Identification of integration mechanisms that influence digital platform design choices: a longitudinal study

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Abstract

The current literature gives a strong outline to conceptualise the characteristics of the design of a digital platform. This includes the design strategy, design features and value creation as the primary considerations. These interconnected domains provide a powerful lens to design choices that a contemporary organisation would need to contemplate. However, there is limited attention to conceptualising the mechanisms to explain how a digital platform's layers integrate. Adopting a critical realist philosophy, research was conducted into how HPE Financial Services (HPEFS) designed and deployed a digital platform to grow the business. The in-depth study was conducted as a seven-year longitudinal study and applied the theoretical generative mechanism model from Henfridsson and Bygstad's (2013) seminal paper.

The study contributes to the digital platform literature in a number of ways. The results of the study provide a detailed description of three platform integration mechanisms to explain integration at the architectural level between layers – (1) Capability Appropriation, (2) Layer Complementarity and (3) Value Hybridisation. Digital platform integration mechanisms can explain the inherent properties of design choices that, in turn, influence the digital design and the subsequent value creation outcomes. The study has proven that causal structures exist that can act, in context, on design choices an organisation may make on its digital platform (Pawson & Tilley, 1997). These causal mechanisms, when actualised, will explain the observable outcomes or events to demonstrate their alignment to the seminal work of Henfridsson and Bygstad (2013).

From here, they are embedded into a conceptual framework and digital platform design model that outlines the cause-and-effect relationship to explain and theorise what an organisation will experience when designing a digital platform.

These are accompanied by a third contribution, the concept of Corrective Mechanisms. They ensure digital platform stability during changes by keeping the underlying deep structure intact and driving incremental improvement without reconfiguration.

As a final contribution, abstracted from the generative mechanisms, a set of design principles are formulated to guide a firm's efforts in digital transformation. Building on the digital platform design model, they are established based on (1) Linkages, (2) Complements and (3) Synergies between the layers and components of a digital platform.

Dedication

To the two main women who made me what I am,

I am eternally grateful to my mother, Bríd, who was taken too soon but drove us to be educated and be the best we could be.

Ar dheis Dé go raibh a hanam.

And to Liz, my better half, who has provided unwavering support throughout the six-year journey to complete my research.

Acknowledgements

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1   Introduction

1.1   Introduction and focus of enquiry

"*When digital transformation is done right, it's like a caterpillar turning into a butterfly, but when done wrong, all you have is a really fast caterpillar.*"

George Westerman - Principal Research Scientist (MIT Sloan Initiative)

McKinsey's annual IT strategy survey (Dhasarathy *et al.*, 2021) of organisations (CIOs and other C-level executives, n=487), reports that the digitalisation of a business has become more imperative in today's ever-changing competitive environment, to create '*tangible business value*'. The term '*digital transformation*' is now very common in everyday vernacular as firms strive to maintain relevance. It can be defined as the process of enhancing an organisation's business model, and its value, by embedding digital technologies that change the products and services it provides (Hess *et al.*, 2016; Matt *et al.*, 2015; Sebastian *et al.*, 2017; Vial, 2019). It generally involves structural change and how value is created where strategic responses are made based on the firm's position in the sector or industry (Kraus *et al.*, 2022). The application of digital technologies and understanding of user behaviour and expectations are vital to the decision on the choice of these strategic responses as defined in their framework from a more recent literature review. IDC estimates the economic value of these transformations is circa. $19 trillion or 20 per cent of the global GDP and is continuing to grow at a similar pace to the last decade (Parker & Fitzgerald, 2019). A key component to enable digital transformations is typically a '*digital platform*' that underpins the growth and success of today's largest companies such as Google, Microsoft, Amazon, Uber, Airbnb among others (Parker *et al.*, 2016). A digital platform can be defined as an '*extensible codebase*' to create '*core functionality'* that integrates '*shared*' software-based subsystems. The integration is facilitated by various interfaces to allow interoperation of the subsystems that in combination provide a product or service solution (Tiwana *et al.*, 2010; Ghazawneh & Henfridsson, 2013; De Reuver *et al.*, 2017; Wulf & Blohm, 2020). Another more recent definition focuses on the digital platform as layered modular architecture that "*allow participants to create value through data, complementarities and transactions taking place on the platform*" (Grover & Lyytinen, 2021:xi)

However, a large number of organisations struggle to digitally transform, with less than 30 per cent succeeding (De la Boutetière *et al.*, 2018). The literature provides little direction on how to properly execute a digital transformation and the phenomenon is regarded to still be in its

infancy (Vial, 2019). Soto *et al.* (2021) support this view and goes further by proposing that research focuses mainly on the formation and execution of strategies. Consequently, there is a limit to the theoretical or practical guidance to explain how choices around digital platforms influence digital transformations. The motivation for my research emerged from these challenges that firms face, where embedding digital technologies into their digital platform do not result in the expected level of enhancement to the organisation's performance.

