sprint are completed, the development team reviews the prototypes, then starts development. During development, a pre-demonstration session is conducted a day and a half before demonstration, so that if UX issues are identified, the team has a day and a half to correct them. This development process ensures that the UX designer always works a sprint ahead of the development team, then supports them during the actual development.

Agile UX has its challenges. One of the key issues is the difficulty of keeping the vision of UX in mind. In Agile software development approaches such as SCRUM, the project team adds so much functionality that by the end of the project, it is difficult to know where to fit new functionality in the overall UX of the system (Lárusdóttir *et al.*, 2012). One suggestion to deal with this challenge is to do a thorough pre-study before prototyping and conducting usability testing (Lárusdóttir *et al.*, 2012). Another key issue highlighted as a hindrance to Agile UX is the reduction in the amount of time allocated to design activities due to budget constraints (Kuusinen & Väänänen-Vainio-

Mattila, 2012). According to Kuusinen and Väänänen-Vainio-Mattila (2012) this is largely a result of misalignment between software sales and software development processes, where the former still run in a Waterfall manner but the latter are Agile. Kuusinen and Väänänen-Vainio-Mattila (2012) suggest the inclusion of UX professionals in the sales process to ensure that there is advocacy for UX design, resulting in its adoption on projects. With these drawbacks considered, it has been found that designing for good UX in an iterative manner is less costly than excluding it then improving what had already been developed (Kuusinen & Väänänen-Vainio-Mattila, 2012).

2.3.2. Lean UX

Lean UX is a UX design process that eliminates waste by minimising documentation, focusing on rapid experimentation and fostering collaboration for all the role players in systems development (Gothelf, 2013). It is applicable across different system development methodologies, both Agile and Waterfall (Gothelf, 2013). The key steps of Lean UX are declaring assumptions, creating a Minimum Viable Product (MVP), running experiments and lastly, feedback and research (Gothelf, 2013). These steps are depicted in Figure 2.3 and summarised below.

Gothelf (2013) describes each of the steps in the Lean UX process. Declaring assumptions is when UX practitioners state the assumptions upon which they base their designs before they can ascertain the facts. This enables UX practitioners to continue with work without any delay, and thereafter validate the assumptions when they can ascertain the facts. Using the information available to them, UX practitioners develop an MVP, which is an early, skeletal version of the envisioned product. Developing an MVP enables UX practitioners to conduct a concept test on the

conceptual design without spending too much time on it, thereby reducing the costs associated with creating the MVP. Once completed, the MVP is tested and gradually improved. The feedback and research conducted by the design practitioners are then used to update the MVP and test it iteratively.

With any two steps, there is a constant overlap. For example, assumptions can be specified while creating an MVP. During concept testing, the MVP can be enhanced. This is best illustrated by Figure 2.3 which summarises the Lean UX process.

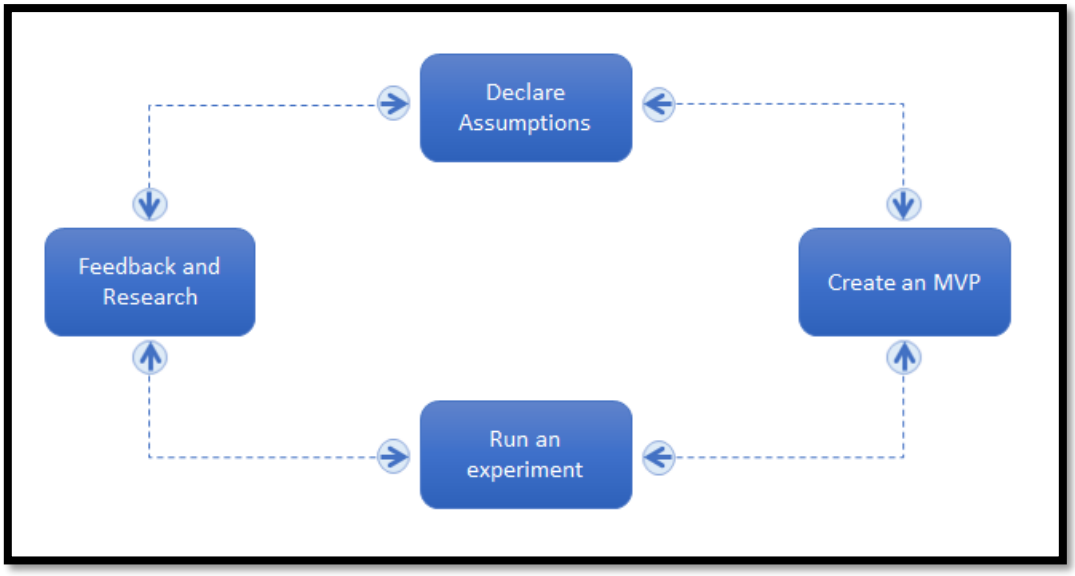

Figure 2.3: Lean UX process [adapted from Gothelf (2013)]

Organisations stand to benefit from implementing Lean UX. One key advantage is the elimination of non-critical documentation, which saves time on projects (Gothelf, 2013). It is also applicable across different types of software development methodologies because the processes can fit with traditional and Agile approaches (Gothelf, 2013). Lastly, the rapid display of incremental improvements results in Lean UX lending itself to be a more attractive option over traditional UX design processes, particularly with business stakeholders (Gothelf, 2013).

Although authors such as Gothelf (2013) and Elberzhager, Holl, Karn and Immich (2017) believe that Lean UX is the ideal way of incorporating UX practices into systems development processes, Liikkanen, Kilpiö, Svan and Hiltunen (2014) identified some challenges with implementing the approach. Lean UX presents a big change for organisations and they find it challenging to implement this way of working, given how differently it tends to be from traditional UX approaches (Liikkanen *et al.*, 2014). This renders it impractical in organisations that are not ready for change (Liikkanen *et al.*, 2014).

2.3.3. Design thinking

Design thinking is a process for solving complex design problems and creating new products (Black, Gardner, Pierce & Steers, 2019). The process was popularised by consulting organisation IDEO in 2001 (Liedtka, 2018). The Design thinking process has been adopted by some of the world's largest organisations such as Google and Apple (Dam & Siang, 2018). Its popularity is so widespread that some universities such as Harvard University and Massachusetts Institute of Technology also teach the process (Dam & Siang, 2018).

There are five phases in the Design thinking process, namely Empathise, Define, Ideate, Prototype and Test. The phases of Design Thinking are depicted in Figure 2.3 and described in the following paragraphs.

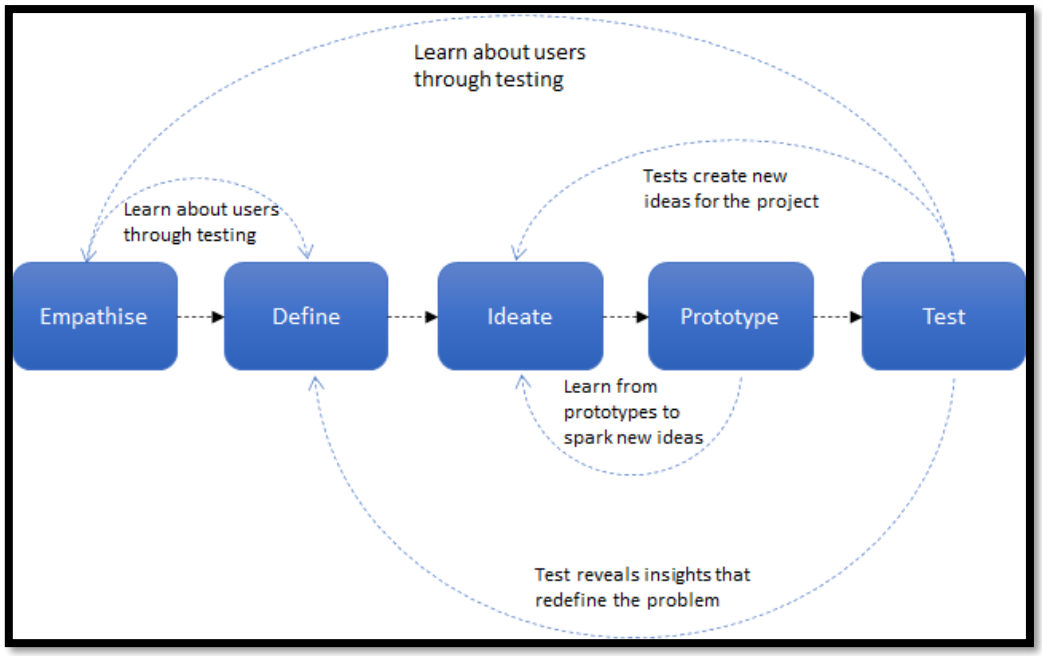

Figure 2.4: Design thinking process [adapted from Dam and Siang (2018)]

Design thinking does not prescribe specific tools and techniques but provides a guideline of what should be done in each phase (Dam & Siang, 2018). In the Empathise phase, designers learn about the users for whom they need to solve a problem. Typically, this involves making assumptions about user characteristics before validating the assumptions through interviews with representatives of the users. The output of this phase is a set of personas that describe the users.

The objective of the Define phase is to document a problem statement (Dam & Siang, 2018). In the Define phase, designers draw insights from data they gathered in the Empathy phase about the user and the user's context, then synthesise the data into a limited set of user needs (Plattner, 2013). By combining their understanding of the user's attributes, context and needs, designers articulate an actionable problem statement, which is the basis for the rest of the design effort (Plattner, 2013).

In the Ideate phase, the designers engage relevant parties and come up with creative ideas for potential solutions to the problem (Dam & Siang, 2018). Examples of

techniques used in this phase are sketching and brainstorming (Plattner, 2013). In the Ideate phase, the emphasis is on generating as many ideas as possible without evaluating their feasibility or suitability for solving the problem (Plattner, 2013). To transition into the Prototype phase, the designers narrow down the ideas into two or three ideas that are most likely to succeed in solving the problem (Plattner, 2013).

The Prototype phase consists of creating prototypes that can be evaluated by users (Plattner, 2013). There are no restrictions on the format in which the a prototype is created, so a designer can choose paper, a whiteboard, prototyping software or any other medium they deem suitable for eliciting user feedback (Plattner, 2013). Designers spend as little time as possible creating the prototypes, while making sure there is enough detail for users to evaluate (Plattner, 2013).

The objective of the Test phase is to evaluate the prototype through concept testing (Plattner, 2013). The concept testing enables designers to elicit users' thoughts and feelings about the prototype (Plattner, 2013). The insights from concept testing are used to refine the design in the following iteration of design (Plattner, 2013).

The phases of the Design thinking process are non-linear and iterative (Dam & Siang, 2018). This implies that when, for example, a prototype is completed and it fails the testing process, the design team goes back to problem definition or ideation, depending on what it deems fit.

2.3.4. Google design sprint

The Google design sprint is an approach for creating and testing solutions to complex design problems in five days (Knapp, Zeratsky & Kowitz, 2016). The sprint is a five-day workshop facilitated by a designer, where representatives from various departments such as Sales, Product Support and IT, collaborate to create and test

solutions to complex problems (Banfield, Lombardo & Wax, 2015). The process was created in 2010 by Jake Knapp while he was working for Google (Knapp *et al.*, 2016). The Design sprint process is depicted in Figure 2.4.

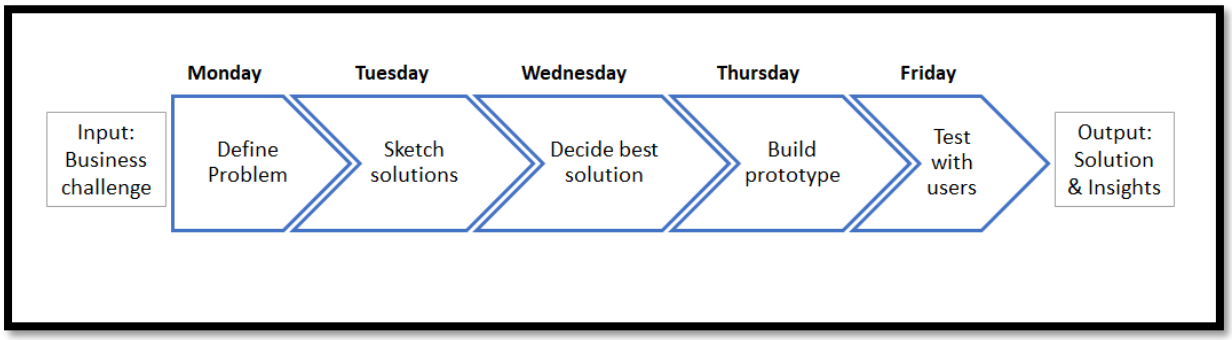

Figure 2.5: Google design sprint's five-day plan [adapted from Knapp et al. (2016)]

Knapp *et al.* (2016) specified the activities that are conducted during each day of a sprint. On Monday, workshop participants define a clear problem statement and the objective(s) for the remaining four days. On Tuesday, participants review existing competitor solutions to the problem, then sketch potential solutions. Another key activity for Tuesday is recruitment of users that match the target user group, for testing. On Wednesday, participants go through a structured process of combining the best ideas from all the sketches completed on Tuesday into one final sketch. On Thursday, the design team creates a testable prototype based on Wednesday's final sketch. This high-fidelity, clickable prototype only needs a UI, rather than a complete technical solution with a database and middleware.

On Friday, the prototype created on Thursday is tested with users. The feedback from testing provides designers with sufficient information to decide whether to take the design forward for development or make refinements.

2.3.5. Double diamond

The Double diamond approach is a process used by design professionals to conduct user-centred design (Tschimmel, 2012). The process was developed by the UK Design Council in 2005 (Tschimmel, 2012).

The Double diamond model has four phases, namely Discover, Define, Develop and Deliver (Tschimmel, 2012). The model is depicted in Figure 2.5 and described in the paragraphs that follow.

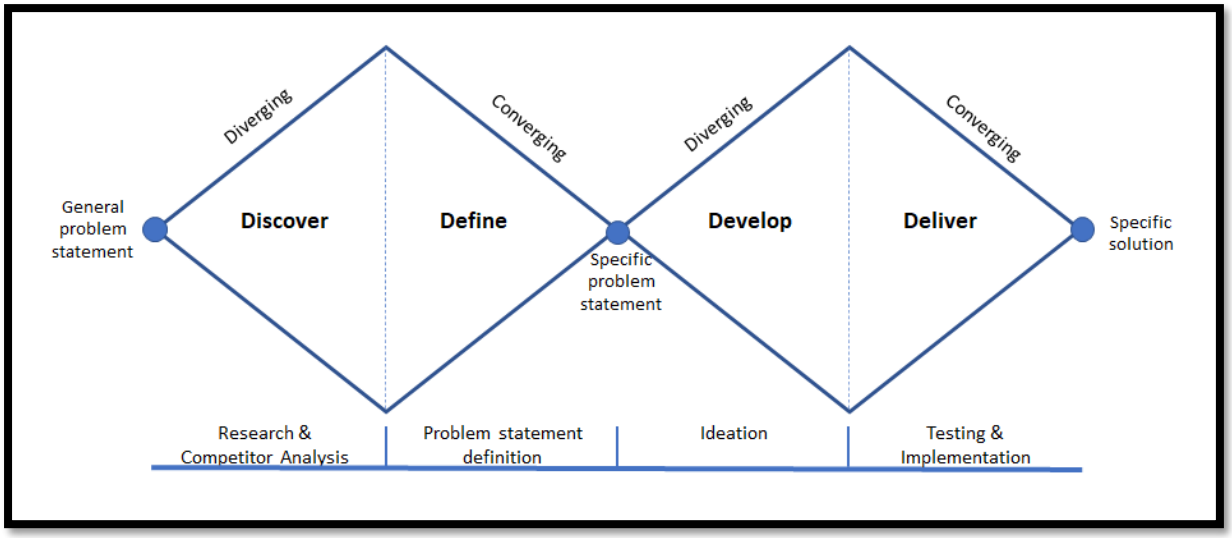

Figure 2.6: Double diamond design process [adapted from Tschimmel (2012)]

The phases of the Double Diamond process are described as either diverging or converging. The diverging phases are characterised by an accumulation of data and ideas, whereas in the converging phases, the volume of data is reduced as data is synthesized into insights (Cahya, Handayani & Wibawa, 2018).

In the Discovery phase, the designer interviews users impacted by a problem, to gain better understanding of their context and challenges (Cahya *et al.*, 2018). In the Define phase, the designer synthesises the data gathered during Discovery and based on the insights, defines a problem statement (Kim, 2020).

Once the problem is clearly defined, potential solutions are brainstormed, refined and prototyped in the Development phase (Tschimmel, 2012). The Delivery phase concludes the process. In the Delivery phase, different solutions are developed on a small-scale, tested and refined, resulting in the implementation of the solution that will likely succeed (Cahya *et al.*, 2018).

2.3.6. Atomic design

A design system is a repository of reusable Graphical User Interface (GUI) components such as text boxes, buttons and labels (Frost, 2016). It enables designers to complete UI design quickly because they can select objects from a library of existing components, rather than creating new ones for each new project (Frost, 2016).

Atomic design is an approach to creating a design system, based on a hierarchy of elements that make up a web page (Frost, 2016). Developed by Brad Frost, Atomic design applies an analogy from the field of chemistry to the development of design systems. It proposes five stages of designing a UI, namely atoms, molecules, organisms, templates and pages (Frost, 2016).

The first three elements are named in a manner that emphasises hierarchy, using concepts from chemistry.

Given that atoms are the smallest unit of matter, the atoms on a UI are the basic Hypertext Markup Language (HTML) elements such as buttons, labels and text boxes (Frost, 2016).

When atoms combine in chemistry, they form molecules, which take on a unique set of properties different from each individual atom. On a UI, molecules are the combination of objects such as a text box with a label and a button to submit captured text (Frost, 2016).

The next level on the hierarchy is an organism, which is a combination of molecules (Frost, 2016). An example of an organism is a page header that contains the Search text box, label and button, together with menu items, to make up a header. An organism can be composed of either similar or different groups of molecules (Frost, 2016).

The next element on the hierarchy are templates, which are objects that enable designers to organise a page's components into a logical layout (Frost, 2016). Templates provide a framework that guides the positioning of organisms and molecules on a web page (Frost, 2016).

The last item on the hierarchy is a page, which is a specific instance of a template. Pages contain specific content that closely resembles the content and function of the final product, such as pictures and text (Frost, 2016).

2.3.7. Web analytics

Web analytics involve tracking of users' online experiences to gain knowledge which organisations can use to make informed decisions about their user interface (Clifton, 2012). It includes the use of software that tracks users' activities on a website (Clifton, 2012).

The key advantage of Web analytics is that UX practitioners can decipher human dynamics through various measures derived from tracking services (Gonçalves & Ramasco, 2008).

Criticism levelled against Web analytics is the violation of user privacy (Akkus, Chen, Francis, Hardt & Gehrke, 2012). Some third-party analytics service providers track user activity across platforms, leading to the development of anti-tracking legislation and tracking-blocking software (Akkus *et al.*, 2012).

2.4. Measuring the benefits of incorporating UX practices in an organisation's systems development process

The adage "what gets measured gets done" has become a common cliché used in a variety of contexts. To illustrate this, 93 500 results were returned when I conducted a Google search for this exact phrase on 12 October 2020. UX and usability are not exempt from the measurement agenda, with authors stating different views on the measurement of the benefits of incorporating UX to an organisation's systems development process. This section discusses the different views.

In a study conducted by Djamasbi, McAuliffe, Gomez, Kardzhaliyski, Liu and Oglesby (2014), it was concluded that optimisation of interfaces has a positive impact on the ROI for a company. Bias and Mayhew (2005) provide empirical evidence and examples of organisations that benefited financially from improving usability, a key element of user experience. Turner (2011) suggests measuring ROI of UX practices from various perspectives. At a strategic level, the author recommends the use of a Balanced Scorecard (BSC) to link UX practices to overall business goals, including the financial perspective, customer perspective, internal business perspective and the innovation and learning perspective. The same author goes on to suggest specific metrics under some categories, examples being the calculation of Net Present Value to cater for the financial perspective, and calculation of cost per order (CPO) as a metric for the internal business perspective.

Other researchers have expressed disagreement with ROI measures for UX. Rosenberg (2004) expresses scepticism towards the accuracy of measurement of ROI in UX. The article highlights that there is an insufficient amount of empirical evidence to support claims that a better user experience results in a good ROI. The same author further states that most of the articles recycle the "limited" amount of empirical work

that has been done in this area. Another issue highlighted in the same publication is the creation of causal relationships between UX practices and the ROI metrics while omitting, intentionally or otherwise, other contributing factors to those metrics. The assumptions made in these causal relationships result in inaccuracies, largely because the studies were not conducted in a controlled environment.

The low uptake of UX practices in South Africa identified by Pretorius *et al.* (2015) and Brosens (2017) has a yet unexplained link to the finding that the top two challenges faced by UX practitioners in South Africa relate to getting buy-in for UX and lack of incorporation of UX practices into systems development processes due to time limitations on projects. Kuusinen and Väänänen-Vainio-Mattila (2012) state that the calculation of the ROI on UX is a tricky exercise on projects in practice and this is further compounded by the fact that UX practices are often conducted outside of software development processes. Traditional UX design processes are conducted prior to development and as such, are often seen as a separate stream of work (Kuusinen & Väänänen-Vainio-Mattila, 2012). This has an impact on funding for that stream of work, as it is often seen as an optional extra. The status quo points to the need for incorporating UX practices as part of software development processes. Section 2.3 explored some of the emerging approaches to UX design that are geared towards addressing the second biggest challenge faced by UX practitioners in South Africa – time constraints on projects, which lead to either exclusion of UX practices or the disregard for the results of UX practices (Pretorius *et al.*, 2015).