My research indicates that design choices for digital platforms directly influence the evolution of the digital transformation and ultimately its success or failure. For the study, I define design choice, within the context of a socio-technical system, as the selection of '*technology'* based changes to deliver on a specific purpose or outcome (Lyytinen & Newman, 2008). To explore this, I present a longitudinal perspective (2013-2019) on how Hewlett-Packard Enterprise Financial Services (HPEFS) underwent a successful digital transformation. To help in the explanation of the events observed, I have adopted '*generative mechanisms*' (Henfridsson & Bygstad, 2013) as my theoretical lens to explore the design choices of its digital platform and the resulting outcomes. The focus of the research is to examine at the architectural level, **why** the action of design choice results in the outcomes observed. In turn, this will help to outline **how** to make design choices about a digital platform's configuration. This would enable a deeper understanding of the mechanisms that underpin these choices and how they can positively influence a firm's digital transformation and, therefore, provide additional insights to guiding change.

The remainder of this introductory chapter is structured as follows: after a short introduction to the case, HPEFS in Section 1.2, I present a summary of the research opportunities by reviewing the literature pertaining to digital platforms and highlighting what I see as underexplored (Section 1.3). From here, I introduce the main theoretical perspective about generative mechanisms, which have grounded the solutions gathered from the empirical analysis of the case (Section 1.4). I restate the study opportunity as a set of research objectives and research questions (Section 1.5) that lead to the resulting contribution of the study (Section 1.6). I outline the structure of this thesis (Section 1.7) to help orientate the reader within the study and then I conclude with a summary of the chapter.

1.2   HPEFS – In-depth and longitudinal single case study

The case study of a digital transformation, spanning over seven years (2013-2019), is HPEFS. With its focus on digital transformation and digital platform design choices, the longitudinal case

generated unique insights to identify causal mechanisms that would explain the realised outcomes. HPEFS is a division of Hewlett Packard Enterprise (NYSE: HPE) that provides financial solutions to the customers of HPE and that works with business partners and distributors (selling '*partners*'). The core objective of the organisation is to inform customers of suitable financial products. The products present options for the customer to the Information Technology (IT) investment strategy that best suits their need to acquire equipment such as servers, storage, networking, desktops, laptops etc. In 2012, the organisation began a shift towards providing these solutions through a digital platform as an alternative to the long-standing person-to-person selling approach. This supported incremental revenue and operating profit while enhancing the customers and partners experience. The digitising of experience was one of the key transformational dimensions (or pathways) to become a '*Digital Business*' (Figure 1.1). It represents the journey from bottom left to top right and the strategic outcomes required. With the external focus, the digital platform would play its part in digitising the customers' experience and enable the move towards being a '*digital customer*'. Transforming the products and services was the second element of the strategy. This was realised by embedding digital technology to change what could be offered as well as how it was offered, through the digital platform. Finally, the internal focus was to enable the digital experience, products, and services. Therefore, changes in this dimension focused on the digitising of the operational aspects of the business.
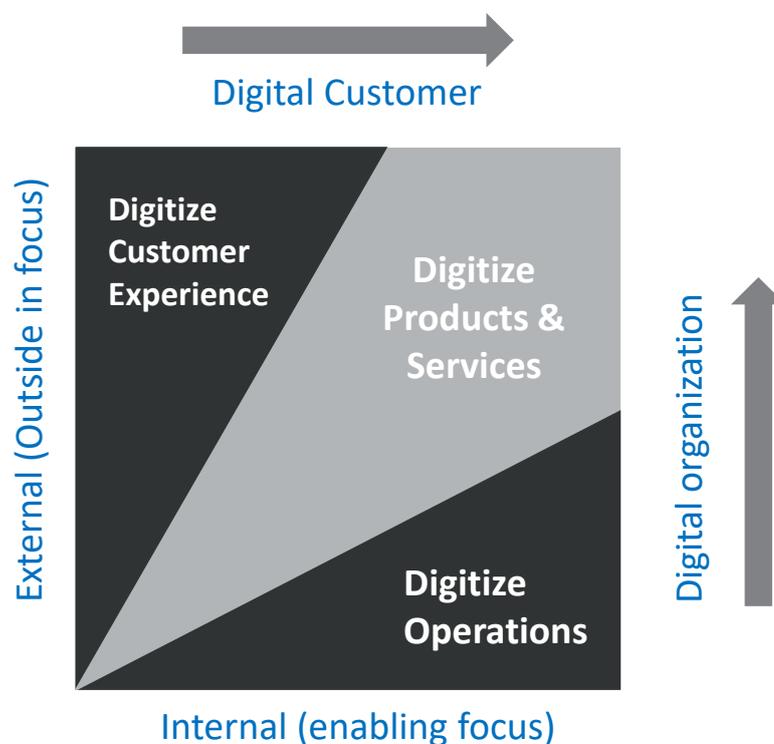
Figure 1.1 Becoming a Digital Business (adapted from Accenture, 2016)

Irv Rothman, President, and CEO of HPE Financial Services, provided the central theme to the digital transformation which was based on value creation and outperforming the competition. The key essence of this philosophy, in 2013, was:

> "*The creation of and execution on a genuine value proposition is the true source of sustainable competitive advantage and the best chance of retaining a customer for life…which should be an imperative*." (Meier, 2013)

The case choice to study HPEFS was additionally influenced by the level of access afforded by my role as Senior Director of Global Digital Transformation, Business Process and User Experience, and as the lead of a digital transformation team within HPEFS during the period of the study. It supported my involvement as a '*fully engaged*' complete participant (Bryman & Bell 2007; Creswell & Poth 2018; Yin, 2018), thus providing '*rich*' insights (Weick, 2007) or '*thick descriptions*' (Geertz, 1973; Stake, 2006) from the detailed reflections, observations, and assembled data. This long-term and deep access provided the opportunity for '*intense observation*' (Flyvbjerg, 2006) and offered a unique scope for studying how relevant phenomena evolved over the seven years (Yin, 2018), thus strengthening the durability of the theoretical and practical insights enabled by this study.