Sections 2.4.1 to 2.2.4 describe four ROI metrics for UX design. The metrics described in sections 2.4.1 to 2.2.4 enabled me to answer research sub-question 3.

2.4.1. Net Promoter Score

The Net Promoter Score (NPS) is a measure of customers' loyalty to an organisation, based on the extent to which they are likely to promote the organisation's products or services (Reichheld, 2003). Bradner and Sauro (2012) identified four key steps for calculating NPS. The first step is to ask customers if they would recommend an organisation's product, applying a scale from zero to ten, with zero meaning "extremely unlikely" and ten meaning "extremely likely." The second step is to divide all the responses into three categories, namely promoters, passives and detractors. Promoters are responses with a nine or ten rating, while passives are responses with a seven or eight rating and detractors are responses with a zero to six rating. Once the responses are categorised, the third step is to calculate the percentage of promoters and percentage of detractors. The last step is to subtract the percentage of detractors from the percentage of promoters.

Organisations use NPS improvement as an ROI measure for UX, given that UX is considered to be a key determinant of customer loyalty (Reichheld, 2003).

2.4.2. Drop-off rate

The drop-off rate is a measure of the number of users that exit an application from a specific page (Young, 2014). A high drop-off rate for a particular page on an application can be an indication of poor design (Weinschenk, 2005). A decrease in the drop-off rate is one of the measures used to calculate ROI in UX design (Weinschenk, 2005). The drop-off rate decrease is established by comparing the drop-off rate before a redesign and after the redesign (Weinschenk, 2005).

2.4.3. Increase in sales

Good UX is often the outcome of a user-centred design process (Weinschenk, 2005). When an application is developed with little or no consideration of users' needs, user frustration is often the result (Weinschenk, 2005). Good UX can lead to increased sales on e-commerce websites and other software on which organisations generate revenue (Weinschenk, 2005). The increase in sales is therefore a metric that can be used to measure ROI in UX design and is calculated by comparing the sales revenue before a redesign to the sales revenue after a redesign (Weinschenk, 2005).

2.4.4. Cost reduction

Poorly designed applications often result in high user training costs, higher call centre volumes for user support and tend to require more detailed user manuals than well-designed applications (Weinschenk, 2005). By implementing a UX design process, organisations stand to reduce costs related to user training, support and user documentation (Weinschenk, 2005). Cost reduction is calculated by subtracting the cost of user training, support and documentation after a redesign from the costs before the redesign (Weinschenk, 2005).

2.5. Conclusion

This chapter provided a summary of insights found in academic literature. The starting point was to describe user-centred design and UX design. The eight disciplines that constitute UX design were identified and a description of UX design practices was provided. A discussion of emerging trends in UX design identified seven leading approaches that may enable organisations to complete UX design in a timeous manner. Lastly, a discussion followed, covering the measurement of benefits of UX design. Numerous authors studying the measurement of the benefits have found it a

difficult and often inaccurate exercise as it almost always requires an assumption that a causal link exists between UX practices and ROI.

3. Research Design

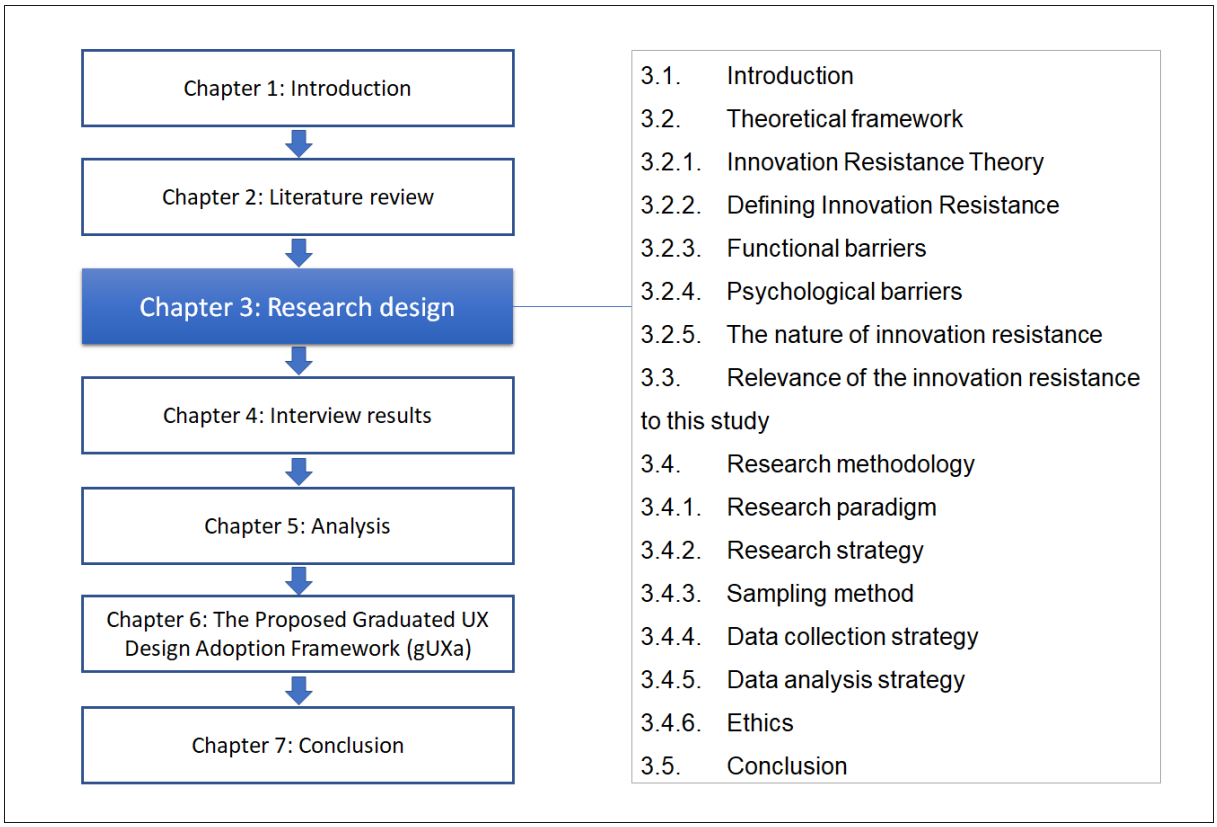

Figure 3.1: Outline of chapter 3

3.1. Introduction

The validity of empirical research studies is measured through multiple dimensions, the key ones being rigour and relevance (Lee, 1999). Rigour is built into empirical studies through the research design (Benbasat & Zmud, 1999). In this chapter, the theoretical framework for this study is discussed, following which is the research methodology that was followed in this study.

3.2. Theoretical framework

Research themes in the Information Systems (IS) field have progressed significantly since the field's inception in the 1960s (Hirschheim & Klein, 2012). As research themes have evolved, so too have theoretical frameworks supporting them (Hirschheim & Klein, 2012). The importance of theory in research has been immortalised in the statement "nothing is quite so practical as a good theory" (Van de Ven, 1989:486).

Gregor (2006) defined five types of theories in IS research, namely:

- Theory for analysing;
- theory for explaining;
- theory for predicting;
- theory for explaining and predicting;
- theory for design and action.

Theory for analysing has a focus on identifying classificatory, compositional or associative relationships for 'what is' rather than creating causal relationships (Gregor, 2006). Taxonomies typify the theories that fall into this category. An example of a theory for analysing is the Trillium model, a usability capability maturity model which specifies five maturity levels for usability practices in organisations (Jokela, Siponen, Hirasawa & Earthy, 2006).

The second type of theory, theory for explaining identifies causal relationships, i.e. how and why events or situations occur (Gregor, 2006). This type of theory explains phenomena without predicting future outcomes based on past occurrences. An example of theory for explaining is the Structuration theory, which explains the reciprocal relationship between human agency or 'action' and the make-up of social structures (Gregor, 2006).

Theory for predicting describes what will occur as a result of one or more factors, without explaining why (Gregor, 2006). The emphasis of this type of theory is the ability to predict outcomes without necessarily establishing a causal link between the dependent and independent variables. An example of a theory for predicting is Moore's law, which predicts that the number of transistors in an integrated circuitry would double every two years (Gregor, 2006).

Theory for explaining and predicting describes dependent and independent variables, clearly identifying causal relationships and explaining the theoretical constructs of each variable (Gregor, 2006). An example of this type of theory is the Technology Acceptance Model (TAM) theory, which identifies the factors that influence when and how users will use a new technology (Davis, Bagozzi & Warshaw, 1989). In the TAM model, a causal link is established between the dependant variable and the independent variables.

Lastly, theory for design and action describes an approach or formula for how to accomplish a specific objective (Gregor, 2006). This type of theory is prescriptive in nature, typically packaged as a method or process. The structured systems analysis and design method is an example of this type of theory (Gregor, 2006). Gregor (2006) asserts that every research study should be based on a sound theory.

The aim of this study was to propose a UX design process that will have the least possible impact on the total duration of project delivery and as a result, increase the adoption of UX design practices by organisations in South Africa. To achieve this, the appropriate theoretical framework must link reduction in time taken for the completion of UX design to an increase in adoption of UX design. Using the five theory types proposed by Gregor (2006), the research problem lends itself to the application of a theory for explaining and predicting, namely the Innovation Resistance Theory (IRT). The Innovation Resistance Theory identifies the factors that influence the level of resistance to an innovation and predicts what would happen if any of the factors are changed (Ram & Sheth, 1989).

3.2.1. Innovation resistance theory

The Innovation Resistance Theory (IRT) was developed to address the high rate of product failure by providing insights into why consumers do not readily adopt new innovations (Ram & Sheth, 1989). Following its formulation, the theory has been applied in a wide variety of research contexts. A few examples of studies that used the IRT are described below.

In a study that investigated lack of adoption of Internet banking by a large proportion of banking clients in Finland, Kuisma, Laukkanen and Hiltunen (2007) applied the IRT. The study was qualitative in nature, with the researchers using semi-structured interviews to gather data. Once data was gathered, the interview responses were linked to each of the barriers to innovation as postulated by the IRT. This enabled the researchers to establish the key sources of resistance to the adoption of Internet banking, using banking clients in Finland as a case study.

In another study, Ma and Lee (2018) used the IRT to investigate the slow adoption of Massive Open Online Courses (MOOCs) in a developing country, using China as a case study. The study was quantitative in nature, with the researchers using focus groups to elicit data from participants. Responses from the focus groups were then linked to each of the barriers to innovation defined in the IRT, thereby establishing the reasons for the slow adoption of MOOCs.

The IRT was also used in quantitative studies. In a study by Lian, Liu and Liu (2012), the authors used the IRT to investigate whether the nature of a product influences the amount of resistance to its adoption, using the adoption of online shopping as a case study. The five barriers to innovation postulated by the IRT were the basis upon which five hypotheses were formulated and tested. The study was quantitative in nature, with a survey employed as the research instrument.

In another study, the IRT was used to understand the reasons for the slow adoption of green innovations like solar water heaters, using Lebanon as a case study (Bakhit, 2016). As with Lian *et al.* (2012), the barriers to innovation postulated by the IRT were the basis upon which five hypotheses were formulated and tested. The study was also quantitative in nature, with a survey employed as the research strategy.

The variety of innovations investigated using the IRT is illustrative of its applicability to a wide variety of products, services, processes and other innovation types. It has been used in both qualitative and quantitative studies, with a variety of research strategies, data collection and analysis methods.

In this study, the IRT was used in two ways. Firstly, to provide a research-based explanation of why the length of time taken to complete the UX design process is a legitimate source of resistance to the innovation named, UX design. Secondly, the

theory was used to evaluate the proposed framework, given that it provides a research-based prediction of what could happen if the time taken to complete UX design practices was reduced.

3.2.2. Defining innovation resistance

A point of departure for understanding what the IRT postulates is to define 'innovation,' 'resistance' and 'innovation resistance.' An innovation can be defined as an idea, practice or object that is perceived as new by an individual or other unit of adoption (Rogers, 2002). Resistance, or resistance to change, is a behaviour that is geared towards maintaining the status quo in situations where there is encouragement to alter the present circumstances (Ram, 1987).

Innovation resistance is therefore the resistance presented by individuals to an innovation, either because it poses potential changes from a satisfactory status quo or because it conflicts with the individual's belief structure (Ram & Sheth, 1989). As depicted in Figure 3.2, there are two categories of barriers to innovation, namely, functional and psychological barriers (Ram & Sheth, 1989).

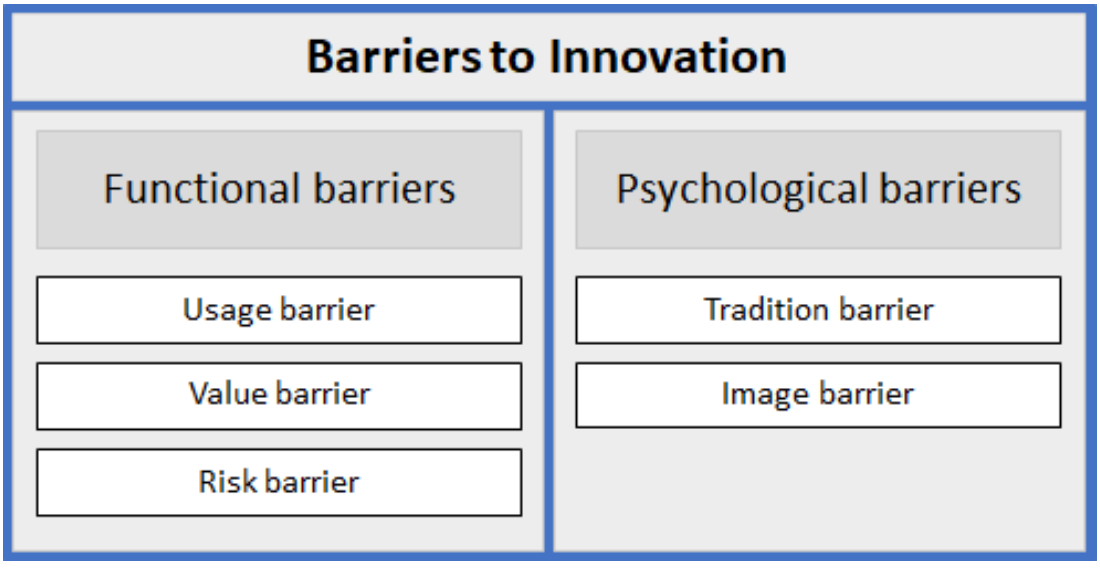

Figure 3.2: Hierarchy of barriers to innovation [adapted from Ram and Sheth (1989)]

3.2.3. Functional barriers

Functional barriers arise when consumers expect an innovation to cause substantial changes to a comfortable status quo (Ram & Sheth, 1989). There are three types of functional barriers, namely: usage, value and risk (Ram & Sheth, 1989).

The most common reason for resistance to innovation is a perception from consumers that the innovation will not be a good fit for existing workflows, practices or habits (Ram & Sheth, 1989). This is called the *usage* barrier.

Another source of functional resistance arises when consumers conduct an analysis of the ROI from adopting an innovation and find that it does not exceed that of the existing or substitute products (Ram & Sheth, 1989). This is called a *value* barrier.

The third functional barrier arises when consumers have uncertainty regarding the potential negative consequences of adopting an innovation, which could lead to the postponement of innovation adoption until better understanding of the innovation (Ram & Sheth, 1989). This is called the *risk* barrier. There are four key risks related to adoption, namely physical harm to people or property, financial losses, mal-performance and social risk i.e. being ostracised for adopting the innovation (Ram & Sheth, 1989).

3.2.4. Psychological barriers

When innovations clash with consumers' views or beliefs, psychological barriers arise (Ram & Sheth, 1989). There are two types of psychological barriers, namely tradition and image barriers (Ram & Sheth, 1989).

Innovation that requires consumers to change established traditions and norms could lead to resistance. This is called the *tradition* barrier (Ram & Sheth, 1989).

The other type of psychological barrier arises when consumers develop negative perceptions of products, product classes or their countries of origin. This is called the *image* barrier (Ram & Sheth, 1989).

3.2.5. The nature of innovation resistance

Understanding the nature of innovation resistance is the key to finding ways to contain, mitigate or eradicate it.

The first characteristic of innovation resistance is that it is a range, not an absolute, static value. The lowest level of resistance is when a consumer postpones adoption until his/her reservations have been addressed (Kleijnen, Lee & Wetzels, 2009). The next level of resistance is when consumers reject a product or service deemed as an innovation, without actively opposing it (Kleijnen *et al.*, 2009). The highest level of resistance is when a consumer actively opposes the innovation (Kleijnen *et al.*, 2009). The bigger the barriers to innovation, the higher the level of resistance to the innovation (Kleijnen *et al.*, 2009).

The second noteworthy characteristic of innovation resistance is that it exists across different products, services and processes (Ram & Sheth, 1989). As a process, UX design is therefore open to innovation resistance.

Lastly, innovation resistance affects the timing of adoption (Ram & Sheth, 1989). The bigger the barriers to adopting an innovation, the longer consumers are likely to delay its adoption.

3.3. Relevance of the Innovation Resistance Theory to this study

The importance of the Innovation Resistance Theory to this study is three-pronged. Firstly, it provides a trustworthy explanation for why the adoption of UX design in South Africa has been slow, as determined by Pretorius *et al.* (2015) and Brosens (2017).

The adoption of UX design, the innovation in this context, can prolong existing workflows. The potential to prolong existing work processes can make the adoption of UX design unattractive, considering the time constraint on software development projects. In other words, a *usage* barrier exists for the adoption of UX design as an innovation in the South African context.

Secondly, the IRT provides a guiding principle for the proposed framework. The framework was formulated with the overarching goal of reducing the size of the usage barrier that persists in South African organisations.

Lastly, the IRT provides the evaluation criteria that were used to assess the proposed framework, given that the IRT is a credible basis for predicting what could happen when the overall time taken to complete the UX design process is reduced. Specifically, a framework with the potential to reduce the overall duration of the UX design process could reduce the usage barrier, hence lowering the level of resistance to the adoption of UX design practices.

To establish the more appropriate theoretical framework for this study, the Technology Acceptance Model (TAM) was considered as an alternative. The TAM postulates that perceived usefulness and perceived ease of use determine individuals' intention to use a system (Davis *et al.*, 1989). The TAM theory falls short in its applicability to this research because it has a narrow focus on technology, which does not encompass UX design. The IRT's broader focus on innovations makes it a more appropriate option for this study, given its inclusion of processes and practices such as UX design.

3.4. Research Methodology

Sections 3.4.1 to 3.4.6 discuss the research methodology for this study, starting with a discussion of the paradigm that was applied. After the research paradigm, the most

suitable research strategy is discussed, followed by discussions detailing the sampling method, data collection strategy, data analysis strategy and lastly, research ethics.

3.4.1. Research paradigm

There are multiple paradigms from which to conduct research, with the predominant ones being the positivist and interpretivist (Lee, 1991). The positivist paradigm views reality as stable and knowledge as objective and observable, understandable through experiments (Terre Blanche, Durrheim & Painter, 2006). Facts are therefore irrefutable from the positivist perspective.

In contrast, the Interpretivist paradigm views reality as the subjective, socially constructed experience of individuals (Walsham, 1995). From an interpretivist perspective, reality can only be understood through the lens of individuals, which means it cannot be separated from its observer.

The objective of this study was to formulate a UX design framework that will enable South African organisations to implement UX design with the least possible impact on the duration of software development projects. To gain an understanding of current UX design practices in the South African context, I investigated the subjective experiences of UX team leads and UX practitioners. The research therefore lends itself to applying an interpretivist research paradigm.

3.4.2. Research strategy

Given the research objective mentioned in section 3.4.1, the investigation required three key steps. The first step was to gain an understanding of the current UX design processes followed by the organisations that participated in the research. A literature review of UX practices that, if adopted, could lead to a faster UX design process was

then conducted. Lastly, a UX design process that could enable the least impact on overall project duration was proposed.

Saunders, Lewis and Thornhill (2016) identified eight research strategies that are generally used in research studies. These are experiments, surveys, archival research, case studies, ethnography, action research, grounded theory and narrative enquiry. Each of these strategies has specific contexts within which it is most appropriately applied.

In selecting a research strategy for this study, several key factors were considered. Firstly, UX design often occurs in the context of systems development projects, so the research strategy of choice needed to be suitable for investigating past and present projects. Secondly, the data collected needed to be understood from UX professionals' perspective and be of a qualitative nature. Lastly, the investigation needed to be carried out in more than one organisation, with research data being elicited within each organisation's natural context. Benbasat, Goldstein and Mead (1987) identified case studies to be a research strategy of choice in cases where the researcher can study information systems in a natural setting, can generate theories from practice and understand the nature of processes taking place. The same authors asserted that case studies are a good strategy to use for qualitative studies in which the experiences of the actors are critical to the study. Given that this study matches the conditions identified by Benbasat *et al.* (1987) as suitable for case study research, it lent itself to the use of case studies as a research strategy. A description of case studies is given the following paragraphs.