1.3 Problem Statement

I find that the digital platform literature has an extensive treatment of the impact of such platforms upon organisations, their strategy, and goals. Yet the design choices associated with digital platforms are pivotable for firms that use the digital platform as a key element of their business model to deliver value (either or both '*in exchange*' at the business level or '*in use*' at the user level (Grönroos & Voima, 2013). Looking more closely at the literature as it relates to guiding and providing insights on digital platform design, we can group the research into three primary domains:

(1) Digital design that embodies the strategic intent for the firm (following Hamel and Prahalad, 2005) to guide high-level direction.

(2) Research on functionality or features of a digital platform and the resulting outcomes and subsequent impact on the social-technical system (Lyytinen *et al.*, 1998; Lyytinen & Newman, 2008; McLeod & Doolin, 2012)

(3) Value creation – studies that have focused on value and how it can be created, cocreated and facilitated through value-in-use actions with customers solutions (Grönroos &

Voima, 2013). Additionally, some studies explore different types of decision modelling to help with IT investments that in turn will realise value.

I propose a challenge to extant research on digital platforms to suggest it should expand beyond the **what** (of design outcomes) from these three domains. There is limited research that examines and extends to the architectural level about **how** to make design choices in configuring the digital platform that would realise these design outcomes. As discussed in Chapter 2, this limitation in the literature presented the opportunity to further explore how a more substantial understanding of these choices can positively influence a firm's digital transformation and provide additional insights to guiding change. I demonstrate that some of the challenges associated with digital transformation could be traced to the choices made surrounding the digital platform at the architectural level thus leading to the question – *what differentiates one design choice over another?*

1.4 A Generative mechanism perspective

The research question that emerged from this thought process was: what is '*in the design choice*' that leads to the result observed? I adopted a critical realist approach as the research philosophy to frame the answer to this question. Observable and measurable facts relating to changes to the digital platform designs over time lend themselves to a critical realist perspective, ontologically. What is defined as '*real*' in this approach is the ability to seek an understanding of the "*causal structure and mechanisms with enduring properties*" (Saunders *et al.*, 2019:148). With this perspective brought to the forefront, a literature search yielded the seminal work on '*generative mechanisms*' by Henfridsson and Bygstad (2013). This theoretical construct was adopted as the best way to enable new theoretical insights and a strive for originality (Corley & Gioia, 2011), given its limited application in the digital platform literature. As a result, it provided a theoretical lens to challenge and expand the academic research on digital platforms.

Generative mechanisms are defined "*as causal structures that generate observable events*" (Henfridsson & Bygstad, 2013:911). As a primary theoretical framework (or lens) to explore digital platform design outcomes, it uncovers plausible explanations surrounding choice. A generative mechanism is described as an inherent property or characteristic of an object or action that possesses the '*power*' to cause or enable a change event and outcome (Sayer, 1992). The power exists whether it is activated (actualised) or not i.e., there is internal potential within the action to generate the event (Pawson & Tilley, 1997; Archer *et al.*, 1998). The search for generative mechanisms is a search for the most plausible explanations of causality (i.e., why we

observe what we observe) amongst the indicators, correlations, co-incidental or spurious associations we find in the empirical data. Searching for plausible patterns behind observable events (Mingers, 2004), changes or outcomes, is how we identify the mechanisms that '*explain*' and '*endure*' (Mingers & Standing, 2017). It is further strengthened as an approach because the contextual conditions in which the mechanism works would impact the effectiveness of the mechanism (Sayer, 1992; Pawson & Tilley, 1997) – Figure 1.2.
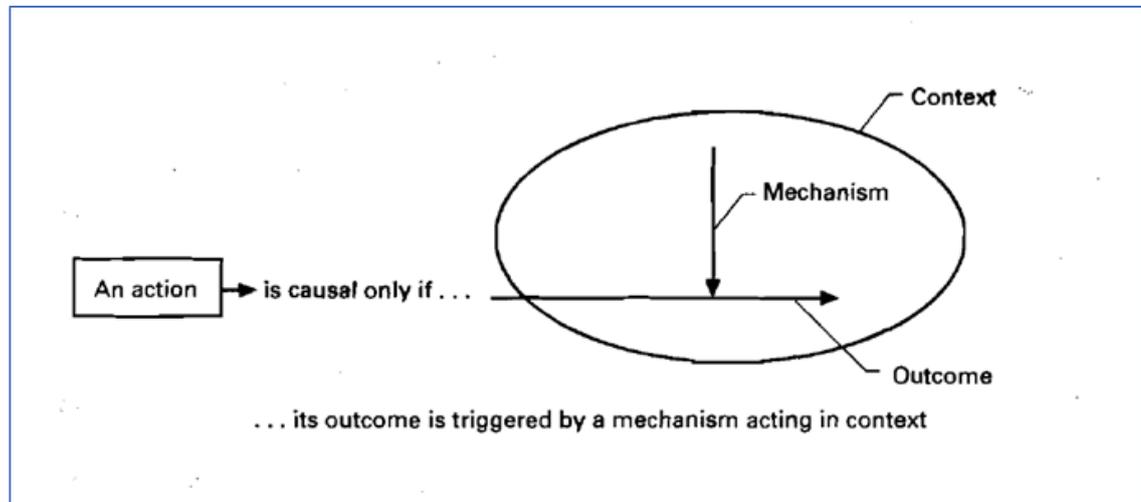
Figure 1.2 Context, Mechanism and Outcome (reference: Pawson & Tilley,1997:58)

Applying this lens to digital platforms has led to the contribution of identifying and categorising impactful generative mechanisms (Haskamp *et al.*, 2021). This, in turn, enabled me to extend my hypothesis such that the evolution of a digital platform, when successful (or failed), can be related to the relevant design choices. By identifying the mechanisms at play, inherent in the choices, can provide the insights and explanation being sought to explain '*why we observe what we observe*'.

1.5   Research objectives and research questions

Overall, the following research question emerged central to the study:

For a digital transformation within financial services, how do enabling mechanisms influence the design choices of a digital platform?

The purpose, therefore, of this qualitative case study is to develop a deeper understanding of the design choices within the transformation of a digital platform. Within the single case of HPEFS's digital transformation between 2013 and 2019, several key objectives were agreed upon to reflect the phases of the study and to address the research question:

Objective RO1)   To examine and contribute to the digital platform literature, its design and design choice treatment.

Objective RO2)   To complete a detailed investigation of the context, actions, events, and outcomes for the digital platform design (the phenomenon) within the setting of a Financial Services organisation (real-world context).

Objective RO3)   To explore and understand the underlying complexities of the critical events of the digital platform design outcomes based on a generative mechanism-based theoretical framework.

Objective RO4)   To propose a novel set of integration strategies at the architectural level that would realise the optimal design outcomes.

Objective RO5)   To provide a focused conceptual '*framework*' and set of '*design principles*' that guide the integration of the digital platform layers to generate value within the context in which it sits.

The research objectives were translated into specific sub research questions, (Table 1.1), and were subsequently operationalised as part of the research design (detailed in Chapter 3). These were chosen to enable answers to the main underlying elements of the main research question.

	Sub-Question	**Why selected**
Sub RQ-1	How do generative mechanisms explain Information Systems (IS) change?	To explore the key theoretical element to apply to the study
Sub RQ-2	How does context impact the type of design choices?	To explain the organisational driven reasons for the design changes.
Sub RQ-3	What conditions are important to enabling an impactful technology-driven change?	To report the situations that enable different outcomes from change.

Table 1.1 Research sub-questions

1.6   Overview of contribution

The study contributes to providing clarity to the key elements of the digital transformation process as it centres on digital platforms. To improve the understanding of digital transformation I have developed a configurationalist perspective (Pawson & Tilley, 1997; Henfridsson & Bygstad, 2013) to characterise the enabling mechanisms in a digital platform deemed to be core and proprietary to an organisation to:

(1) Extend the work of Henfridsson and Bygstad (2013) by identifying contingent 'action-formation' mechanisms that underpin the design choices at the architectural level of a digital platform and the outcomes they influence.

(2) Contributing to the digital platform literature by increasing the application of generative mechanisms to provide a deeper understanding of different activities within a digital transformation.

(3) Propose a model for integrative mechanisms in a digital platform.

(4) Outline a set of digital platform design principles that can guide a firm's efforts into digital transformation.
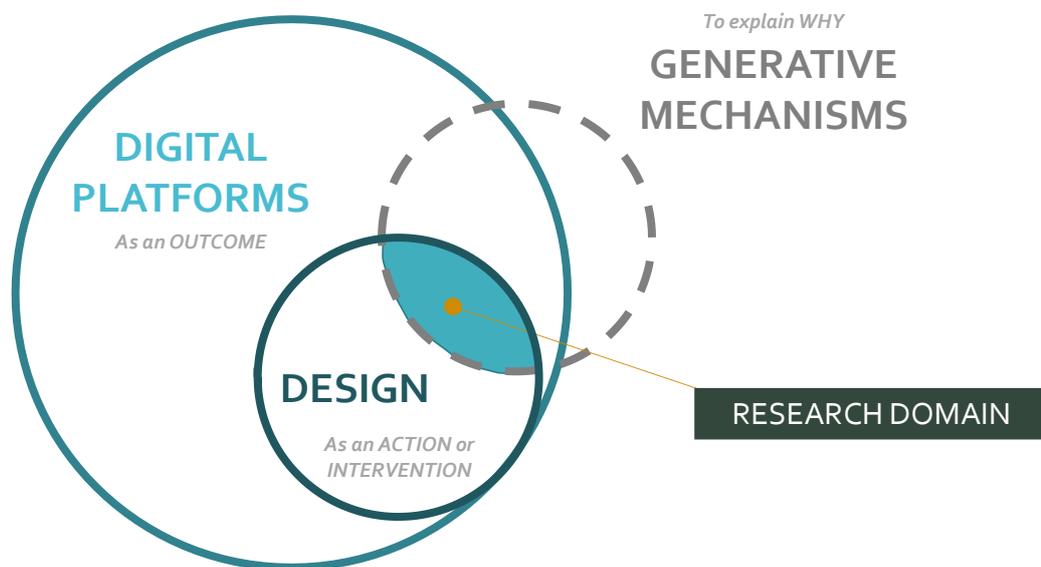
Figure 1.3. Research Focus