Yin (2011) distinguishes between case studies carried out in one organisation and those carried out in more than one organisation, the single and multiple case study,

respectively. Given the focus on more than one organisation, the best-fit research strategy to apply for this study was the case study, using different organisations as case studies.

Using case study research has some benefits and drawbacks. One key benefit is that it is suitable for studies in which a link between key activities and actors needs to be established in a causal link (Benbasat *et al.*, 1987). In this study, I maximised this benefit of case studies by interviewing the role players whose processes I studied, namely, UX design practitioners. One drawback of using case studies is that in cases where historical data is being collected, research subjects might have inconsistent recollection of events (Benbasat *et al.*, 1987). In this study, I minimised the potential impact of inconsistent recollection of events by interviewing multiple participants per case study. Interviewing multiple participants was beneficial in that interview responses that deviated significantly from otherwise homogenous responses could easily be identified as an outlier to the general response. If I had interviewed one person per case study, it would not have been possible to differentiate between normative and exceptional responses.

3.4.3. Sampling method

When selecting organisations to participate in the study, I considered two key factors. Firstly, the organisation should have UX design practices embedded in its systems development process. This is an important consideration, given that only organisations with UX design processes could provide information that is relevant for answering the research question. The other consideration is that the organisations must be willing to participate in the study. Given that the selection of participants in the study was based on specific qualities they possessed, purposive sampling was the appropriate

sampling method (Etikan, Musa & Alkassim, 2016). Within each case study organisation, I requested a list of individuals that worked as UX design specialists, team leads and managers. After the lists were provided by each organisation, I conducted one-on-one, semi-structured interviews with the consenting participants, using a list of questions linked to research sub-questions 1-5. The interview questions are documented in Appendix A.

3.4.4. Data collection strategy

The subjective emphasis of an interpretivist research study requires an understanding of the individual research participant's perspective (Terre Blanche *et al.*, 2006). Common approaches to collecting data for interpretivist research are interviews, observations, document reviews and visual data analyses (Mackenzie & Knipe, 2006).

I used interviews as a data collection strategy. I conducted semi-structured interviews with UX professionals and UX team leads in four organisations, as they were the most knowledgeable individuals regarding UX practices. I also interviewed individuals in roles that worked closely with UX professionals, for example, Business Analysts and Product Owners. Interviews provided opportunities to ask follow-up questions to gain deeper insights. The key information elicited from the interviews were the UX practices implemented in organisations in South Africa.

3.4.5. Data analysis strategy

Data collection and data analysis in interpretivist research studies are often conducted in parallel, with the latter taking more emphasis once the former is completed (Terre Blanche *et al.*, 2006). Terre Blanche *et al.* (2006) state five key steps for conducting data analysis in interpretive studies. The first step is for researchers to familiarise themselves with the data during the data collection process, with the result being a

good idea of the interpretations that are likely to be supported by the data. The second step is to derive a set of optimally complex themes from the data, with relevant sub-themes, ideally using a bottom-up approach.

While deriving relevant themes, the third step is conducted, which is the linking of specific passages of text from collected data to the themes identified. This step is known as “coding”. The fourth step is to refine and rearrange the themes and sub-themes, an iterative process known as “elaboration”. During elaboration, themes and sub-themes are reorganised until no new insights can be found from the data. The fifth and final step is to interpret the findings, typically making use of the themes and sub-themes identified. During interpretation, the researcher also reviews the themes and sub-themes, and makes relevant changes, as necessary.

I followed the process detailed by Terre Blanche *et al.* (2006), starting with conducting the interviews. All interviews were audio-recorded and transcribed, adhering to the University of Pretoria’s research ethics guidelines (see section 3.4.6).

While conducting the interviews with research participants, I documented the current UX design practices followed by each organisation. This documentation of UX design practices continued after completion of the interviews and developed into a process of deriving themes using coding and elaboration. The final step was interpreting the findings, which involved sequencing UX design practices in the context of systems development processes and deriving key insights that were useful for formulating the proposed framework.

3.4.6. Ethics

I conducted the study in a manner that upheld research participants’ rights, particularly the right to confidentiality, anonymity, informed consent, withdrawal and non-

participation as recommended by Oates (2005). Prior to being interviewed, each participant reviewed and signed a combined letter of introduction and informed consent, a copy of which is provided in Appendix B. The letter highlighted the participant's rights to confidentiality, anonymity, informed consent, withdrawal and non-participation. I also obtained ethical clearance from University of Pretoria's Research Ethics Committee and ensured that all data collection, analysis as well as reporting of the results were in line with the University's research ethics requirements. A copy of the ethics clearance letter is provided in Appendix C.

3.5. Conclusion

This chapter discussed the theoretical framework and research methodology for this study. The Innovation Resistance Theory is the theoretical model of choice for this study. It was selected as the most appropriate theoretical framework after careful consideration of an alternative, for two key reasons. Firstly, it provides a research-based and credible explanation for the reasons for the slow adoption of UX design by South African organisations. Secondly, it is the basis upon which the proposed framework was evaluated, as it provides a credible basis for predicting what could happen if the overall time taken to complete the UX design process is reduced. The research methodology discussion covered the research paradigm, research strategy, data collection approach and data analysis approach. The nature of this study lent itself to an interpretivist paradigm and a multiple case study. Interviews were the key data collection approach and lastly, the data was analysed through a process of coding, culminating in the derivation of logical themes that informed the proposed framework.

4. Interview results

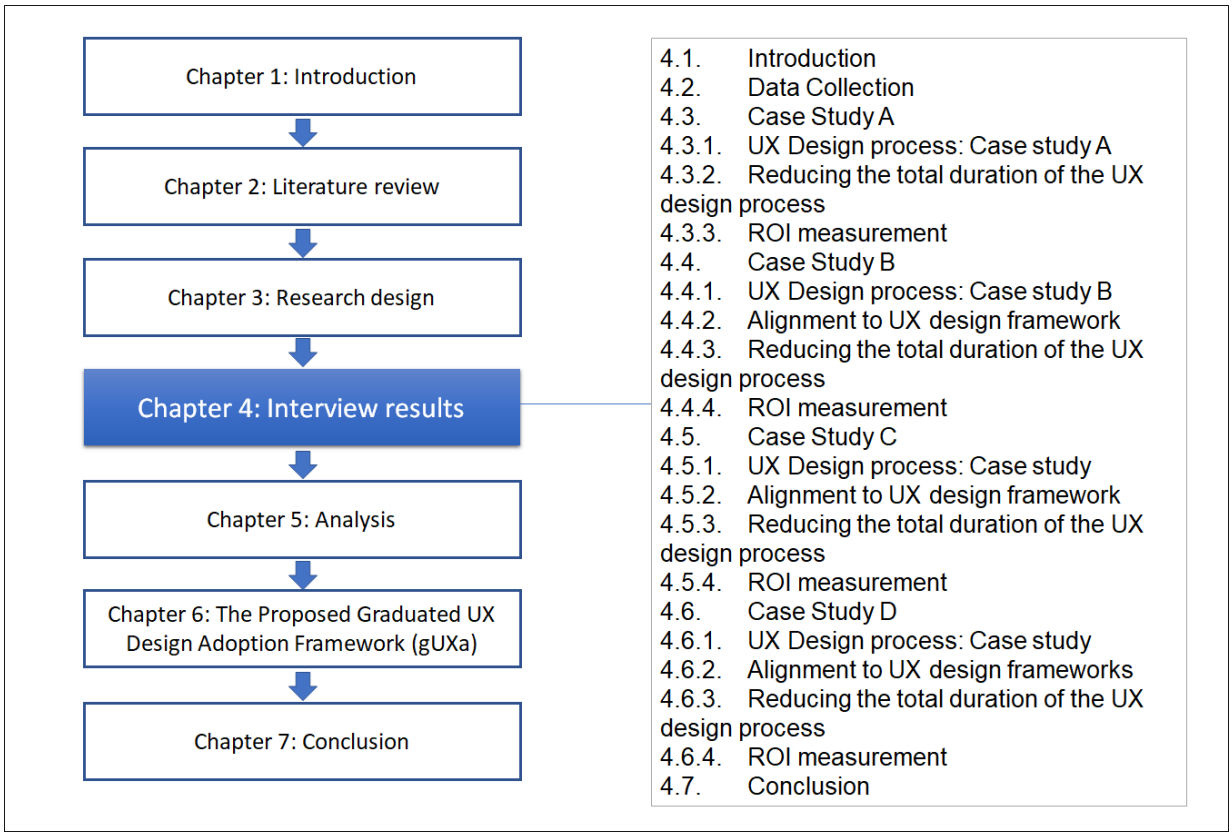

Figure 4.1: Outline of chapter 4

4.1. Introduction

The main research question that I undertook to answer in this study was "*how can the user experience design process be optimised to ensure minimal impact on overall system development time?"* There were three steps to answering this question, as stipulated in section 3.4.2. The first step was to gain an understanding of the current UX design processes followed by organisations in South Africa. Next was to conduct a literature review of UX practices that, if adopted, could lead to a faster UX design process. The third and final step was to design a process that could have minimal impact on overall system development time. This chapter focuses on the first step. To understand the current UX design processes followed by organisations in South Africa, data was collected from four organisations that have UX design processes.

4.2. Data collection

As specified in section 3.4.4, interviews were the appropriate data collection strategy for this study. To gain an understanding of the current UX design processes followed by organisations in South Africa, I conducted 33 interviews with participants in four case study organisations.

4.3. Case Study A

Case Study A is a Johannesburg-based organisation that specialises in developing applications for its client organisations in a wide variety of industries. The organisation was formed in 2003 and has clients located both in South Africa and abroad. This section contains a summary of the UX design process followed by Case Study A, the opportunities for optimisation of their processes and how ROI in the incorporation of UX is measured in the organisation.

I interviewed two individuals from Case Study A, a Creative Director who co-founded the organisation and a Lead UX Designer. Their respective roles required them to understand the organisation's entire software development process and influence the UX design process.

4.3.1. UX design process: Case Study A

Figure 4.2 depicts the key steps followed by the organisation to complete UX design and Table 4.1 contains a narrative for each step.

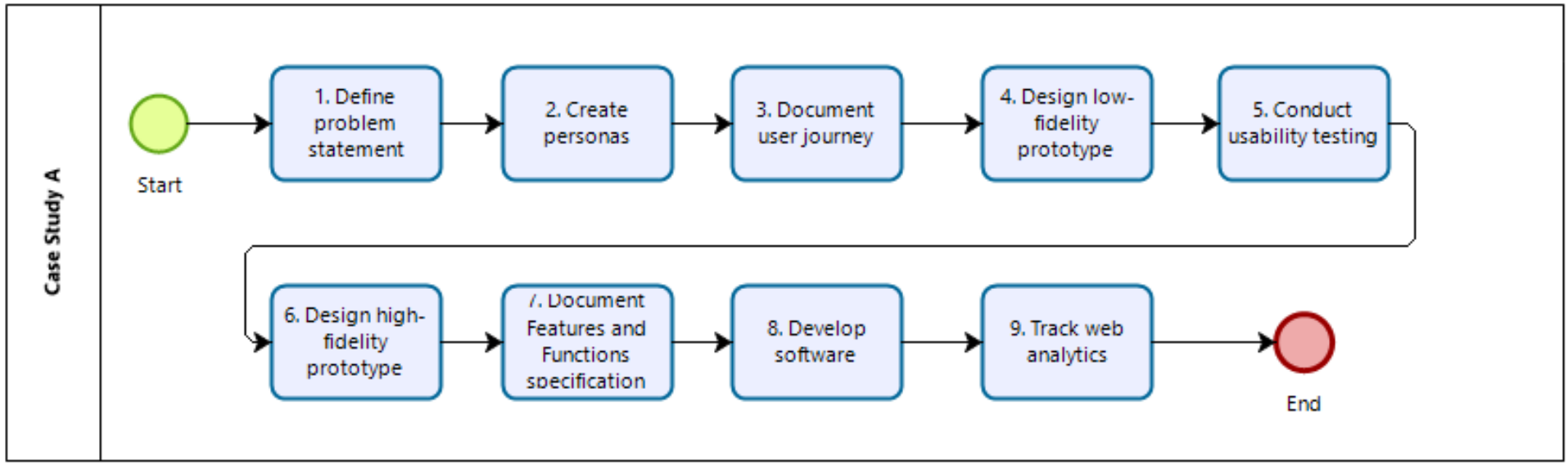

Figure 4.2: UX design process for Case Study A

Table 4.1: Description of each step of Case Study A's UX design process

Step No.	Step name	Step description	Step output
1	Define problem statement	The project team from Case Study A schedule a workshop with the representative(s) of a client organisation to understand their business objectives and the problem that a proposed website or custom software should solve. The problem statement is written down on a white board during a *Discovery session*. A Discovery session is a workshop during which a cross-functional team collaborates with representative(s) of the client organisation to understand the problem, brainstorm solutions and create designs. Key roles involved in the Discovery session: - Business Strategist, whose role is to facilitate the workshop; - Front-end developer, whose role is to advise workshop participants on which design ideas are feasible and which ones are infeasible, based on front end technology constraints; - Middleware and back end developer, whose role is to advise workshop participants on which design ideas are feasible and which ones are infeasible, based on back end and middleware technology constraints; - UX/UI Designer, whose role is to lead the ideation and sketching of potential design ideas, - Representative(s) of the client organisation, whose role is to describe the problem and decide which solution will best solve the business problem. Representatives of the client organisation are usually a manager from the business unit paying for the software and other individuals they may choose to accompany them to the Discovery session. The output of this step is a documented problem statement.	Problem statement
2	Create personas	During a Discovery session, personas are developed by eliciting from the client representative(s) who the typical users of a proposed website or custom software are. This is followed by the creation of the personas, with inputs from the representative(s). In cases where the representative(s) does not know the potential users of a proposed application, the Design team will make assumptions about the	Personas

		potential users in order to create user profiles and personas. These assumptions are validated later in the UX design process through usability testing and confirmation from the client organisation's representative(s). In cases where a similar application has been developed in the past, the Design team reuses and adjusts existing personas. While defining personas, the Design team also identifies other human user types such as System Administrators and non-human 'users' such as web analytics software. These other user types are treated as personas when user journeys are mapped. The output of this step is a set of personas.	
3	Document user journey	During the third step, the team maps each user's journey during the Discovery session, with the different journeys displayed parallel to each other. Two types of user journeys are created. An 'As-is' user journey enables the team to understand the status quo, while a 'To-be' user journey documents the future journey users will experience. This process culminates in the development of the 'To-be' user journeys, which are mapped collaboratively using a brainstorming approach.	To-be user journeys
4	Design low-fidelity prototype	During the fourth step, the team develops the information architecture and a low-fidelity prototype. The prototype is grey (no saturated colours) to ensure that stakeholders' reviews focus more on the user navigation rather than the content. Low-fidelity prototype is typically the last output from Discovery sessions.	Low-fidelity prototype
5	Conduct usability testing	In this step, the low-fidelity prototype is tested by individuals that are not part of the project team and may or may not fit the description of users as detailed in the personas. Examples of such individuals are UX designers and software developers that are part of the organisation but working on other projects. The feedback from the testing is used to refine the low-fidelity prototype and then incorporated into the high-fidelity prototype. The output of this step is usability testing results.	Usability testing results
6	Design high-fidelity prototype	This step entails designers adding content to the low-fidelity prototype, followed by feedback from the client organisation's representative(s). The designers then add colours, interactions and where necessary, animations to the design.	High-fidelity prototype

		Depending on a client's requirements, the design team either creates a video with a recording of the high-fidelity prototype and how to navigate it, or a link to the high-fidelity prototype. In cases where the design team send the client representative(s) a link to the prototype, the client representative(s) navigate through the prototype to check whether their expectations are met.	
7	Develop Features and Functions specification	In this step, the design team documents user stories, details about each web page, the functionality it offers and the user flow on the page, all in the Features and Functions specification. The output of this step is a set of user stories in the Features and Functions specification.	User Stories
8	Develop software	This step involves the software developers building the database, middleware and web pages based on the outputs of the previous steps. The output of this step is functioning software.	Functioning software
9	Track web analytics	After deployment of the website or custom software, the design team tracks data analytics and uses the statistics as an input for making decisions for future design changes.	Web analytic results

4.3.2. Reducing the total duration of the UX design process

The interview participants from Case Study A considered their organisation's UX design process as having a fast turnaround time, thus not requiring any optimisation to make the process faster.

On average, a website typically takes the organisation one to two weeks to complete the UX design, with more complex software taking up to a month and simpler software taking as few as two days to complete. The organisation credits two key factors as the catalysts for the fast turnaround times.

The first contributing factor to a fast turnaround time is the continuous improvement of the UX design process over time. From the organisation's inception in 2003, the process has undergone numerous refinements. At the time I conducted interviews in November 2019, the UX design process was a combination of practices drawn from the Design Thinking, Agile UX and Atomic Design approaches. Redundant steps have been removed from the process and each step in the process has been optimised to ensure a fast turnaround time without compromising the rigour of the design process.

The other contributing factor is the availability of a Design system, a library of reusable GUI components that the design team could draw from. This saves time as there is no need to *reinvent the wheel*. For instance, the team has on occasion completed the UX design process from problem definition to a clickable prototype in two days. For one of the designs that took two days to complete, the interviewee attributed the fast turnaround time to the low complexity of the design problem and the existence of a vast library of reusable GUI components, which the design team could draw from.

Participants from Case Study A identified one key improvement that needed to be made to their UX design process. The organisation's process did not involve end

users. In the absence of end users, the organisation applied a pragmatic approach by involving individuals that were not part of the project team but probably fitted the description of users as detailed in the personas. This practice could possibly distort the accuracy of the personas and skew the results of the usability testing. To address this issue, the organisation plans to persuade client organisations to provide the necessary funding to recruit end users to participate in user research and usability testing.

4.3.3. ROI measurement

At the time that the interviews were conducted in November 2019, Case Study A did not incorporate the measurement of ROI in UX processes. The organisation's engagements with clients end upon successful delivery of an application. Thereafter, clients do not share any data with the case study organisation to enable the calculation of the ROI in UX.

4.4. Case Study B

Case Study B was a management consulting organisation headquartered in Johannesburg, with offices in Cape Town, the United States of America and Australia. The organisation provides software development and management consulting services to organisations in a variety of industries. The organisation was formed in 1998 and the South African office currently employs 500 people, 30 of which make up the Design competency. This section contains a summary of the UX design process followed by Case Study B, the opportunities for optimisation of their process and how ROI in the incorporation of UX is measured in the organisation.

I interviewed nine individuals from the organisation, whose titles included Lead UX Designer, User Interface (UI) Designer, UX Researcher, Lead Business Analyst and Lead Engineer.

4.4.1. UX Design process: Case Study B

Figure 4.3 depicts the key steps followed by the organisation to complete UX design and Table 4.2 contains a narrative for each step.

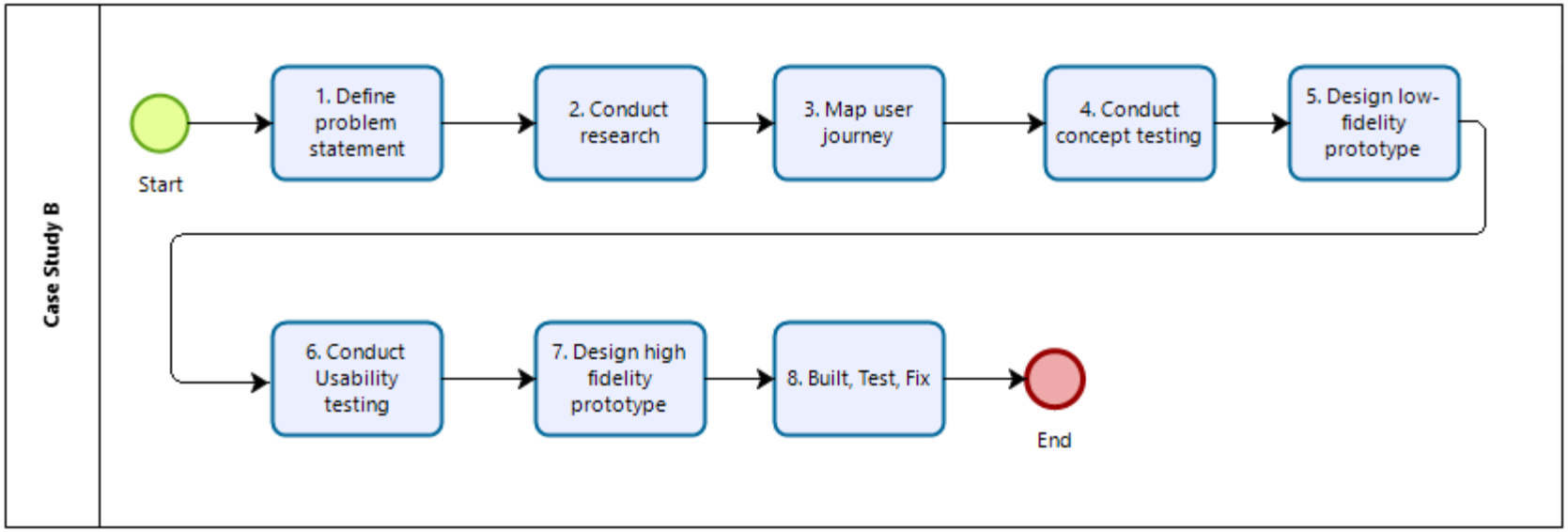

Figure 4.3: UX design process for Case Study B

Table 4.2: Description of each step of Case Study B's UX design process

Step No.	Step name	Step description	Step output
1	Define problem statement	During the first step of the design process, the Design Lead facilitates a workshop to understand the business problem. The typical workshop attendees are representatives of the client organisation from different business units, including: - Representatives of the different market segments, who understand each group of end users; - Representatives of the business unit that manages the services offered on the software. An example from a banking client organisation is a representative from the business unit responsible for originating loans or savings accounts, - Representatives of Operations business units including IT, Sales and Customer support. In cases where the client organisation has an existing application, the Designers conduct a heuristic evaluation of the application. Improvement opportunities are identified from the heuristic evaluation and shared with the client organisation. Statistics from Web Analytics from the existing solution are analysed and used to enhance the problem statement. The output of this step is a problem statement.	Problem statement
2	Conduct research	In this step, the UX Designers conduct a competitor analysis with input from the same group of stakeholders involved in the problem definition. They also conduct desktop research and interviews with competitor clients recruited through an agency, to collect as much information as possible about competitor solutions. They also conduct user research, interviewing representatives of end users to gain insights into the individuals for whom the software is going to be designed. The outputs of this step are a competitor analysis report and personas.	- Competitor analysis report - Personas

3	Map user journey	In this step, the Lead Designer facilitates a brainstorming session to identify potential user journeys. After consensus is reached on a final user journey, the concept is tested with a selection of end users recruited through an agency. The output of this step is the 'To-be' user journey.	'To-be' user journey
4	Conduct concept testing	In this step, the UX Designers validate their solution ideas. The objectives of the concept testing are two-fold. One to validate whether the proposed software would appeal to the target users and identify improvements to the user journey. The output of this step is a concept testing report.	Concept testing report
5	Design low-fidelity prototype	In this step, the UX Designers develop a low-fidelity prototype. In some cases, the UX Designers develop paper prototypes. In other cases, they design the low-fidelity prototype using prototyping software. The choice of paper or software depends on the Designer's preference. The output of this step is a low-fidelity prototype.	Low fidelity prototype
6	Usability testing	Whether a paper or black-and-white digital prototype is developed, it is tested with end users. In cases where a sufficient budget is allocated to the project, usability testing participants are individuals that are recruited through an agency. Where budget allocation is low, the UX Designers conduct usability testing with individuals within the client organisation that are not part of the project team and that may not align to the persona. The output of this step is a report detailing the usability testing results.	Usability testing results
7	Develop high-fidelity prototype	In this step, a UI Designer develops a high-fidelity, clickable prototype which acts as the standard upon which the rest of the software's functionality is based. The high-fidelity prototype is not a complete software product but a combination of high-priority functionality, only considering *happy path* scenarios. Happy path scenarios are the actions users would take in a situation in which there are no errors or exceptions to the functionality being tested. The output of this step is a high-fidelity prototype.	High-fidelity prototype
8	Build, Test, Fix	In this step, a cross-functional team selects a portion of functionality and analyses, designs and develops it. The organisation follows the Scrum methodology, using 2-week sprints. There are two types of sprints, one focused on design and the other focused on developing, testing and deploying software. Each piece of functionality goes through a Design sprint followed by a	Working software

		Development sprint with the former happening one or two sprints ahead of the latter. Each cross-functional team comprises one or more Business Analysts, UX Designers, UI Designers, Software Developers and Software testers working closely with a Product Owner and Scrum Master. The size of each team is dependent on the size and complexity of the functionality to be developed, with bigger and more complex features requiring bigger teams. The output of this step is software that works.	

4.4.2. Alignment to UX design approaches

Whenever a new UX design approach is published, the manager of the UX design competency requests two to five UX designers to conduct research on it and share knowledge about it with the rest of the team of designers. This allows the UX designers to keep abreast of new developments in the field of UX design.

Although the interview participants from Case Study B were not of the view that their organisation strictly followed a UX design process, a clear pattern of UX design steps that were typically followed in the organisation emerged from the interview data. I referred to these commonly followed steps as the organisation's UX design process. The UX design process followed in the organisation, illustrated in Figure 4.3, was derived from the Google design sprint, Lean UX, Agile UX and Design thinking approaches.

In cases where a client organisation had a formal UX design process, the designers in Case Study B would tailor the process that they typically followed to suit their client organisation's requirements. In cases where a client organisation did not have an existing UX design process, the UX design professionals would then follow the process illustrated in Figure 4.3 as an unwritten rule.

One of the key principles that UX design professionals in the organisation adhered to was continuous improvement of their UX design knowledge and practices. The interviewees displayed a sense of pride in their propensity to experiment with new UX Design approaches. Interviewees were of the view that not being afraid to experiment had served their organisation well through improvements in their UX design practices over time. An evidence of this improvement was that when the organisation first adopted Agile UX, they used to work in two-week sprints which incorporated design

and software development. Over months, the designers found that two-week sprints tended to be a bottleneck for the developers because their work required iteration and creativity. To resolve this issue, the sprints were split into a Design sprint and a Development sprint, with the Design working a sprint or two ahead of the Development sprint. This and many other improvements over the years have resulted in improvements in the organisation's UX design process.

4.4.3. Reducing the total duration of the UX design process

As stated in section 4.4.2, Case Study B organisation did not have a formal UX design process. The absence of a formally documented UX design process led to a diversity of views regarding how to reduce the overall duration of UX design activities. Two participants from the organisation indicated that they were able to reduce the total duration of the UX design process by eliminating steps that the designers considered optional, such as developing a high-fidelity prototype. For example, the participants would only create high-fidelity prototypes in the 'first few' sprints when a cross-functional team starts working together. Once a project team reaches a high level of 'maturity' and has worked together 'long enough,' the team as a collective would decide when it would be appropriate to stop developing high-fidelity prototypes. This recommendation is predicated on the notion that software developers only need the level of detail found in high-fidelity prototypes in the initial stages of development in order to understand the design standards. In this line of reasoning, the software developers would no longer need such detail once they become accustomed to the organisation's design standards.

Another method that the organisation uses to shorten the duration of the UX design process is to reduce the amount of time spent on usability testing. According to study participants this is achieved by limiting the number of usability test participants to three

rather than the standard minimum of six. Another approach is elimination of the time spent on recruiting end users from outside the organisation by an external agency, in cases where target users are external to the client organisation. Rather than relying on external agencies, UX designers would involve end users that are employees of the client organisation, that closely match the target users' description as detailed in the personas. To mitigate the risk of skewing usability test results, a screening process needs to be applied within the organisation to identify users that closely match the personas.

Study participants also indicated that activities that can be conducted in parallel are identified and carried out in parallel. This approach enables them to reduce the total duration of the UX design process.

The last method that the organisation uses to shorten the duration of the UX design process is to implement a division of labour by allocating specific activities in the UX design process to specialised UX professionals. This replaces the 'Jack of all trades' UX professional with distinct roles such as UX Researcher, UX Designer, UX Copywriter and UI Designer. Such specialisation facilitates the completion of tasks in parallel, which shortens the overall duration of the UX design process. This is yet another way the organisation has reduced the overall duration of the UX design process.

4.4.4. ROI measurement

The interview participants from Case Study B identified ways to measure ROI in UX. One metric that the study participants have used is the improvement in the Net Promoter Score, a measure of the likelihood of clients of Case Study B recommending their services to other potential clients. The NPS is calculated by an independent organisation and published annually. The UX designers compared the Net Promoter

Score before and after a design was implemented to establish whether the design led to an improvement in customer loyalty and brand image.

Another measure is the reduction in the number of drop-offs after a new design was implemented. The UX designers would compare the drop-offs before and after a redesign to establish whether the design resulted in an improvement in usability.

Another measure is a calculation of the percentage increase in sales that result from the new design.

Lastly, ROI is measured by calculating the amount of money saved from the rejection of ideas that failed concept testing.

4.5. Case Study C

Case study C is a financial services organisation that has been in existence for a century. The organisation is headquartered in Johannesburg and has offices and branches in all the nine provinces of South Africa. It also has offices and branches in 15 countries across Africa, Asia and Europe. The organisation has 140 UX design professionals working on both customer-facing and internal applications. This section describes the UX design process followed by Case Study C, the opportunities for optimisation of their processes and how ROI in the incorporation of UX is measured in the organisation.

I interviewed 17 individuals from the organisation. The titles of the interviewees included Creative Director, Lead UX Designer, UX Designer, User Interface (UI) Designer, UX Researcher, Lead Business Analyst, Product Owner, Customer Experience (CX) Specialist and Service Design Lead.

4.5.1. UX Design process: Case Study C

Case Study C followed two UX design processes. The first process contains a comprehensive set of UX design steps that are mandated for all newly formed project teams. The second UX design process is shorter than the first process and can only be followed once a project team has completed at least one software release. Figure 4.4 depicts the key steps followed by the organisation to complete UX design for new projects and Table 4.3 contains a narrative for each step. Figure 4.5 depicts the steps followed in the shortened UX design process and Table 4.4 contains a narrative for each step of the shortened process.

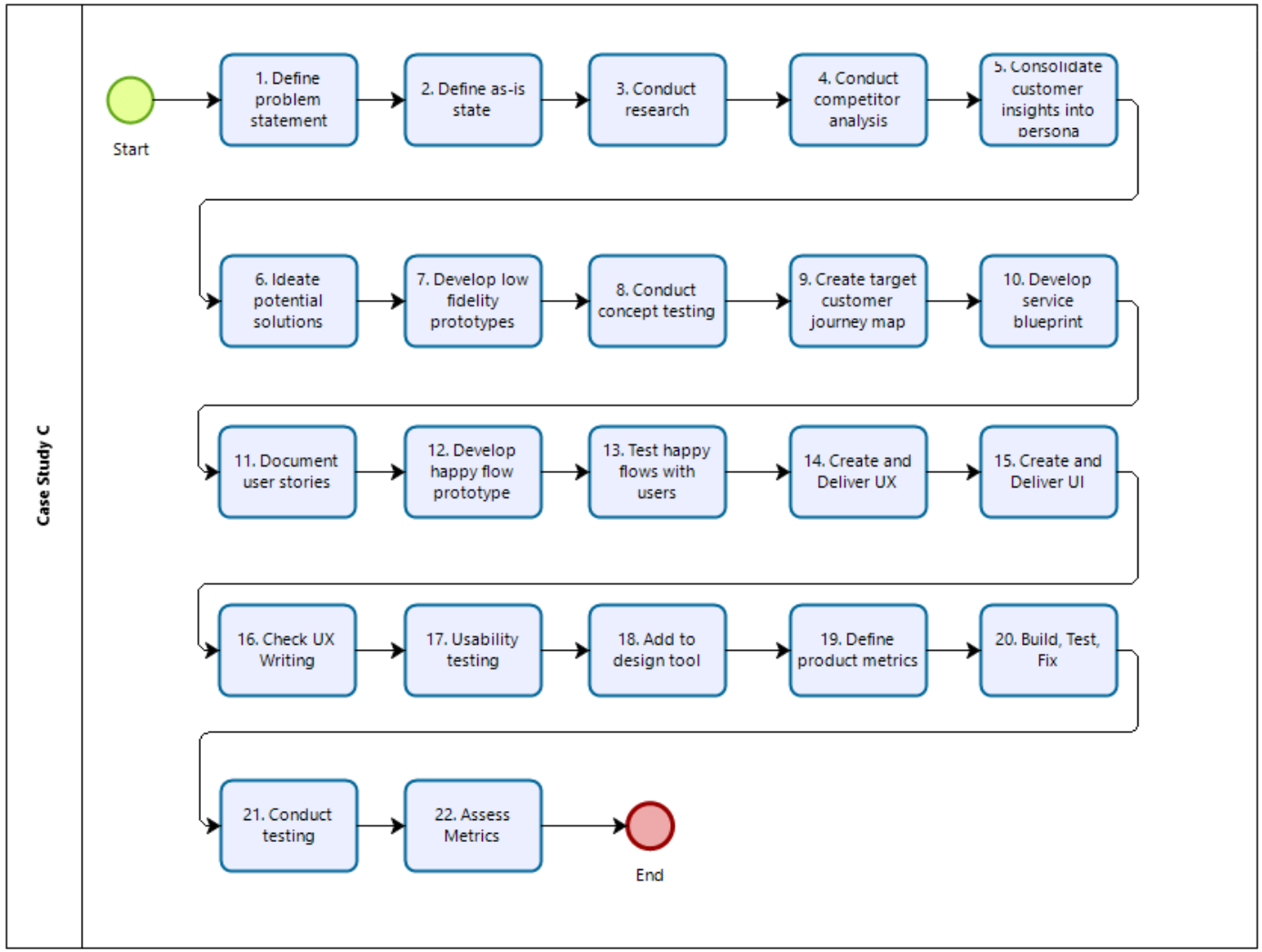

Figure 4.4: UX design process for Case Study C

Table 4.3: Description of each step of Case Study C's UX design process

Phase	Step No.	Step name	Step description	Step output
Discover	1	Define problem statement	Within Case Study C, representatives of the business unit requesting the application define a problem statement before a systems development project is initiated. Once a project is initiated, the Business Analyst meets with the business unit's representatives to understand the problem statement and where necessary, refine it. A problem statement is refined in cases where the Business Analyst perceives it to be unclear or requiring elaboration. The output of this step is a problem statement.	Problem statement
Discover	2	Define as-is state	In the second step the UX Researcher, Customer Experience Specialist and UX Designer conduct a workshop to understand the existing customer journey. They include representatives of the business unit responsible for onboarding new customers and the business unit responsible for customer retention. The output of this step is an 'As-is' journey map.	'As-is' journey map
Discover	3	Conduct research	In the third step, The UX Researcher conducts research to verify the accuracy of the problem statement. This investigation comprises interviews with end users and desktop research. Upon completion of the investigation, the UX Researcher identifies key themes and presents recommendations to a decision-making committee, regarding whether to proceed with the project. The benefit of such research is the provision of a fact-based recommendation of whether an idea is likely to succeed or fail. The organisation also saves money by not pursuing ideas that are not likely to be profitable. The output of this step is a research report.	Research report
Discover	4	Conduct competitor analysis	In this step, the UX Researcher and UX Designer review solutions that were implemented by competitor organisations for solving similar problems. Competitor analysis is typically conducted through desktop	Competitor analysis report

			research and other creative ways of collecting data. An example of a creative method for collecting data for competitor analysis was given by one of the interview participants. On a project whose objective was to build a mobile application, she enrolled herself as a client of four of Case Study C's main competitors and accessed their respective mobile applications. Accessing the competitors' mobile applications enabled her to conduct a competitor review based on her first-hand experience using each competitor's mobile application. The output of this step is a competitor analysis report.	
Describe	5	Consolidate customer insights into persona	In this step, the UX Researcher elicits characteristics of target user groups by conducting interviews with a sample of end users recruited through an agency. The UX Researcher creates personas by identifying themes from interview data related to characteristics such as typical daily routines, age range and needs of each target user group. To save time, UX Researchers from Case Study C reuse personas that were created on other projects provided they are at most, six months old. The output of this step is a set of personas.	Persona
Describe	6	Ideate potential solutions	In this step, the UX Designer facilitates a workshop to brainstorm potential solutions, using the existing customer journey and completed research as inputs. In the brainstorming workshop, the UX Designer, Business Analyst, UX Researcher and Development Team Lead sketch potential solutions and narrow them down to one or two solutions they identify as most likely to solve the problem. The output of this step is a set of concept sketches.	Concept sketches
Describe	7	Develop low-fidelity prototype	In this step, the UX Designer facilitates a brainstorming workshop including representatives of various business units, the Business Analyst and Development Team Lead. In this workshop, they create a low-fidelity prototype on paper or on whiteboards. In some cases, the Ideation workshop (step 6) results in the creation of a low-fidelity prototype, hence combining steps 6 and 7. The output of this step the low-fidelity prototype.	Low-fidelity prototype

Define	8	Conduct concept testing	In this step, the UX Researcher tests the low-fidelity prototypes with end users to identify flaws with the conceptual design. UX Researchers can conduct concept testing using paper prototypes, sketches on a whiteboard, sketches on a digital application, or through interviews with end users. The output of this step is a concept testing report.	Concept testing report
Define	9	Create target customer journey map	In this step, the UX Researcher, Customer Experience Specialist and UX Designer collaborate in a brainstorming workshop, to define the desired customer journey. The output of this step is a 'To-be' user journey map.	'To-be' journey map
Define	10	Develop service blueprint	In this step, the Service Designer facilitates a workshop with representatives of business units that are responsible for back office operations that would support the 'To-be' user journey. During the workshop, the Service Designer presents the 'To-be' user journey, then documents the back-office processes that support the user journey, based on input from the workshop attendees. A service blueprint displays the back-office operations for each step of a user journey map. The output of this step is a 'To-be' service blueprint.	'To-be' service blueprint
Define	11	Document user stories	In this step, the Business Analyst documents user stories using the low-fidelity prototype and user journey map as inputs. The Business Analyst also documents requirements identifying the data that will be analysed and tracked after the project, for each feature. To confirm the accuracy of the user stories, the Business Analyst facilitates review meetings with the Product Owner and representatives of the business unit requesting the features. The output of this step is the user stories.	User stories
Define	12	Develop happy flow prototype	In this step, the UX designer develops a prototype with only the ideal flow, without catering for cases where the process does not operate as planned. 'Negative' flows are developed together with the high-fidelity prototype (step 15). To save time, happy flows are sometimes developed as early as during the Discover phase during ideation of potential solutions (step 6) and refined as the process progresses.	Happy flow prototype

			The output of this step is a happy flow prototype.	
Define	13	Test happy flows with users	In this step, the UX Researcher conducts usability testing for the happy flow prototype, with end users recruited through an agency. The insights from the usability testing are incorporated into the next iteration of design. In cases where happy flows are ready by the time concept testing is conducted, they are tested for usability at that stage. The output of this step is a usability testing report.	Usability testing report
Deliver	14	Create and deliver UX	In this step, the prototype is refined based on the results of usability testing. In cases where the UX Designer had created a paper prototype, they create a digital version of the prototype and store it on the enterprise design software during this step. The output of this step is the refined low-fidelity prototype.	Refined low-fidelity prototype.
Deliver	15	Create and deliver UI	In this step, the UI Designer adds more detail to the low-fidelity prototype by applying the organisation's design standards on screen elements such as colour schemes, button sizes and font sizes. The UI Designer also refines the text on labels and other objects on each page, to align with the organisation's standards. The output of this step is a high-fidelity prototype.	High-fidelity prototype
Deliver	16	Check UX writing	In this step, a Copywriter reviews the text on the high-fidelity prototype and applies changes to align it to the organisation's standards. The output of this step is a refined high-fidelity prototype.	Refined high-fidelity prototype
Deliver	17	Usability testing	In this step, the UX Researcher conducts usability testing on the high-fidelity prototype with end users recruited through an agency. The Design team has an option to omit this step from the UX design process, as they would have tested low-fidelity prototypes when they tested happy flows. The output of this step is a usability testing report.	Usability testing report
Deliver	18	Add to Design tool	In this step, the UI Designer moves the high-fidelity prototype to a system that is accessed by software developers. The software developers use the high-fidelity prototype to build the software. The output of this step is a high-fidelity prototype that is ready for software developers to use as a reference point for developing the UI.	Ready-for-development prototype

Deliver	19	Define product metrics	In this step, the Product Owner facilitates a process to establish the metrics by which the software is measured once its implementation is completed. The Product Owner elicits the metrics from representatives of the business unit that requested the software. The output of this step is a set of Key Performance Indicators (KPI).	Key Performance Indicators
Disrupt	20	Build, Test, Fix	In this step, the software is developed, tested for accuracy, then refined. Case Study C follows the Scrum methodology for building software. The organisation defines two types of sprints, namely a Design sprint and a Development sprint. The Design sprint is a 2-week sprint during which Business Analysts refine user stories and UX Designers create and refine prototypes. Once the design of a particular feature is complete, the functionality is developed and tested in the Development sprint. The output of this step is functioning software.	Functioning software
Disrupt	21	Conduct testing	In this step, the UX Designers and UX Researchers test the system for design defects by recruiting end users through an agency and asking them to perform tasks on the software. This step is optional, so it is performed on some projects and omitted on others. The output of this step is a Usability testing report.	Usability testing report
Disrupt	22	Assess metrics	In this step, the performance of the software is evaluated against the established KPIs. If performance is not in line with expectations, a root-cause analysis is conducted by the Product Owner and remedial action taken. In cases where design flaws are seen to be the root case, a new project is initiated to address them. The output of this step is a performance assessment report.	Performance assessment report