Figure 1.3 positions the research domain of the study (Jenkins, 2003) as highlighted by the application of generative mechanisms into the digital platform domain and within the design perspective.

The findings of the study identify integration mechanisms linking digital platform design choices to digital platform outcomes. I have identified four contingent digital platform integration mechanisms that underpin the design choices in the HPEFS platform and the realised outcomes (value creation) of its digital transformation. In addition to adopting the main theoretical lens of '*generative mechanisms*' (Henfridsson & Bygstad, 2013) I also utilised the insights from the punctuated socio-technical change model (Lyytinen & Newman, 2008) to assess the unfolding events. Moreover, I was able to translate these mechanisms into a proposed set of design

principles to guide practitioners to drive and sustain a digital transformation through its digital platform.

1.7 Thesis structure

The thesis structure is guided by the processes outlined by Eisenhardt's (1989) and Stake (2006), wherein I built theory from case study research. Table 1.2. provides a summary of the structure of each chapter and the main outputs.

Chapter	Content summary
Chapter 1 - Introduction	• An overview of the research and identification of the focus of the study.
Chapter 2 – Literature Review	• An account of the processes and protocols followed in the structured literature review and the findings of how extant literature addresses research on digital platforms. • Development of and introduction to the research problem and question identified.
Chapter 3 – Research Design and methodology	• The methodology designed for this research and the strategic decisions followed is based on the principles of Saunders *et al.* (2019) research onion. • The rationale that guided decisions that lead to an appropriately constructed, end-to-end, research design approach.
Chapter 4 – HPEFS Case Study	• A comprehensive summary of the HPEFS case and its digital transformation journey from 2013 to 2019. • Case data and analysis applied.
Chapter 5 – Findings and discussion	• The findings from the HPEFS case. • The proposed integration mechanisms outlined and design principles for digital platforms.

Chapter 6 – Conclusions	• Closing out on the dissertation with a focus on
	  • Theoretical contribution - the core contributions for theory and practice.
	  • Implications to Practice – views on the potential application by practitioners.
	  • Research limitations – reflections on the limitations in the study.
	  • Further research – proposals for potential leverage of the findings of the study, to expand beyond the single case of HPEFS and other unexplored areas in the literature.

Table 1.2 Thesis structure

A high-level flow for this thesis and the key elements from the chapters is presented in Figure 1.4 to provide a graphical description of the study as a whole. It goes across the chapters and is intended to provide the reader with both a flow and the main findings in the study.
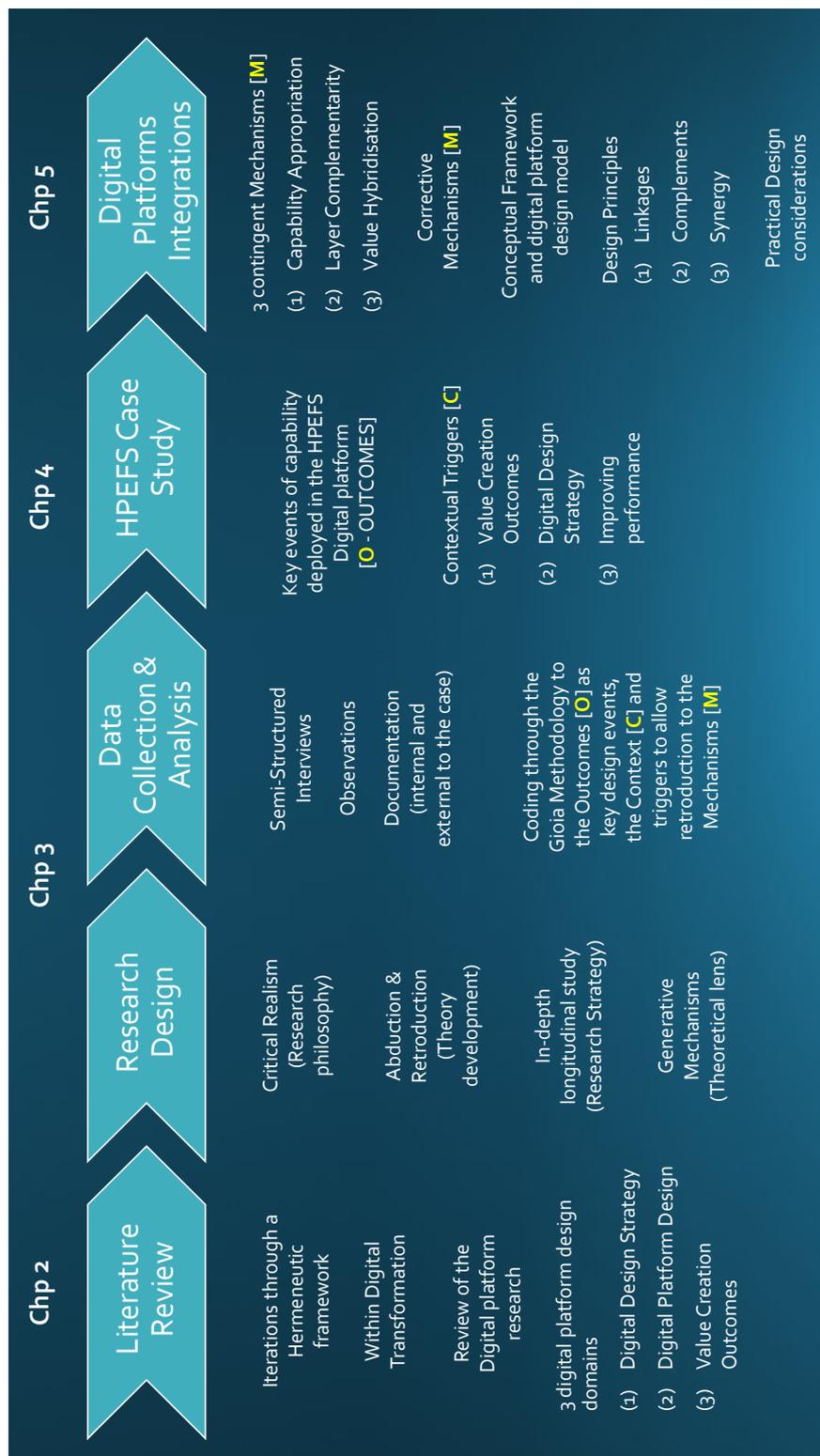
Figure 1.4 Hi-level methodological flow for the study