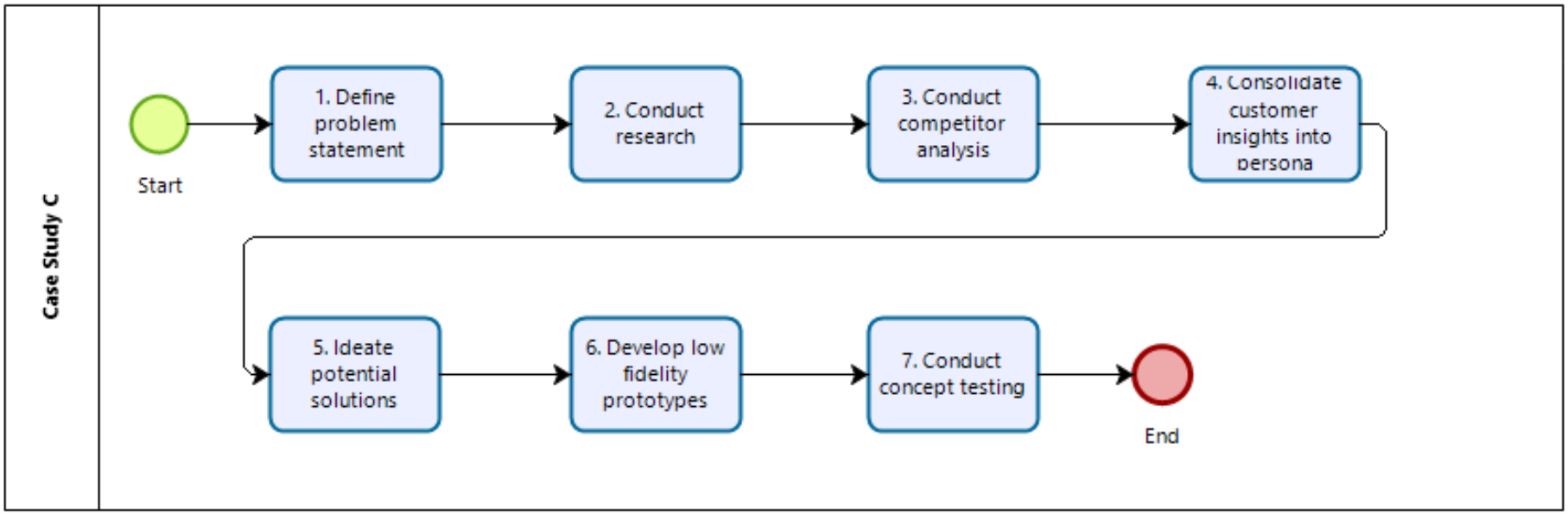

Figure 4.5: Shortened UX design process for Case Study C

Table 4.4: Description of each step of Case Study C's shortened UX design process

Phase	Step No.	Step name	Step description	Step output
Discover	1	Define problem statement	Within Case Study C, representatives of the business unit requesting the software define a problem statement before a software development project is initiated. Once a project is initiated, the Business Analyst meets with the business unit's representatives to understand the problem statement and where necessary, refine it. A problem statement is refined in cases where the Business Analyst perceives it to be unclear or requiring elaboration. The output of this step is a problem statement.	Problem statement
Discover	2	Conduct research	In the third step, The UX Researcher conducts research to verify the accuracy of the problem statement. This investigation comprises interviews with end users and desktop research. Upon completion of the investigation, the UX Researcher identifies key themes and presents recommendations to a decision-making committee, regarding whether to proceed with the project. The benefit of such research is the provision of a fact-based recommendation of whether an idea is likely to succeed or fail. The organisation also saves money by not pursuing ideas that are not likely to be profitable. The output of this step is a research report.	Research report
Discover	3	Conduct competitor analysis	In this step, the UX Researcher and UX Designer review solutions that were implemented by competitor organisations for solving similar problems. Competitor analysis is typically conducted through desktop research and other creative ways of collecting data. An example of a creative method for collecting data for competitor analysis was given by one of the interview participants. On a project whose objective was to build a mobile application, she enrolled herself as a client of four of Case Study C's main competitors and accessed their respective mobile applications. Accessing the competitors' mobile applications enabled her to conduct a	Competitor analysis report

			competitor review based on her first-hand experience using each competitor's mobile application. The output of this step is a competitor analysis report.	
Describe	4	Consolidate customer insights into persona	In this step, UX Researcher elicits characteristics of target user groups by conducting interviews with a sample of end users recruited through an agency. The UX Researcher creates personas by identifying themes from interview data related to characteristics such as typical daily routines, age range and needs of each target user group. To save time, UX Researchers from Case Study C reuse personas that were created on other projects provided they are at most, six months old. The output of this step is a set of personas.	Persona
Describe	5	Ideate potential solutions	In this step, the UX Designer facilitates a workshop to brainstorm potential solutions, using the existing customer journey and completed research as inputs. In the brainstorming workshop, the UX Designer, Business Analyst, UX Researcher and Development Team Lead sketch potential solutions and narrow them down to one or two solutions they identify as most likely to solve the problem. The output of this step is a set of concept sketches.	Concept sketches
Describe	6	Develop low-fidelity prototypes	In this step, the team develops the low-fidelity prototype, which are grey (no saturated colours) to ensure that stakeholders' reviews focus more on the user navigation rather than the content. The output of this step is a low-fidelity prototype.	Low-fidelity prototype
Define	7	Conduct concept testing	In this step, the UX Researcher tests the low-fidelity prototypes with end users to identify flaws with the conceptual design. UX Researchers can conduct concept testing using paper prototypes, sketches on a whiteboard, sketches on a digital application, or through interviews with end users. The output of this step is a concept testing report.	Concept testing report

4.5.2. Alignment to UX design approaches

Case Study C followed the four phases of the Double Diamond approach, with an additional phase they tailored in, namely, *Disrupt*. The *Disrupt* phase was added to reflect the organisation's strategic intent, which was to be a market leader in their industry.

The organisation's UX design process also incorporated the Lean UX principle of rapid paper prototyping to save time. While most UX Designers in this organisation conducted rapid paper prototyping, not all of them followed this principle because, in some cases, their respective project sponsors only signed off on prototypes documented on prototyping software because, in their view, it looked more 'professional.' Whenever this happened, it constrained the UX Designers by forcing them to use software for their prototyping.

Another reason why rapid paper prototyping was not always followed was that preferences varied from one designer to another. Some UX Designers from Case Study C preferred drawing their prototypes on top of their desks as it was common practice within the organisation, while others used whiteboards and others strictly used prototyping software. Although the Lean UX principles were predominantly followed in the case study organisation, there were no restrictions on how prototyping is conducted.

Lastly, the organisation applied the Agile UX principle of splitting sprints into a Design sprint and a Development sprint, with the former happening ahead of the latter. As an organisation standard, each of the sprints were two weeks long. In some cases, the Design sprint happened one sprint ahead of the Development sprint and in other cases

two or in rare cases, three sprints ahead. Each project team tailored the process to suit their project's requirements.

4.5.3. Reducing the total duration of the UX design process

In the two years before I conducted the interviews in November 2019, some measures were implemented within Case Study C organisation to reduce the duration of the UX design process.

The first measure was the implementation of a *design system*, a central repository of reusable components that UX and UI Designers used to define high-fidelity prototypes. When high-fidelity prototypes were completed on the design system, they matched exactly how the final solution would look. The design system saved time in two ways. Firstly, the clarity that software developers achieved from a design that represented the final output eliminated most, if not all the need to ask the UI Designer questions about interface elements like fonts and button sizes. Secondly, the number of errors made by designers was reduced since the design system restricted them to objects that were aligned to the organisation's design standard.

A second measure that was implemented was the splitting of sprints into a Design sprint and a Development sprint. When the organisation adopted the Agile UX approach, the software development project teams would attempt to complete UX design in the same sprint as the software development. In that setup, UX Design was seen as a bottleneck because design work often required more time than anticipated, which led to the missing of deadlines. The process was changed to one where UX Design was conducted in one sprint and software development in its own sprint. This new process led to a more efficient process because Design teams now had sufficient time to deliver their outputs two or four weeks ahead of software developers.

Another measure implemented by the organisation was to reduce the number of steps that design teams followed after implementing the Minimum Viable Product (MVP), in

line with Lean UX principles. This measure was formalised through the shortened UX design process.

Usability testing was identified by interview participants as an important part of the UX Design process that should not be removed under any circumstance. Case Study C used two ways to reduce the amount of time taken to conduct usability testing. Firstly, the UX Researchers conducted testing using only five participants, which was the bare minimum group of users that would yield accurate results (Nielsen & Landauer, 1993). The other measure was to conduct usability testing with proxy users, who are users that were not recruited through an agency. An example of this is in a case where a project did not have adequate budget allocation for usability testing. The UX Researcher and UX Designers would test the design using family members or relatives as participants whose profiles matched those of the system being developed.

Lastly the UX Design process allowed team members to tailor the process to what was suitable for the software under development. Examples of tailoring that reduced the overall duration of the UX Design process were the removal of optional steps and working on some design activities concurrently.

The interviewees from the Case Study C organisation identified two measures that could further reduce the overall duration of the UX design process in their organisation. The first measure would be to conduct only one usability test instead of conducting multiple iterations. The usability test would be done using low-fidelity prototypes and the findings of the usability testing report would then be incorporated into the design of high-fidelity prototypes.

The second suggestion would be to include UX Designers in meetings where Business Analysts elicited requirements from representatives of the business unit that requested

the software. Including UX Designers in the requirements elicitation would enable them to start prototyping earlier in the process, rather than waiting for user stories to be completed by Business Analysts. Close collaboration between the Business Analysts and User Experience Designers would result in earlier delivery of high-fidelity prototypes. However, the interviewees were of the view that this suggestion could be difficult to implement since UX Designers often worked on multiple projects. This could limit their capacity to be involved in requirements elicitation. This meant the organisation may need to rethink the way they allocated UX Designers to projects, to enable them to work on fewer projects.

4.5.4. ROI measurement

At the time of conducting the interviews, ROI in UX practices was not being measured in Case Study C organisation. Business cases were typically developed for each project and ROI was calculated per project, without allocating returns to a specific discipline within the project team. One metric the organisation tracked was the Net Promotor Score.

The interview participants identified ways that ROI in UX processes could be measured. Reduction in the number of drop-offs after a new design had been implemented and the percentage increase in sales were identified useful measures.

4.6. Case Study D

Case Study D was a management consulting organisation with an office in Johannesburg. The organisation provided management consulting services for organisations in the South African financial services industry. The organisation employed 120 people, 80 of whom made up the Design competency. This section describes the UX design process followed by Case Study D, the opportunities for

optimisation of their processes and how ROI in the incorporation of UX was measured in the organisation.

4.6.1. UX design process: Case Study D

Case Study D organisation did not have a formally documented UX design process but trained each newly hired UX design professional on the methods they followed. From the interview data, a clear pattern of UX design process steps emerged, which I refer to as the organisation's process. Figure 4.6 depicts the key steps followed by the organisation to complete UX design and Table 4.5 contains a narrative for each step.

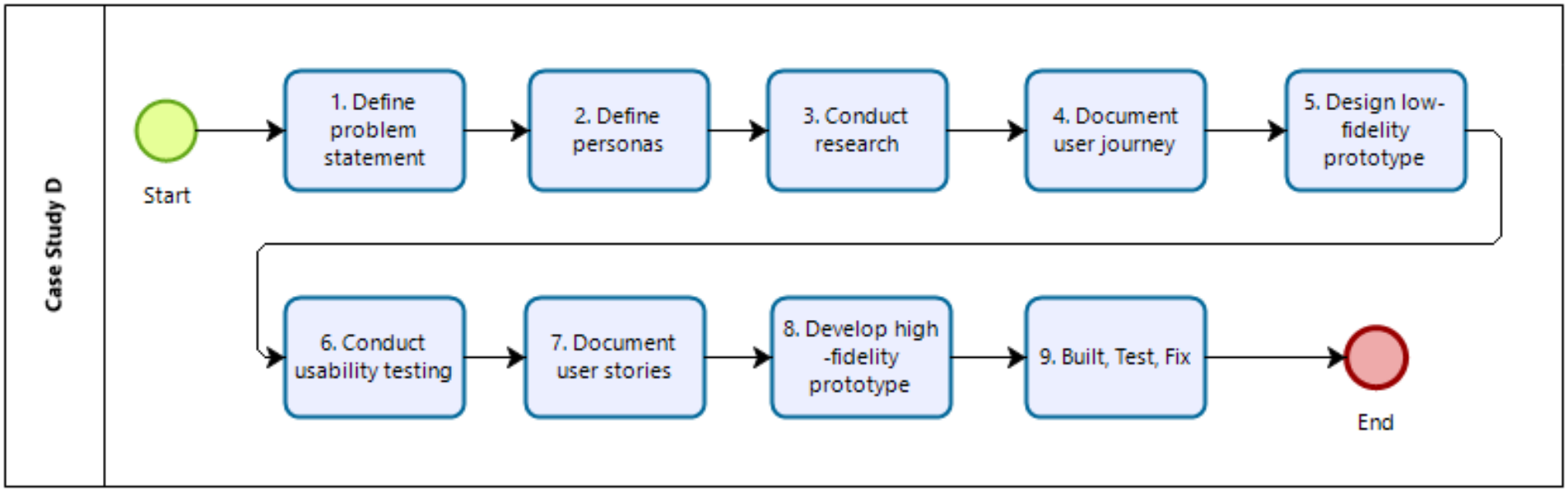

Figure 4.6: UX design process for Case Study D

Table 4.5: Description of each step of Case Study D's UX design process

Step No.	Step name	Step description	Step output
1	Define problem statement	In the first step, a Business Analyst and UX Designer facilitate workshops with representatives(s) of a client organisation to define the problem statement. Representatives of the client organisation are usually managers from the business unit(s) paying for the project and the business unit(s) that have understands the end users. The output of this step is a problem statement.	Problem statement
2	Create Personas	In this step, the UX Designer makes assumptions about the users and creates personas based on those assumptions. The UX Designer validates the assumptions with representatives of the client organisation that understand the users. The output of this step is a set of proto personas.	Proto persona
3	Conduct research	In this step, the UX Designer conducts a contextual inquiry to understand the existing solution and how it is used. As part of research, the UX Designer also conducts a heuristic evaluation to identify potential issues with the existing application, if one exists. In cases where a sufficient budget is allocated to the project, the UX Designer conducts interviews with end users to understand the user characteristics. The information from these interviews is an input into confirming and refining the personas. The UX Designer also conducts a competitor analysis, from which they develop an understanding of existing solutions from local and international competitors. The insights from the competitor analysis are an input to the ideation of potential solutions. The UX Designer also investigates trends for solving specific design-related problems by accessing websites such as www.dribbble.com, www.material.angular.io and www.behance.net. The outputs of this step are a competitor analysis report, a heuristic evaluation report and updated personas.	Competitor analysis report Heuristic evaluation report Updated personas
4	Document user journey	In this step, the UX Designer documents current and future user journeys during a collaborative workshop derived from the Google Design Sprint. The UX Designer	'As-is' user journey map

		facilitates the workshop and includes the Business Analyst, Project Owner, Development Lead, representatives of the business unit that understand the products and representatives of the business unit that understand the users. The outputs of this step are the 'As-is' and 'To-be' user journey maps.	'To-be' user journey map
5	Design low-fidelity prototype	In this step, the UX Designer creates a paper prototype, using insights from the research (step 3) and 'To-be' user journey map. The output of this step is the low-fidelity prototype.	Low fidelity prototype
6	Conduct usability testing	In this step, the UX Designer conducts usability testing with end users to validate the low-fidelity prototype. Once the usability testing is complete, the UX Designer compiles a report with usability testing results, together with recommendations for improving the design. The output of this step is a usability testing report.	Usability testing report
7	Document user stories	In this step, the Business Analyst documents user stories using the low-fidelity prototype as an input. The Business Analyst confirms the accuracy of the user stories by facilitating a review meeting with the Product Owner and representative(s) of the business unit requesting the features. The output of this step is the user stories.	User stories
8	Design high-fidelity prototype	In this step, the UX Designer enhances the low-fidelity prototype by adding page components, colour schemes and where relevant, animations. Using page components from the client organisation's design system, the UX Designer develops a high-fidelity, clickable prototype. The output of this step is the high-fidelity prototype.	High-fidelity prototype
9	Build, Test, Fix	In this step, the Software Developer develops the functionality, following which the Quality Assurance Analyst tests the integrity of the software and the UI Designer conducts design testing. Design testing is the review of the UI to ensure that it is identical to the high-fidelity prototype. The Software Developer also makes the necessary changes to the software based on the testing conducted by the Quality Assurance Analyst and the design testing conducted by the UI Designer. The output of this step is functioning software.	Functioning software

4.6.2. Alignment to UX design approaches

The UX design approaches the organisation followed were the Google design sprint, Agile UX, Lean UX and Design thinking. The UX Designers also used Web analytics data to guide the features to develop first in a redesign, with the most frequently used features being the ones that were prioritised first.

4.6.3. Reducing the total duration of the UX design process

The interviewees from Case Study D organisation identified measures that could facilitate reduction in the total duration of UX design. To reduce the time taken when conducting user research, UX Designers from Case Study D would define proto personas. These were *just enough* information to understand the target users. In most cases, proto personas were validated by meeting with representatives of a client organisation that understood users. In rare cases, UX Designers conducted user interviews to validate their assumptions. An alternative approach used by one of the interviewees was the use of demographic data provided by the client organisation, to understand 'typical users', without creating personas.

Another measure taken by the UX Designers was to conduct some activities concurrently. For instance, one participant stated thus

> *"If I'm designing a low-complexity functionality, I can already start doing a user journey as I conduct the research. I'll give an example of a login. Once I see how competitors do it, understand the frustrations/pain points users have with it, I can go ahead and do a user journey for that. For higher complexity features I could do it differently".*

A third way of reducing the overall duration of the UX design process was to shorten the duration of usability testing. This could be achieved by limiting the number of users to a maximum of six.

Another time reduction measure was to distinguish between functionality aligned with personas that required usability testing and functionality that did not require usability testing. Examples of functionality that required usability testing included features related to the completion of complex tasks or specialist knowledge. An example of functionality that did not require usability testing was common software features like password reset. The complex task would require recruitment of participants through an agency, whereas the latter could leverage a *Friends of the programme* group, which would be a set of volunteers recruited at the beginning of the project to participate in testing.

One way that the design team used to minimise the likelihood of miscommunication of project objectives and requirements was the inclusion of the Development Lead in problem statement definition and requirements elicitation workshops. A benefit of this approach was that the Development Lead could start ideating and building some of the simpler features while the Design team was still refining the design. This gave the Development team time to raise any issues with the feasibility of the solution, rather than wait until the requirements elicitation was complete.

4.6.4. ROI measurement

Case Study D's engagements with client organisations ended when software development was completed. Upon successful delivery of software, client organisations did not share any data with the organisation to enable the calculation of

the ROI in UX. As a result, Case Study D did not calculate ROI in UX. Nevertheless, interview participants provided suggestions for how ROI in UX could be established.

Study participants suggested measuring reduction in the number of calls to an organisation's call centre after an application redesign. This measure was applicable in situations where, prior to a redesign, call centre data points to usability as being the root cause of a rise in support-related calls. A reduction in the number of such calls could translate to cost savings for the organisation and the intangible benefit of increasing the likelihood of customer retention through a better user experience.

Another measure was the increase in the volume and value of sales emanating from the design and implementation of new features or the redesign of existing ones. Closely linked to this measure was the identification of an increase in the number of sales leads generated as a result of design and implementation of new features or redesign of existing ones. For these two measures, the interviewees acknowledged that that ROI was usually established for the entire project, not just the incorporation of UX design process. To resolve this, one suggestion given by an interviewee was to ascertain the gain the project as a whole brought to the organisation, then apportion it to each discipline involved in the project according to the number of hours worked.

4.7. Conclusion

This chapter presented the results of the interviews conducted with 33 participants from four case study organisations. For each case study organisation, the UX design process that was followed in the organisation was discussed, together with an identification of the UX design methods adopted by the organisation. This was followed by a discussion of how the organisations had reduced the overall duration of their UX design process. A description of how each organisation established ROI on UX design

was also highlighted. In chapter 5, I presented my analyses of the data collected from the interviews.