1.8   Chapter summary

Chapter 1 provides an overview of the research and pinpoints the focus of the study. After a short introduction to the case, HPE Financial Services (HPEFS), I presented a summary of the research opportunity by reflecting on the literature on digital platforms highlighting what I see as underexplored (Section 1.3). An initial definition of the main theoretical perspective of generative mechanisms (Section 1.4), provides a preliminary understanding of the structure of the proposed integration mechanisms outlined in Chapter 6. The study opportunity summarised by the set of research objectives and research questions (Section 1.5) leads to the resulting contribution from the study (Section 1.6). I concluded the chapter by outlining the structure of this thesis (Section 1.7) to orientate the reader within the flow of the study and the subsequent chapters from this point.

2 Literature Review

Chapter 2 accounts for the process and protocols followed in a structured approach to identify the research problem and the subsequent research question. The aim of a literature review is "*to enable the researcher both to map and to assess the existing intellectual territory, and to specify a research question to develop the existing body of knowledge further.*" (Tranfield *et al.*, 2009:208). To achieve this goal, I leveraged the structured approach of a hermeneutic framework (Boell & Cecez-Kecmanovic, 2014). This method proved helpful as it integrated interpretation and analysis of the literature while searching iteratively. Selecting this framework was based on two main characteristics of the process:

(1) One of the main focuses of this structured approach is on '*intellectual engagement,*' i.e., interpretation and critical assessment (Boell & Cecez-Kecmanovic, 2014). Other approaches, such as the systematic literature review (Tranfield *et al.*, 2003; Denyer & Tranfield, 2009; Okoli & Schabram, 2010), are seen to be potentially too formulaic as they emphasise rigour, replicability, and objectivity. As a result, they can downplay the intellectual and critical nature of the process to identify gaps in the literature (Webster & Watson, 2002; Boell & Cecez-Kecmanovic, 2014; Rowe, 2014).

(2) It also facilitates the iterative aspect of the literature review process. As digital transformation and digital platform research are still regarded to be in their infancy (Vial, 2019), I deemed this critical to my selection. As new research continues to come on-stream and articles emerge from multiple sources (i.e., not just academic database searches), appropriate adjustments can be made throughout.

Integrating insights and definitions from other vital sources were employed to augment the approach, i.e., problematisation (Alvesson & Sandberg, 2011), the concept-centric approach from Webster and Watson (2002) and others such as Rousseau *et al.* (2008) on synthesis and Rowe (2014) on what a literature review '*is not*'. Despite not adopting a systematic literature review (Tranfield *et al.*, 2003; Denyer & Tranfield, 2009; Okoli & Schabram, 2010), I selected aspects that I felt would improve the overall output. The protocols, as a result, became centred around improving reproducibility (and repeatability), which I deemed necessary when following an iterative approach. It also improved the comprehensive identification of all relevant material.