5. Analysis

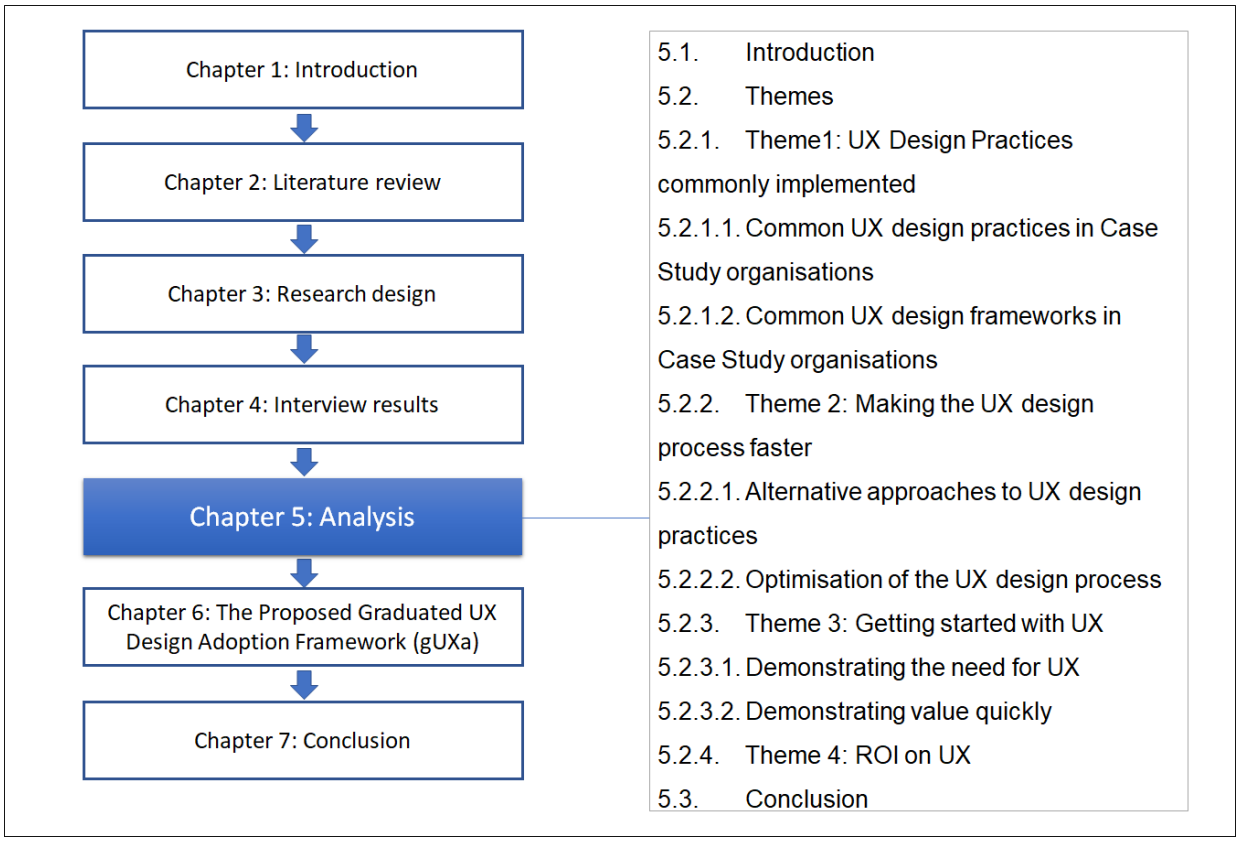

Figure 5.1: Outline of chapter 5

5.1. Introduction

The objective of this study was to propose a UX design process that could have the least possible impact on the total duration of project delivery and as a result, increase the adoption of UX design practices by organisations in South Africa. In section 3.4.2, I identified three steps as being necessary for achieving the research objective. The first step, understanding the current UX design processes followed by organisations in South Africa, is the subject of chapter 4. The second step is to identify ways through which the UX design process may be accelerated. The third step is to formulate a UX design process that meets the objective of the study. The focus of this chapter is the second step. In this chapter, I identified the common themes that emerged from the interviews and the literature review. The themes identified in this chapter were the basis upon which the proposed gUXa framework was built.

In section 3.4.5, I described the coding and elaboration process recommended by Terre Blanche *et al.* (2006). Figure 5.2 depicts the process of coding and elaboration that I followed to identify themes from interview data. Upon completing all the interviews, I listened to all the interview recordings and read the interview transcripts to familiarise myself with the responses. While listening to the interview recordings and reviewing the transcripts, I started identifying and documenting responses that I deemed to be useful for answering the main research question and sub-questions. I reviewed the interview transcripts multiple times, identifying and documenting the useful responses until there were no new insights from the interview transcripts. While deriving insights from the interview recordings and transcripts, I also read extant literature and documented relevant insights from them.

After deriving insights from interview recordings, transcripts and extant literature, I grouped similar insights into themes, using a bottom-up analysis approach. Based on

the insights from the interview recordings, transcripts and extant literature, I created the set of themes described in section 5.2, namely *UX design practices commonly implemented*, *Making the UX design process faster*, *Getting started with UX* and *ROI in UX*.

The final themes and sub-themes were the result of the analysis process described in this section, with gradual refinement. An example of gradual refinement is the process I followed to derive the theme *UX design practices commonly implemented,* which was not part of the first set of themes that I created. The first set of themes that I created included the two themes *Common UX design practices in case study organisations* and *Common UX design approaches in case study organisations.* After revising the interview recordings and transcripts multiple times, I decided to create the theme *UX design practices commonly implemented* and make it the main theme, reorganising the two initial themes into sub-themes. I decided to reorganise the themes in this manner because the themes *Common UX design practices in case study organisations* and *Common UX design approaches in case study organisations* are closely related, so I saw it fit to categorise them under one main theme.

I followed the same coding and elaboration process for all the data elicited from interview questions, including the follow-up questions.

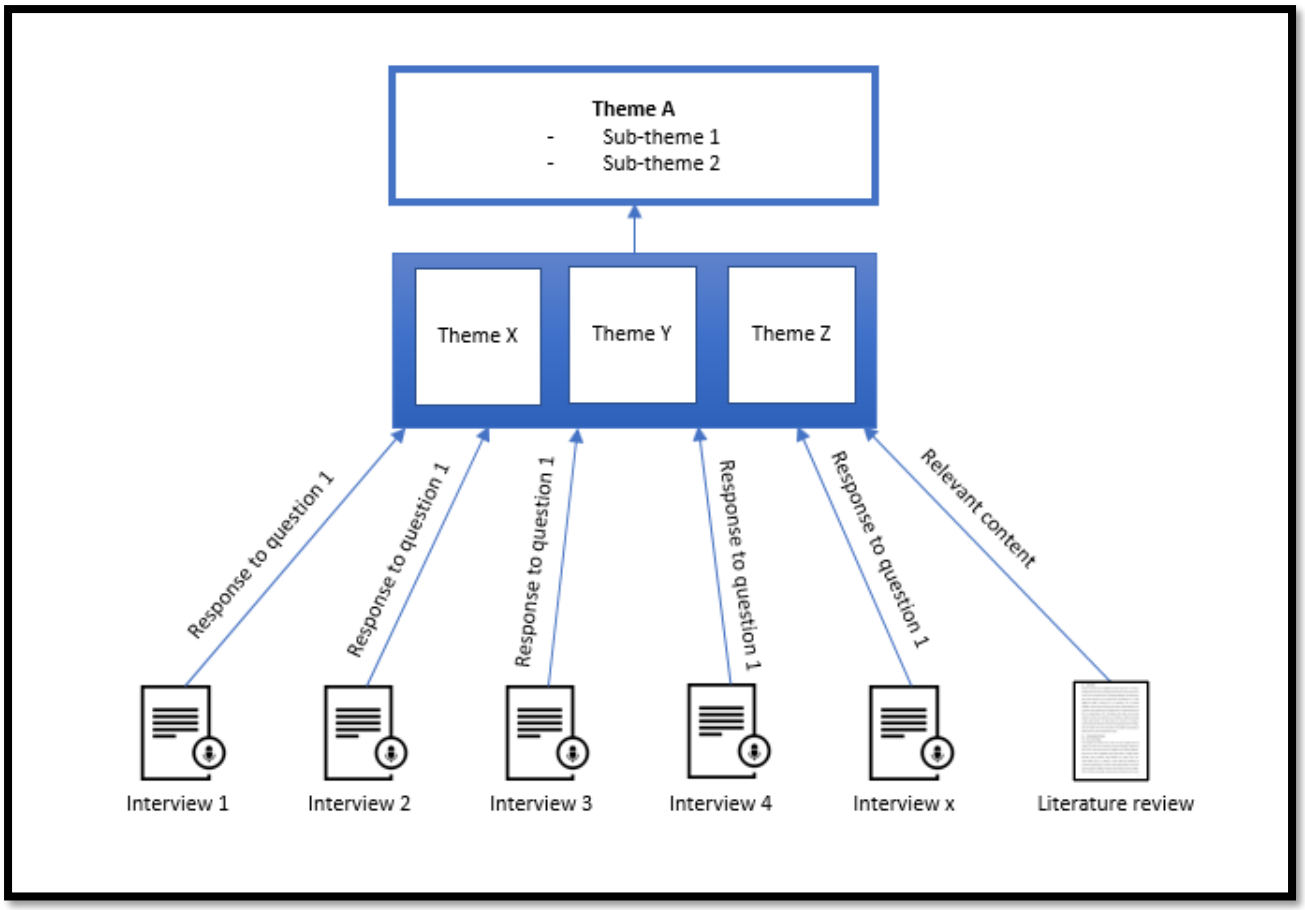

Figure 5.2: Summary of coding and elaboration process to derive themes

5.2. Themes

In line with the appropriate data collection strategy for this study, I conducted semi-structured interviews with UX design professionals at four case study organisations. The interview questions (see Appendix A) were linked to each of the research sub-questions identified in section 1.3. Through a process of coding, I identified four themes, namely *UX design practices commonly implemented*, *Making the UX design process faster*, *Getting started with UX* and *ROI in UX*. Figure 5.3 depicts the themes and sub-themes.

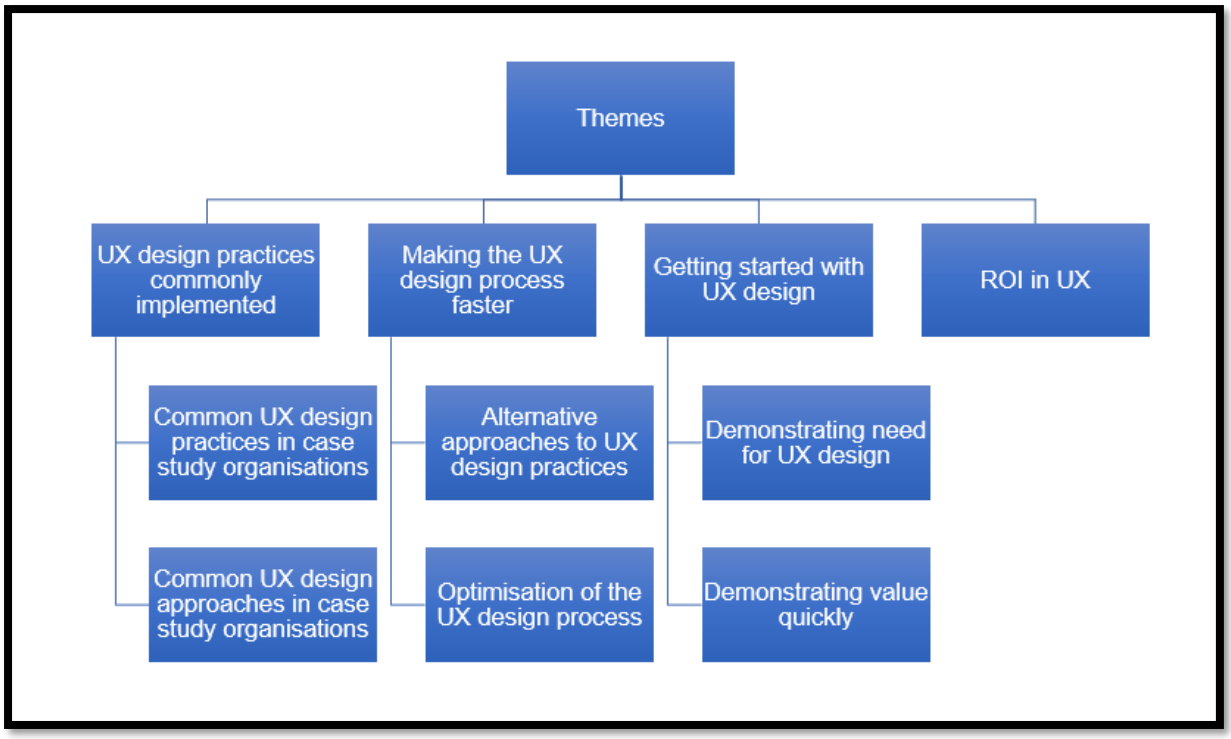

Figure 5.3: Summary of themes from analyses of interview results

5.2.1. Theme1: UX design practices commonly implemented

This theme is divided into two sub-themes, namely *Common UX design practices in Case Study organisations* and *Common UX design approaches in Case Study organisations*. The two sub-themes are described in the following sub-sections.

5.2.1.1. Common UX design practices in case study organisations

A theme arising from reviewing case study organisations' UX design processes is the set of UX design practices they have in common. Table 5.1 contains a list of all the practices identified from the interview data and an indication of which organisation applies a specific practice. Column 1 of Table 5.1 provides the UX design practice, columns 2 to 5 identify a case study organisation and indicate whether a specific UX design practice is followed in the organisation ('Yes') or not ('No'). Column 6 provides my categorisation of the 'level of importance' of a specific UX design practice, as described in the following paragraphs.

Table 5.1: Common UX design practices in case study organisations

UX Design Practice	Case Study A	Case Study B	Case Study C	Case Study D	UX Design Practice Categorisation
Problem statement definition	Yes	Yes	Yes	Yes	Non-negotiable
User research	No	Yes	Yes	No	Useful
Persona definition	Yes	Yes	Yes	Yes (proto personas)	Non-negotiable
Design research: Competitor Analysis	No	Yes	Yes	Yes	Important
Heuristic evaluation	No	Yes	No	No	Unimportant
User journey mapping	Yes	Yes	Yes	Yes	Non-negotiable
Concept testing	No	Yes	Yes	No	Useful
Low-fidelity prototyping	Yes	Yes	Yes	Yes	Non-negotiable
Usability testing	Yes	Yes	Yes	Yes	Non-negotiable
High-fidelity prototyping	Yes	Yes	Yes	Yes	Non-negotiable
Web analytics	Yes	No	Yes	No	Useful

To establish a rating of the importance of a particular practice relative to the other ones, I established four categories. Each category is based on the number of the case study organisations that have embedded the specific practice in their UX design process. Practices that are embedded in all four organisations' UX design processes are categorised as *non-negotiable*, whereas if they are implemented by three of the organisations, they are categorised as *important*. Where two of the four organisations have a specific practice embedded in their process, a rating of *useful* is assigned. Lastly, practices that are followed by only one organisation are categorised as *unimportant*. This categorisation was one of the criteria that informed the proposed gUXa framework.

5.2.1.2. Common UX design approaches in case study organisations

Each of the case study organisations based their processes on one or more international UX design approaches. Table 5.2 summarises the popularity of each UX design approach followed. Column 1 of Table 5.2 provides the UX design approach, columns 2 to 5 list each case study organisation, with an indication of whether a specific UX design approach is followed in the organisation ('Yes') or not ('No'). Column 6 provides my categorisation of the 'level of popularity' of a specific UX design approach.

To establish a rating scale for the popularity of each UX design approach relative to the other ones, I established four categories. Each category is based on how many of the case study organisations have adopted the approach in their organisation. UX design approaches adopted by all four organisations were *highly popular*, whereas if they were implemented by three of the organisations, they were *popular*. Where two of the four organisations have adopted the approach, a rating of *somewhat popular* was assigned. Lastly, UX design approaches adopted by only one organisation were

not popular. This categorisation was one of the criteria that informed the proposed framework.

Table 5.2: Common approaches followed by case study organisations

Approach	Case Study A	Case Study B	Case Study C	Case Study D	Application
Atomic Design	Yes	No	No	No	Not Popular
Design thinking	Yes	Yes	Yes	Yes	Highly Popular
Agile UX	Yes	Yes	Yes	Yes	Highly Popular
Lean UX	Yes	Yes	Yes	Yes	Highly Popular
Google Design Sprint	Yes	Yes	Yes	Yes	Highly Popular
Double Diamond	No	No	Yes	No	Not Popular

5.2.2. Theme 2: Making the UX design process faster

The second theme identified from the data was the set of measures taken by case study organisations to reduce the overall time taken to complete the UX design process. There are two sub-themes, namely *alternative approaches to UX design practices and optimisation of the UX design process*. The former sub-theme specifies ways through which specific UX design practices can be expedited, while the latter sub-theme specifies ways through which the entire process could be expedited.

5.2.2.1. Alternative approaches to UX design practices

Interview participants specified ways to reduce the duration of completing usability testing. The first measure was to limit the number of usability test participants to five, the smallest number that can yield accurate results (Nielsen & Landauer, 1993). This would shorten the amount of time taken to recruit participants, conduct the usability tests and compile a usability testing report, than in a scenario wherein more than five

participants are recruited. Another method that could speed up the design process involves the use of end users within the client organisation, that closely match the personas. This approach can eliminate the time that is spent to recruit end users from outside the organisation through an agency. To mitigate the risk of skewing usability test results, a screening process would be applied within the organisation to identify proxy users that closely match the end users, as defined in the personas.

Another measure was to conduct only one usability test instead of conducting multiple iterations. The usability test would be done using a low-fidelity prototypes and the results from the Usability Testing Report incorporated into the design of the high-fidelity prototype.

Another practice that could reduce the time spent on UX design process was the development of *proto personas* in place of personas. The *proto personas* are based on assumptions made by the UX design professionals and partly informed by data on user groups. Design teams from the case study organisations that create personas would typically conduct user research that will culminate in the development of these personas. Proto personas speed up persona creation by not relying on user research that can take months to complete. When creating proto personas, UX designers make assumptions about the user groups, then validate the assumptions with the business unit(s) that understand the users and their characteristics.

Lastly, usability testing can be conducted with participants whose characteristics do not necessarily match those of the personas. From the interview data, this practice has been applied in cases where no budget has been allocated for usability testing. While this can be viewed as ‘cutting corners’, interview participants that used this

approach to usability testing justified it by highlighting that they preferred usability testing with any user over no usability testing at all.

5.2.2.2. Optimisation of the UX design process

Interview participants identified measures that could improve the UX design process. In the context of this study, optimisation of UX design processes refers to any activity conducted with the objective of reducing the duration of the UX design process without compromising the quality of design artefacts such as prototypes.

The first approach that could be used to optimise the UX design process is the implementation of a Design System. Interview participants indicated that the presence of a repository of reusable GUI components that the Design team can draw from saves time as there is no need to *reinvent the wheel* during the definition of high-fidelity prototypes. Interview participants also highlighted that the presence of a repository of reusable GUI components reduces the likelihood of design inconsistencies in considerations such as button sizes and colours.

The splitting of work into a Design sprint and a Development sprint is a measure taken by all the case study organisations to accelerate the rate of delivery by project teams. In cases where both UX design and software development are performed in the same sprint, Design tends to be a bottleneck due to the number of iterations required. All case study organisations have restructured their processes to ensure that their Design team works at least one sprint ahead of the Development team. This measure has ensured that the UX design processes are not a bottleneck to the entire development process.

Organisations can embed flexibility into their UX design process, to enable teams to tailor design process to their design context. One way to achieve this is to impose

specific requirements on UX design teams in the initial iteration of a software development project, followed by a gradual loosening of the constraints. An example of this is to have two distinct UX design processes, one that is applied in the initial iteration of a project and a shortened one applied once a team starts working *optimally*, as determined by a Design governance body. Based on the interview results, Case Study C organisation was able to implement this approach successfully. Another way of achieving the gradual relaxation of constraints is to make certain practices compulsory only in the first iteration, following which teams have the flexibility to tailor the practice out of the process. An example of this is to mandate the design teams to conduct high-fidelity prototyping from when a cross-functional team starts working together until the end of the first software release. Once the project team has completed the first software release, the team as a collective would decide when it would be appropriate to stop developing high-fidelity prototypes. This measure would work in cases where software developers only need the initial detail found in high-fidelity prototypes in the initial stages of development to understand the design standards.

Yet another measure that may be useful for optimising the UX design process is to identify design activities that can be conducted in parallel and perform them in that manner. An example of this is the inclusion of UX Designers in meetings where Business Analysts elicit requirements. Including the UX Designers in the requirements elicitation meetings enables them to start prototyping earlier in the process, rather than waiting for user stories to be completed by Business Analysts.

Having an adequate number of UX design professionals enables a ‘division of labour’ that can expedite the process. One interview participant from Case Study D organisation identified the inadequate number of UX design professionals on a project

as the reason it took ‘too long’ to complete the process. The interviewee identified herself as a ‘Jack of all trades’ UX professional. To avoid a scenario in which software development projects are delayed because of an inadequate ‘division of labour’ Case Study C organisation divided UX-related responsibilities into distinct roles. Examples of the UX-related roles were UX Researcher, UX Designer, UX Copywriter and UI Designer. Such specialisation enabled different parts of the process to be completed in parallel, which in turn, reduced the overall duration of the UX design process.

The last measure to optimise the UX design process was continuous improvement and refinement of the process. Each case study organisation reviewed their UX design process periodically and with each improvement, new ways are found to save time.

5.2.3. Theme 3: getting started with UX

The third theme from the interview data pertains to the steps UX design advocates could take to convince resistant organisations of the benefits they stand to gain by adopting UX design practices. This section discusses two sub-themes arising from the data, namely *Demonstrating the need for UX and Demonstrating value quickly*.

5.2.3.1. Demonstrating the need for UX

During the interview process, participants shared principles from their experience with establishing a UX design competency in their organisation. From these participants and those who sell their respective organisations’ UX design services, a common first step was to convince sceptical organisations of the need for incorporating UX design in the development process. To achieve this, a heuristic evaluation of one of the organisation’s existing systems was carried out. This was followed by usability testing with users from the organisation’s target market. Results from the heuristic evaluation and usability testing often surprised the organisations’ decision-makers because they

were able to see ‘first-hand’ how users struggled with the organisation’s application. These two activities often put the organisations’ management in a position where they are open to listening to recommendations on how to improve their application.