Research motivation and chapter flow (Figure 2.1) - the term '*digital transformation*' is now widespread in everyday vernacular as firms strive to maintain relevance. It can be defined as the process of enhancing an organisation's business model and its value by embedding digital

technologies that change the products and services it provides (Matt *et al.*, 2015; Hess *et al.*, 2016; Sebastian *et al.*, 2017; Vial, 2019). IDC estimates the economic value of these transformations is circa $19 trillion or 20 per cent of the global GDP and continues to grow at a similar pace to the last decade (Parker & Fitzgerald, 2019). However, many organisations struggle to digitally transform, with less than 30 per cent succeeding, according to McKinsey (De la Boutetière *et al.*, 2018). Research to understand how to improve success motivates this study, especially as the phenomenon is still in its early stages of understanding (Vial, 2019).

Problem or Research Problem being 'solved'

Digital Transformation	**A view of the 'problem'** Digital platform 'failure' or challenge – not as simple as '*we need to become digital*'	Section 2.3 Search and acquisition
Digital Platforms (incl Ecosystems & Digital Infrastructure)	**Where the solution can be located – the importance of Digital Platforms to Digital Transformation** Digital Platform as the central building block (Vial, 2019) and key element to successful transformation (Sebastian *et al.*, 2017)	Section 2.4.2 Conceptual categories Section 2.4.3 Critical Assessment
Platform Design	**PROBLEM STATEMENT** The current research does not provide all the answers on successfully embedding technologies into a firm's digital platform and business model **RESEARCH PROBLEM** **G**ap in the research on *how* best to make design choices on a digital platform and *why* they impact outcomes	Section 2.4.4
Design Choices	**HYPOTHESIS (leading to Solution)** Some of the challenges of digital transformation could theoretically come about due to architectural choices in the digital platform. **QUESTION** *What differentiates one choice to another?*	Section 2.4.5
RQ	For a digital transformation within financial services, how do enabling mechanisms influence the design choices of a digital platform ?	

Figure 2.1 Overview of Chapter 2 - Literature Review

A key component to enable digital transformations is typically a '*digital platform*' that underpins the growth and success of today's most prominent companies such as Google, Microsoft, Amazon, Uber, Airbnb, among others (Parker *et al.*, 2016). A digital platform can be defined as an '*extensible codebase*' to create '*core functionality'* that integrates '*shared*' software-based subsystems. Various interfaces facilitate the integration to allow interoperation of the subsystems that, in combination, provide a product or service solution (Tiwana *et al.*, 2010; Ghazawneh & Henfridsson, 2013; De Reuver *et al.*, 2017; Wulf & Blohm, 2020). Looking closely at the literature, we see that the digital platform is a central '*building block*' (Vial, 2019) and a critical digital transformation element (Sebastian *et al.*, 2017). Therefore, a transfer of focus from digital transformation to designing more impactful digital platforms can be considered. In other words, it could provide potential sources of improving success by understanding the connections of how one can affect the other.

With the importance of digital platforms as a potential solution, Section 2.2 provides an overview of Platform and Digital Platform Literature to support the searching process. I outline the literature review protocols in the '*search and acquisition*' phase (Section 2.3) to allow the domain to be mapped, classified, and critically assessed (Section 2.4). The critical assessment provides the source for discussion to outline the research problem (Section 2.4.4) as it connects to digital platforms supporting the digital transformation's '*real world*' problem (Van de Ven, 2007). This leads to the research question (Section 2.4.5) to address the gap, and I conclude by discussing the proposed theoretical contribution (Section 2.5).

As stated, the literature review followed the hermeneutic framework approach (Boell & Cecez-Kecmanovic, 2014). Prior to presenting the results, an outline of the framework next explains the method adopted.

2.1 Structured Literature Review

Using a hermeneutic understanding process means that the literature review is inherently interpretative "*where the reader engages in ever-expanding and deepening understanding of a relevant body of literature*." (Boell & Cecez-Kecmanovic, 2014:259). It effectively develops iterative insights (Figure 2.2) from relevant material to help solve the research problem.
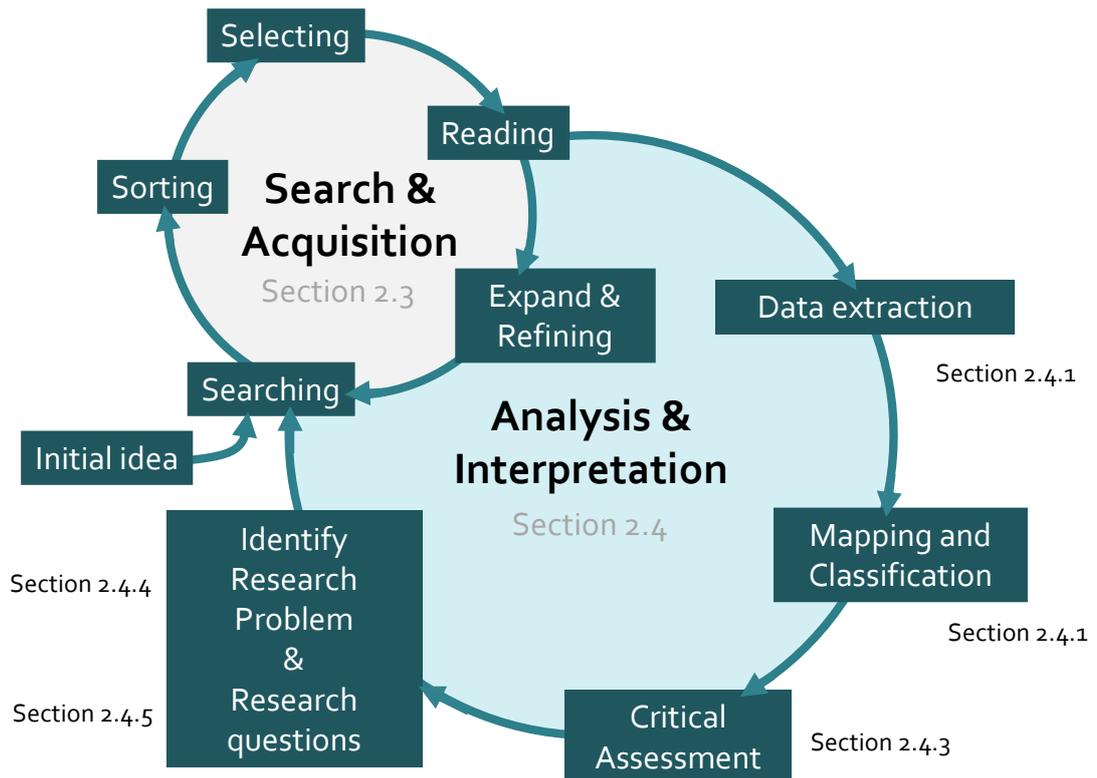
Figure 2.2 A hermeneutic framework for the literature review process (adapted from Boell & Cecez-Kecmanovic, 2014)