Hence, heuristic evaluation and usability testing enable UX designers to demonstrate the need for incorporating UX design in the development processes of organisations that would have been resistant to it.

5.2.3.2. Demonstrating value quickly

Following the completion of heuristic evaluation and usability testing, an organisation’s management is usually open to the idea of implementing a pilot UX design process. Analysis of the interview data showed that UX design ‘champions’ typically conducted what is called ‘Discovery’, a process where UX design professionals conduct research and develop a low-fidelity prototype, followed by usability testing and the development of high-fidelity prototypes in the shortest possible time. A Discovery process often takes about five days, based on the Google Design Sprint approach. The Discovery process often leads organisations to a decision point regarding whether to make UX design practices a part of their development process and in many cases, they do.

Interview participants with experience in setting up a UX design competency or selling UX design services followed similar steps, namely, demonstrating the need for UX followed by demonstrating value quickly.

5.2.4. Theme 4: ROI in UX

Based on my analysis of the interview data, interview participants identified four metrics that could be used to measure ROI in UX. The metrics are (i) the Net Promoter Score improvement, (ii) reduction in the drop-off rate, (iii) percentage increase in sales and (iv) cost savings from ideas that are invalidated by concept testing.

It should be noted that none of the case study organisations calculated ROI on UX design, but they used metrics that are typically used to measure ROI in UX design, to calculate ROI in an entire software development project. The above-mentioned metrics were incorporated in a business case document, together with other metrics that are used to establish the ROI of a software development project, such as Net Present Value. This means that in practice, none of the case study organisations separated UX design from other project roles in the calculation of ROI. This is counter-intuitive, given the number of UX professionals in each of the case study organisations. An apparent continued recruitment of UX design professionals suggests that there was an implicit understanding of the value that UX design brought to the organisations.

5.3. Conclusion

This chapter provides the discussions of the themes that emanated from my analyses of the interview data. Four main themes were identified, namely (i) *UX design practices commonly implemented,* (ii) *Making the UX design process faster,* (iii) *Getting started with UX and* (iv) *ROI on UX*. The first three themes have sub-themes, while the ROI on UX theme does not. The themes identified in this chapter were used as input to the proposed gUXa framework.

6. The Proposed Graduated UX Design Adoption Framework (gUXa)

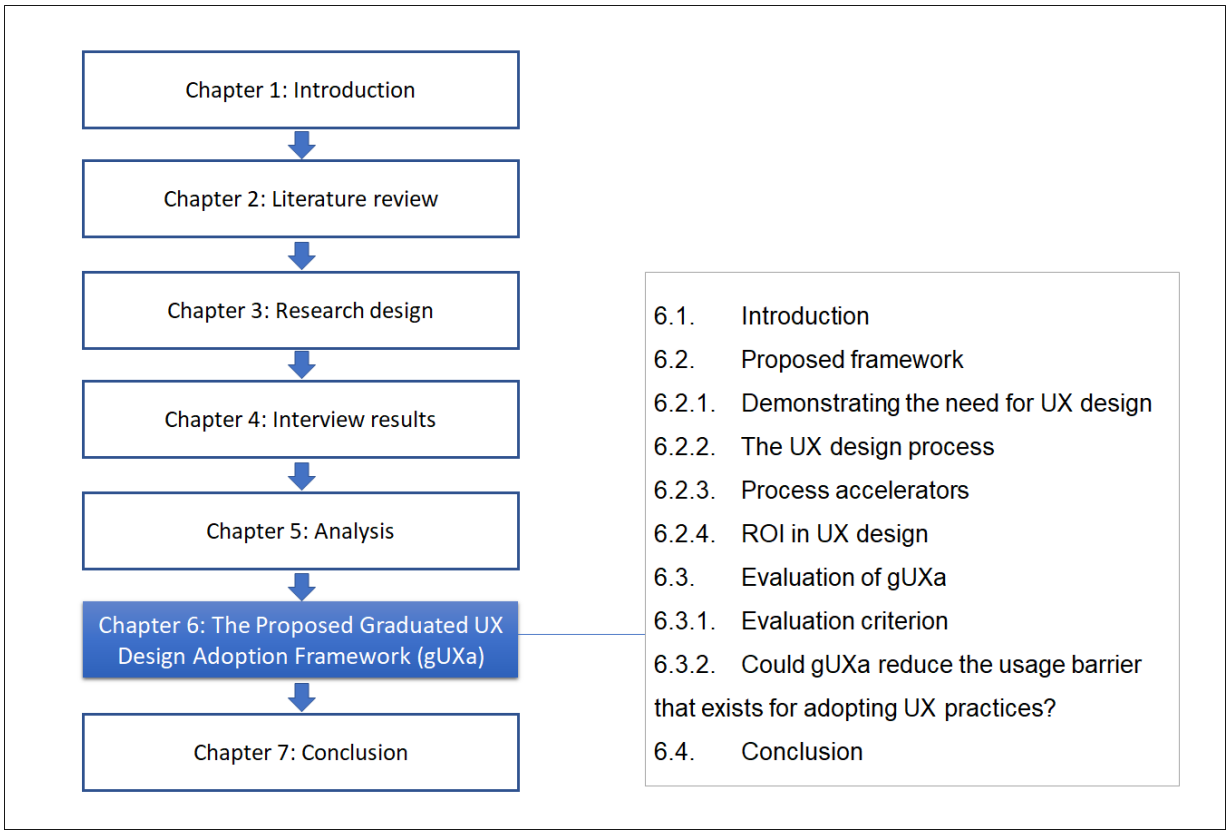

Figure 6.1: Outline of chapter 6

6.1. Introduction

In section 1.6, I stipulated the output of this study to be a UX design framework geared towards minimising the impact of UX design activities on the total duration of software development projects. The focus of this chapter is to present the proposed Graduated UX Design Adoption (gUXa) framework. In section 6.2, each component of gUXa is described in detail. Section 6.3 contains an assessment of whether the framework achieves its objective.

6.2. Proposed framework

The framework that emanates from this study, the Graduated UX Design Adoption (gUXa) framework, illustrated in Figure 6.2, consists of four components. They are (i) *Demonstrating the need for UX design*, (ii) *UX design process*, (iii) *Process Accelerators* and (iv) *ROI in UX design*. Each component of gUXa is predicated on the themes identified in section 5.2.

As stated in section 3.3, one of the ways in which the IRT was applied in this research is that it served as the guiding principle for the proposed gUXa framework. The guiding principle was that the proposed framework should be geared towards reducing the usage barrier to the adoption of UX practices in South African organisations. According to the IRT, reducing the barrier to innovations results in a decrease in the level of resistance to the innovation which in turn, increases the likelihood of adoption (Kleijnen *et al.*, 2009). The descriptions of each component of the gUXa framework are provided in sections 6.2.1 to 6.2.4.

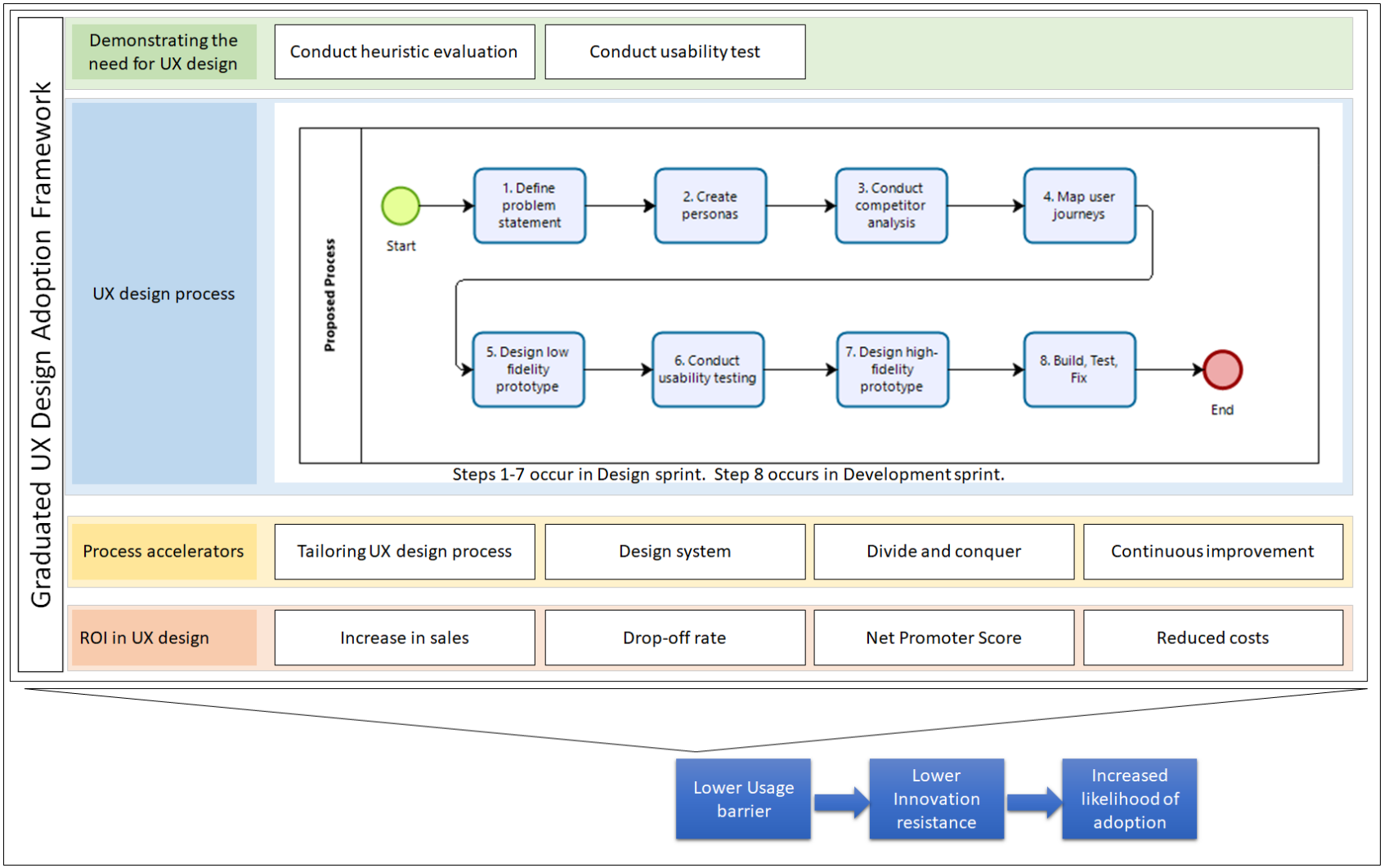

Figure 6.2: The proposed gUXa framework

6.2.1. Demonstrating the need for UX design

In section 5.2.3 two activities emerged as being pivotal for convincing an organisation to adopt UX design practices. The first activity is a heuristic evaluation, which enables UX designers to identify areas of improvement in existing application(s) in a quick and cost-effective manner (Nielsen, 1994).

The aim of the second activity, usability testing, is to demonstrate the difficulties that users encounter while completing tasks on existing application(s). Results obtained from this study showed that decision-makers were more willing to support the incorporation of UX design into their organisation's development process when they saw, first-hand, how users struggled when using the organisation's application.

Based on evidence from the research results, heuristic evaluation and usability testing with five users are proposed as the first steps to demonstrate the need for the incorporation of UX design in an organisation's development process. If an organisation's decision-makers are resistant to the adoption of a full UX design process, they may be open to the application of the two steps, namely heuristic evaluation and usability testing. This is the first way in which the usage barrier is reduced.

6.2.2. The UX design process

The proposed UX design process incorporates principles from the Agile UX, Lean UX and Google Design Sprint approaches. In line with the Agile UX and Google Design Sprint approaches, the proposed process has two separate sprints, namely a Design sprint and a Development sprint.

The design sprint entails the first seven steps of the UX design process:

- Define problem statement;

- create personas;
- conduct competitor analysis;
- map user journeys;
- design low-fidelity prototype;
- design high-fidelity prototype,
- conduct usability testing.

Based on results from this study, each of these design sprints should be two weeks long.

The actual development of the software takes place during the development sprint (Build, Test, Fix), based on the outputs of the design sprint. This is followed by testing and refinement of the software, based on testing results. Based on results from this study, the development sprint should be two weeks long.

In line with the Agile UX principle, the Design sprint should occur one sprint ahead of the Development sprint (Kuusinen & Väänänen-Vainio-Mattila, 2012). Based on the Lean UX approach, the principle of rapid, iterative paper prototyping should be applied during the development of low fidelity prototypes, step 5 of the UX design process.

The proposed UX design process is illustrated as a component of gUXa framework (see Figure 6.2). Table 6.1 provides a narrative of each step, the outputs from each step, and guidelines for the completion of each step in a timely manner.

Table 6.1: Process steps for the gUXa framework

Step No.	UX design process step	Process step description and guidelines for completing step in a timely manner	Step output
1	Problem statement definition	In the first step, a Business Analyst facilitates a workshop with representatives(s) of the business unit paying for the project, to define the problem statement. The UX Designer is included in the workshop. UX designers should be part of the problem statement definition process, rather than receiving problem statements that have been defined by a Business Analyst. Involving UX designers in the problem statement definition will ensure that they can validate the problem statement while it is being defined, rather than afterwards. The output of this step is a problem statement.	Problem statement
2	Create personas	In this step, the UX Researcher identifies the characteristics of target user groups by conducting interviews with a sample of end users recruited through an agency. The UX Researcher creates personas by identifying themes from interview data related to characteristics such as typical daily routines, age range and needs of each target user group. To shorten the duration of persona creation, the UX Researcher can use proto personas as is commonly practiced among the case study organisations. UX Researchers can also reuse personas that were created by other project teams solving a similar design problem within the past six months or other timeframe determined by the UX Researchers. The output of this step is a set of personas that match the target users of the proposed application.	Personas that match the target users of the proposed application

3	Competitor Analysis	In this step, the UX Researcher and UX Designer review solutions that were implemented by competitor organisations for solving similar problems. The output of this step is a competitor analysis report.	Competitor analysis report
4	User journey mapping	In this step, the UX Researcher and UX Designer co-facilitate a brainstorming workshop to define the desired user journey. The workshop participants are representatives of the business unit paying for the project and representatives of the business unit responsible for the customer experience. The output of this step is a 'To-be' user journey map.	'To-be' user journey map
5	Low-fidelity prototyping	In this step, UX Designers conduct rapid, iterative paper prototyping of the solution in line with Lean UX principles. The creation of paper prototype should start during the Competitor Analysis step. The output of this step is a low-fidelity prototype.	Low-fidelity prototype
6	Usability testing	In this step, the UX Researcher conducts usability testing with five participants. Previous studies, such as Nielsen and Landauer (1993) have shown that usability testing with five is sufficient to identify the majority of usability problems, irrespective of the type of application (web site, computer-based or mobile applications, etc.). The profile of usability testing participants should be aligned with the personas that were created during step two of the UX design process. The output of this step is a usability testing report.	Usability testing report
7	High-fidelity prototyping	In this step, the UI Designer adds more detail to the low-fidelity prototype by applying the organisation's design standards on screen elements such as colour schemes, button sizes and font sizes. The UI Designer also refines the text on labels and other objects on each page, to align with the organisation's standards. To expedite high-fidelity prototyping, an organisation can implement a design system	High-fidelity prototype

		so that UI Designers have a set of reusable components they can choose from. The output of this step is a high-fidelity prototype.	
8	Build, Test, Fix	In this step, the software is developed, tested for accuracy, then refined. Steps 1-7 occur in a 2-week Design sprint, while the Build, Test, Fix step occurs in a 2-week Development sprint. The output of this step is functioning software.	Functioning software

6.2.3. Process accelerators

The third component of the gUXa framework is a set of Process Accelerators. Process Accelerators are the measures that if taken, could reduce the time taken to execute the proposed UX design process.

The first accelerator is the tailoring of the UX design process to an organisation's needs. One way to tailor the process is for a design team to identify activities that could be carried out concurrently and execute those activities in parallel, to expedite the process. Tailoring the process also could also take the form of reducing the number of UX design steps a team chooses to complete. One way that the number of the UX design process steps can be reduced is by removing the development of high-fidelity prototypes from the full UX design process. Omitting high-fidelity prototypes is based on the premise that as software developers grow in experience working within the proposed process, they reach a stage where they understand the organisation's design standards so well, that they only need low-fidelity prototypes from UX designers. However, omitting high-fidelity prototypes from the process is only recommended once a project team has completed at least one release of a software, not for newly-formed project teams. As such, a project team should be able to tailor the gUXa framework to fit with their context and exclude steps that are deemed unnecessary, such as high-fidelity prototypes.

The second accelerator is the use of a 'design system' which is a repository of reusable GUI components that the design team can use. A design system saves time as there will be no need to 'reinvent the wheel' during definition of both low- and high-fidelity prototypes.

The third accelerator is to 'divide and conquer' the design work. This refers to assigning a selection of specialist UX design professionals, such as a UX Researcher, UX Designer, Service Designer, UX Copywriter and UI Designer on one project. In cases where the 'divide and conquer' accelerator is applied, each specialist is responsible for a part of the design effort. The result is a division of labour that expedites the design process by facilitating the execution of some activities in parallel. The antithesis of the 'divide and conquer' accelerator is the 'Jack of all trades' UX designer as pointed out in section 5.2.2.2. A 'Jack of all trades' UX designer has a limited capacity to execute activities concurrently but assigning specialists to specific activities expedites the delivery. A notable disadvantage of the 'divide and conquer' accelerator is that it is only feasible for application within organisations that can afford to pay for multiple UX design professionals, which may limit its applicability.

The last accelerator is the continuous improvement and refinement of the UX design process. This entails reviewing the UX design process periodically and with each review, finding and implementing new ways to save time. Within Case Study C, there was a team of UX design process custodians whose role was to review the process periodically. By reviewing project Lessons Learnt logs and investigating international best practices, the process custodians constantly identified ways to optimise the organisation's UX design process. This is a practical way to continuously improve the process.

6.2.4. ROI in UX design

In section 2.4, I noted the scepticism that exists among researchers, over calculations of ROI on UX. The primary source of contention is the creation of a causal relationship between UX practices and ROI metrics while omitting other contributing factors to

those metrics (Rosenberg, 2004). The fact that none of the case study organisations calculated ROI in UX furthers the scepticism. In section 5.2.4 I specified that all four case studies calculated ROI on entire projects, not on UX design only. With this in mind, the gUXa ROI metrics are included in the project's business case rather than a separate calculation that singles out UX design. The metrics to be included are Net Promoter Score improvement, reduction in the drop-off rate, percentage increase in sales and percentage cost reduction.

6.3. Evaluation of gUXa

6.3.1. Evaluation criterion

In section 3.3, I specified that the IRT would be useful to this study in three ways. Firstly, the theory provided a research-based explanation of the reasons why the duration of UX design can result in a low adoption rate of UX design practices, as highlighted by Pretorius *et al.* (2015) and Brosens (2017). Secondly, the theory provides the basis upon which the proposed gUXa framework was formulated. More specifically, the framework was formulated with the goal of reducing the size of the usage barrier to the adoption of UX design. Lastly, the theory provided the criterion for evaluating the proposed framework. In this section, the gUXa framework was evaluated using the IRT.

According to the IRT, the size of a barrier to innovation influences the level of resistance to that innovation (Ram & Sheth, 1989). The higher the size of the barrier to innovation (independent variable), the higher the innovation resistance (dependent variable) and vice versa (Ram & Sheth, 1989). Figure 6.3 depicts this relationship. An appropriate evaluation criterion for the gUXa framework was to determine its impact on the independent variable, the usage barrier. The evaluative question for the

framework was therefore, *could the gUXa framework reduce the usage barrier that exists for adopting UX design practices?*

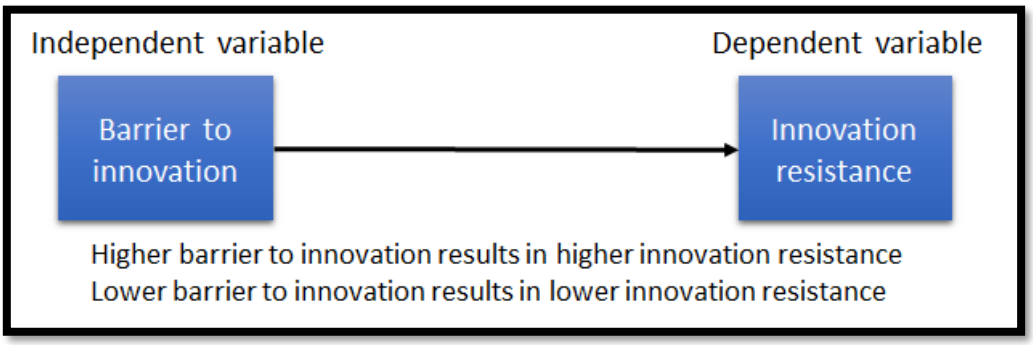

Figure 6.3: Relationship between barrier to innovation and innovation resistance

6.3.2. Could gUXa reduce the usage barrier that exists for adopting UX practices?

One of the main reasons the adoption rate of UX design practices is low in South Africa is the perception that incorporating UX design would unnecessarily prolong software development projects (Pretorius *et al.*, 2015). Each component of the gUXa framework was formulated with the goal of reducing this usage barrier, thereby reducing the level of innovation resistance. Figure 6.4 depicts the impact of the gUXa framework on the usage barrier and Table 6.2 describes the impact. The first column on Table 6.2 identifies the component of gUXa framework and the second column contains descriptions of the impact of the components on the usage barrier.

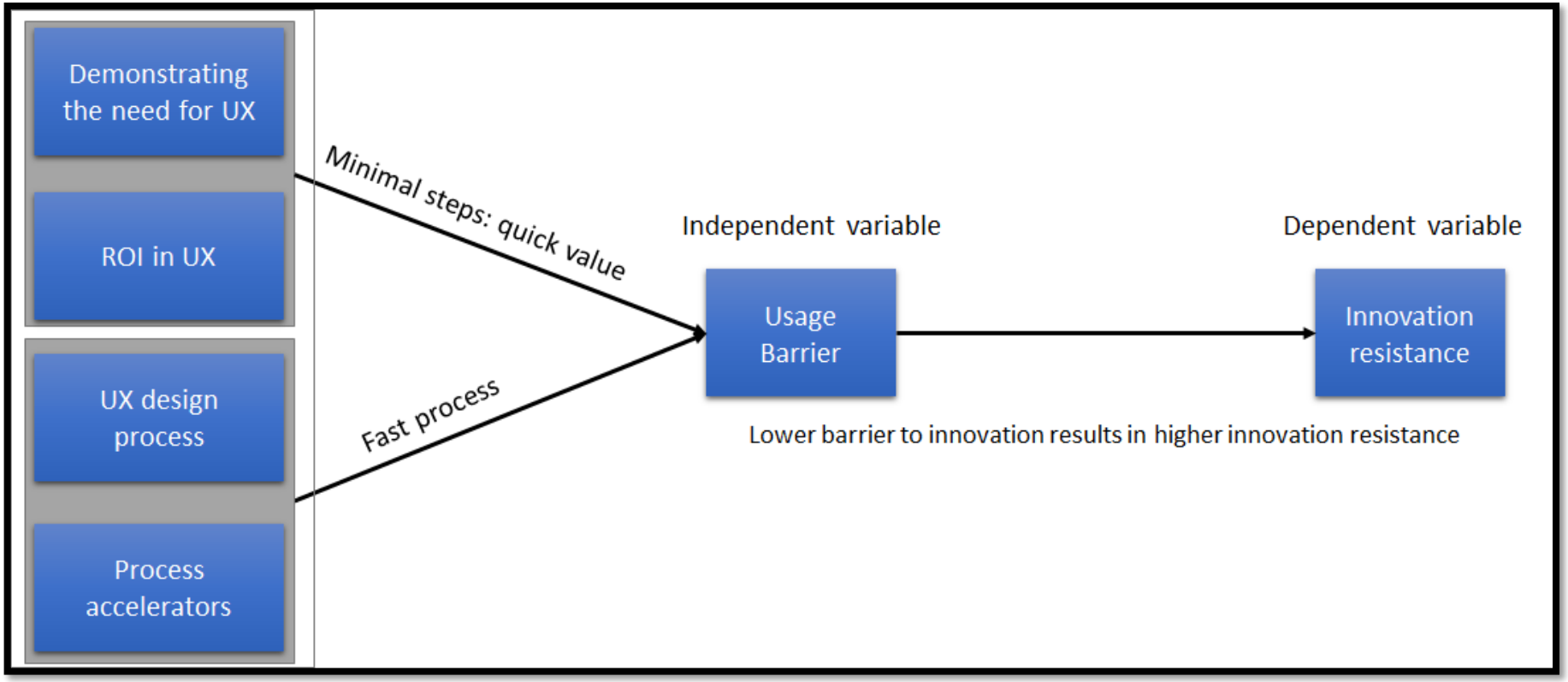

Figure 6.4: Impact of gUXa on usage barrier

Table 6.2: Impact of each gUXa component on the usage barrier

Component	Impact on usage barrier
Demonstrating the need for UX	Demonstrating the need for the incorporation of UX design process entails evaluating existing systems using heuristic evaluation and usability testing. A heuristic evaluation identifies potential improvements to an application and a usability test demonstrates the difficulty users face using an organisation's application. These two steps take a much shorter duration than completing an entire UX design process, which reduces the usage barrier because the UX designers would limit the UX design process steps to two activities.
ROI in UX	As part of presenting the usability testing report and potential improvements, UX designers would also present the relevant benefits to the organisations in the form of ROI measures documented as part of a business case. Establishing the potential ROI that the organisation stands to benefit would likely increase the likelihood of decision-makers providing the necessary support for the implementation of a full UX design process.
UX design process	Application of the UX design process coupled with relevant process accelerators would likely lead to faster delivery. A fast delivery cycle that demonstrates the speed with which the design team could deliver designs is likely to reduce the usage barrier, therefore increasing the likelihood of adopting UX design practices.
Process accelerators	

Based on the impact that each component of the gUXa framework is likely to have on the usage barrier, the cumulative impact is likely to be a reduction in the usage barrier. Hence, based on the preceding discussions, I have shown the ability of that the gUXa framework to reduce the usage barrier that exists for adopting UX design practices.

6.4. Conclusion

In this chapter I introduced and described the Graduated UX Design Adoption (gUXa) framework. The framework is based on the results of the interview data as well as existing literature. The chapter also provided a detailed description of each component of the gUXa framework. Finally, I demonstrated the ability of the framework to reduce the usage barrier to the adoption of UX design into systems development processes.

7. Conclusion

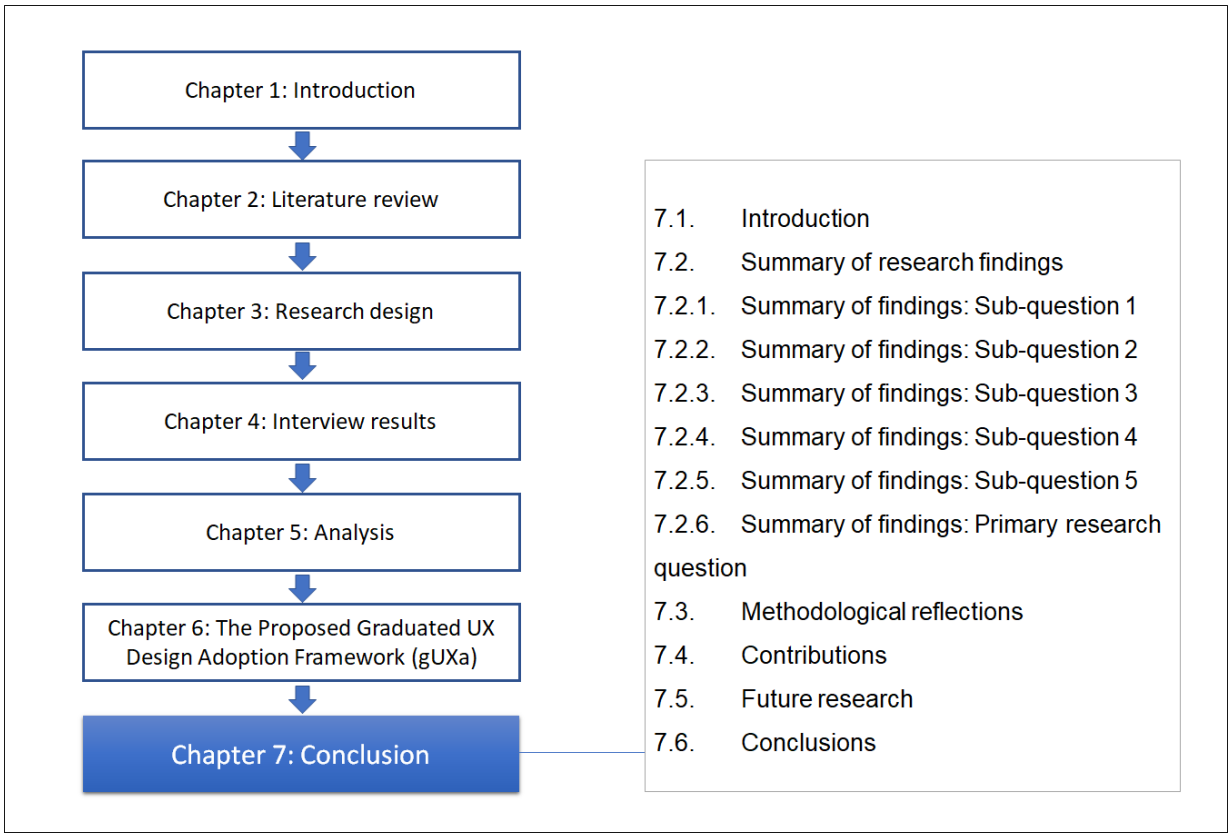

Figure 7.1: Outline of chapter 7

7.1. Introduction

The purpose of this chapter is to summarise the research findings, reflect on the research methodology, discuss this study's contribution to the HCI body of knowledge and identify future research areas.

This dissertation consists of seven chapters and a set of appendices. Chapter 1 is an introduction to the study, which provides context to the research, the objective of the study and an overview of the content in the rest of the dissertation. Chapter 2 contains a description of UX design, a review of prominent UX design approaches and a discussion of ROI in UX design. In Chapter 3, the Innovation Resistance Theory was described and its relevance to the study specified, following which the research methodology was discussed. Chapter 4 provided a summary of the collected data from the case studies, following which an analysis of the collected data was provided in Chapter 5. Chapter 6 contains a description of the proposed framework, gUXa. Chapter 7 is the conclusion of the dissertation.

7.2. Summary of research findings

The objective of this study was to formulate a UX design framework that could enable organisations to complete UX design activities with the least amount of impact on the speed of delivering systems development projects. The study was conducted using literature review and four case studies, the latter being organisations that have embedded UX design processes into their systems development processes.

The first focus of the literature review was to discuss user-centred design and UX design practices. The second aspect of the literature review was a discussion of prominent UX design approaches including Agile UX, Lean UX, Design thinking, Google design sprint, Double diamond, Atomic design and Web analytics. The last

aspect the literature review focused on was understanding ROI in UX and how it is measured.

The analysis of data from the literature and data from case studies combined the practices from the prominent UX design approaches identified in existing literature with practices implemented in the case study organisations. The analysis culminated in the formulation of a framework with a proposed UX design process, graduated adoption approach and proposed ROI measurements.

Five sub-questions were formulated to answer the main research question.

7.2.1. Summary of findings: sub-question 1

Sub-question 1: "Which UX design practices are predominantly used by UX practitioners in South African organisations?"

The goal of the first sub-question was to understand the UX design practices adopted by UX professionals in South Africa. This was done by interviewing 33 participants from four case study organisations. Based on the themes from interviews, discussed in section 5.2.1, the predominantly used practices are problem statement definition, user research, persona definition, competitor analysis, user journey mapping, concept testing, prototyping, usability testing and web analytics.

7.2.2. Summary of findings: sub-question 2

Sub-question 2: "How do organisations in South Africa incorporate UX design practices into their systems development processes?"

The goal of the second sub-question was to understand how organisations in South Africa incorporate UX design practices into their systems development processes.

This was done by interviewing 33 participants from four case study organisations. As discussed in section 5.2.2.2, all the four case study organisations implemented a design sprint, where UX activities were carried out, and a development sprint in which the application was developed, tested and refined. The design sprint occurred ahead of the development sprint because software developers used the outputs delivered by the design team. The prominent UX design approaches discussed in the literature review also follow a similar pattern, where the UX design activities are part of a separate sprint from the development activities.

7.2.3. Summary of findings: sub-question 3

Sub-question 3: "How can return on investment (ROI) in UX practices be measured?"

The goal of the third sub-question was to understand the ROI metrics applied for UX design. The data to answer this question was extracted from a literature review and from interviews conducted with 33 participants from four case study organisations. The literature review showed that there is a high level of scepticism around measurement of ROI in UX, mainly due to the difficultly of establishing the causality between incorporating UX design and the ROI (Rosenberg, 2004). The main source of scepticism is that the metrics for measuring ROI in UX tend to ignore other factors that contribute to the ROI measurement. From the case study organisations, the key finding was that the organisations did not establish ROI in UX in isolation as a discipline, but on a project in its entirety.

7.2.4. Summary of findings: sub-question 4

Sub-question 4: "What emerging UX design practices are currently not being used by organisations in South Africa?"

The goal of the fourth sub-question was to identify optimisation opportunities for UX design processes elicited from the case studies, based on UX design approaches and practices identified in the literature review. The UX design practices identified in the literature but not currently being used by case study organisations were identified in section 5.2.1.1, together with practices that were being used. Heuristic evaluation is the notable UX design practice that was not commonly used by case study organisations. The prominent UX design approaches identified in the literature but not being applied by case study organisations were identified in section 5.2.1.2, together with approaches that were being applied within the case study organisations. The Atomic design and Double diamond approaches are the prominent approaches that were not commonly used by case study organisations.

7.2.5. Summary of findings: sub-question 5

Sub-question 5: "What combination of UX design practices and sequence of UX design practices can enable organisations in South Africa to incorporate UX design in the software development process without compromising the speed of project delivery?"

The goal of the fifth sub-question was to formulate a framework that could enable an organisation to implement UX design practices without negatively impacting the speed of delivery on software development projects. The framework, Graduated User Experience Adoption, was developed based on key themes from collected data, that

took into account existing practices and optimisation opportunities identified in existing literature and case study organisations. The gUXa framework proposes a graduated approach to UX design adoption, starting with two UX design practices, namely heuristic evaluation and usability testing. The second component of gUXa is a UX design process that separates design activities and software development activities into a design sprint and a development sprint, respectively. The UX design practices in the design sprint include problem statement definition, persona creation, competitor analysis, user journey mapping, low- and high-fidelity prototyping and usability testing. The development sprint includes the programming, testing and refinement of software. The gUXa framework also identifies a set of process accelerators that include tailoring the process, the use of a design system, a division of labour and continuous improvement of the UX design process. Lastly, the framework specifies measures for calculating ROI in UX that should be included in a project's business case, including the increase in sales, drop-off rate, Net Promoter Score and reduced costs. Section 6.2 contains a detailed description of the framework.

7.2.6. Summary of findings: primary research question

Research question: "How can the user experience design process be optimised, so that it has the least amount of impact on the speed of delivery of systems development projects?"

Each of the five sub-questions contributed to answering the primary research question.

Sub-question 1 enabled the identification of UX design practices that were commonly applied in the case study organisations. These UX design practices provided a starting point from which optimisation opportunities could be investigated.

Sub-question 2 prompted the investigation of how case study organisations incorporated UX design practices into their systems development processes. Establishing how UX design was incorporated into software development processes enabled the identification of an approach used by all four case studies, namely the distinction between a design sprint and a development sprint. The distinction between a design sprint and development sprint serves to enable the delivery of UX design with minimal impact on the speed of delivery of systems development projects. The separation of design sprints and development sprints is a key component of the gUXa framework.

Sub-question 3 prompted the investigation of ROI measures for UX design, how ROI in UX was measured by organisations as identified in the literature review and lastly, how ROI in UX was measured within case study organisations. Four ROI measurements were incorporated in the gUXa framework as a means to persuade decision-makers to incorporate UX design practices into software development projects.

Sub-question 4 enabled the identification of opportunities for optimising the case study organisations' UX design processes. Emerging UX design practices and approaches were a key consideration in formulating the gUXa framework.

Sub-question 5 prompted the formulation of the gUXa framework. The framework considered the findings from sub-questions 1 to 5, culminating in a UX design process that could have the least amount of impact on the speed of delivery of systems development projects.

7.3. Methodological reflections

In this section, I reviewed the research design.

The objective of this study was to formulate a UX design framework that will enable South African organisations to implement UX design with the least possible impact on the duration of software development projects. The study lends itself to the application of an interpretive paradigm because data needed to be collected from individuals who by nature, may have different perspectives on the same question. Given that I needed to understand the UX design process followed by four organisations, the appropriate research strategy was a multiple case study, with semi-structured interviews being the data collection strategy of choice. I found the methodology followed to be appropriate, given that the data collected enabled me to fulfil the research objective.

7.4. Contribution

The main contribution of this study was the Graduated UX Design Adoption (gUXa) framework for adopting UX design with the least possible impact on the duration of systems development projects. The practical contribution of the study was that organisations that wish to consider embedding UX design into their systems development processes will have a research-based framework they can refer to and tailor to suit their specific needs. The framework was validated using the IRT as being able to reduce the usage barrier to resistance, through its graduated approach.

7.5. Future research

In this dissertation, the gUXa framework was evaluated based on a theory, namely the Innovation Resistance Theory. An opportunity for future research is to implement the gUXa framework to test its ability to enable South African organisations to implement

UX design with the least possible impact on the duration of software development projects.

One of the key findings from the study was that all case studies did not calculate ROI on UX alone, but ROI on a project. This supports the scepticism by Rosenberg (2004) around measurement of ROI in UX. While it was useful to establish that all four case studies did not calculate ROI in UX alone, an opportunity for future research is to investigate the calculation of ROI across a larger sample size. This could take the form of a quantitative study that examines organisations from different industries.

7.6. Conclusion

In this dissertation, a new framework for adopting UX design practices was formulated. The gUXa framework addresses the study's main objective of a UX design framework that has the least impact on the duration of software development projects. The framework was developed based on existing literature and the results obtained from the data collected from four case study organisations. In this chapter, a summary of the study was provided, including the research findings, methodological reflections, contributions and future research.

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Appendix A: Interview questions

Questions linked to Sub-questions 1 and 2

- What UX design practices are used within your organisation?
- How long does it typically take to complete each of the UX practice?
- On the list provided to you, please indicate the UX practices you currently use in your organisation. Name any practices you use but are not listed, bearing in mind the following examples:
    - Agile UX
    - Lean UX
    - Web Analytics
    - Design Thinking

Questions linked to Sub-question 3

- What outputs (documentation or other deliverables) do UX professionals in your organisation deliver?
- What kind of information is packaged in each of the deliverables?
- How do you attain the information you need for the deliverables (the techniques you use)?
- Can you describe the SDLC process followed in your organisation and highlight when the UX deliverables are produced?

Question linked to Sub-question 4

- In your organisation, how is return on investment (ROI) measured on UX design practices?

Questions linked to Sub-question 5

- In your opinion, what do you think would make the UX design process shorter?
- What new UX practices would you introduce to your team to improve your design process?
- Why are you not currently using these new practices?
- How would you go about introducing the new practices to your team?

Closing Question:

- Is there any information that you wish to provide?

Appendix B: Combined letter of introduction and informed consent

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Economic and Management Sciences

Letter of Introduction and Informed Consent

Dept. of Informatics

Optimizing the time spent on user experience design during the systems development process.

Research conducted by:
Mr. T.N. Chawana (16251360)
Cell: 076 107 8985

Dear Participant

You are invited to participate in an academic research study conducted by Trevor Ngonidzashe Chawana, Masters' student from the Department Informatics at the University of Pretoria.

The aim of this study is to propose a UX design process that will have the least possible impact on the total duration of project delivery and as a result, increase adoption of UX design practices by organizations in South Africa.

Please note the following:

- The answers you give in the interview(s) will be treated as strictly confidential as you cannot be identified in person based on the answers you give.
- Your participation in this study is very important to us. You may, however, choose not to participate and you may also stop participating at any time without any negative consequences.
- Please answer the questions in the interview as completely and honestly as possible.
- The results of the study will be used for academic purposes only and may be published in an academic journal. We will provide you with a summary of our findings on request.
- Please contact my study leader, Dr Funmi Adebesin on funmi.adebesin@up.ac.za if you have any questions or comments regarding the study.

In research of this nature the study leader may wish to contact respondents to verify the authenticity of data gathered by the researcher. It is understood that any personal contact details that you may provide will be used only for this purpose and will not compromise your anonymity or the confidentiality of your participation.

Please sign the form to indicate that:

- You have read and understand the information provided above.
- You give your consent to participate in the study on a voluntary basis.

_____ _____

Participant's signature **Date**

Appendix C: Ethical clearance certificate

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

RESEARCH ETHICS COMMITTEE

Faculty of Economic and Management Sciences

Approval Certificate

23 October 2019

Mr TN Chawana
Departement: External department

Dear Mr TN Chawana

The application for ethical clearance for the research project described below served before this committee on:

Protocol No:	EMS192/19
Principal researcher:	Mr TN Chawana
Research title:	Optimising the user experience design process for timeous systems development: a South African case study.
Student/Staff No:	16251360
Degree:	Masters
Supervisor/Promoter:	Dr TF Adebesin
Department:	External department

The decision by the committee is reflected below:

Decision:	Recommendation Set
Conditions (if applicable):	
Period of approval:	2019-11-01 - 2020-02-29

The approval is subject to the researcher abiding by the principles and parameters set out in the application and research proposal in the actual execution of the research. The approval does not imply that the researcher is relieved of any accountability in terms of the Codes of Research Ethics of the University of Pretoria if action is taken beyond the approved proposal. If during the course of the research it becomes apparent that the nature and/or extent of the research deviates significantly from the original proposal, a new application for ethics clearance must be submitted for review.

We wish you success with the project.

Sincerely

pp PROF JA NEL
CHAIR: COMMITTEE FOR RESEARCH ETHICS