This critical examination identifies potential weaknesses and phenomena that may be poorly understood (Boell & Cecez-Kecmanovic, 2014) or enables a problematisation approach to assumptions (Alvesson & Sandberg, 2011). It aligns with Webster and Watson (2002), where high-quality research is concept-driven instead of publication-based. Moreover, as a review process to go beyond "*summarising/synthesising"* towards the goal of *"the identification of new research direction*" (Rowe, 2014:243). My proposal in this study is that a hermeneutic approach would achieve this aim.

The process comprises two major hermeneutic circles that are mutually intertwined (Figure 2.2). The '*search and acquisition*' circle focuses on the steps (Table 2.1) to search the literature and attain more information about the domain of interest and the '*problem*' established in the study. Success involves identifying relevant sources of information and reading to develop understanding.

Step	Description
Searching	• Searching for relevant articles by applying search operators within academic sources and going beyond the database search when necessary. • Focus on search techniques to quickly drill down into highly relevant material (precision).
Sorting	• Applying different methods to sort the articles found in the search (e.g., dates, citations, and relevance).
Selecting	• Defining and applying relevant criteria, determining which papers to carry out orientation-based reading.
Reading (Orientational)	• Developing an initial understanding through '*orientational*' reading to position the study. • Review the paper's title and key paragraphs (i.e., abstract, introduction and conclusion) for a preliminary but brief assessment to gain an overall impression of the content (Wallace & Wray, 2016). • Applying selection criteria for subsequent deeper '*analytical*' reading (part of the search and acquisition circle).

Expand and Refining	• Based on reading and reflections from the '*analysis and interpretation*' stage to decide, if necessary, to
	   o Expand the search approach, i.e., different journals or sources.
	   o Refine the search '*criteria*' to focus on specific areas of interest.
	• Identify improvements in the search strategies to achieve greater precision in subsequent searches.

Table 2.1 Search and Acquisition (adapted from Boell & Cecez-Kecmanovic, 2014)

The '*analysis and interpretation*' circle acts as a continuation of '*search and acquisition*' where the focus is to go delving deeper into the literature. As the researcher strives for a better understanding, the goal involves creating a well-defined perspective from the "*dialogical engagement and the fusion of horizons among researcher and numerous texts*" (Boell & Cecez-Kecmanovic, 2014:264). In other words, critically assessing the context of the target domain allows for creating new links among concepts and theories. The research moves from an '*orientational*' to an '*analytic*' reading of the literature before extracting the key data. Once the literature is systematically mapped and synthesised, the key step of '*critical assessment*' is undertaken. The research problem is determined from here and reformulated into research questions. Table 2.2 gives a summary of the steps. I have defined data extraction as a step of its own before mapping, highlighting the elements that would subsequently organise in a concept

matrix (Webster & Watson, 2002). I feel it is essential to have a step to carefully consider which elements are most important to the study before building the map of the data.

Step	Description
Reading (Analytical)	• In-depth, '*analytical*' reading to help in mapping and classifying. • To interpret and become immersed to achieve understanding.

Data extraction	• An outcome of '*analytical*' reading.
	• Making extensive notes to '*deconstruct*' the article into key elements, e.g.,
	    ○ Understanding of the paper.
	    ○ The papers' purpose or focus.
	    ○ Research questions being addressed.
	    ○ Findings and proposals.
	    ○ Key concepts and theories adopted.
	    ○ Methodologies and approach.

Mapping and Classification	• To systematically organise the data and present it in a '*succinct form*,' i.e., representing graphically or in tables to enable critical assessment. • Mapping and classifying relevant ideas, findings, links, and contributions within the literature. • Synthesising logical groupings of patterns to reflect the key concepts. • A creative process that may lead to new questions and drive to identify new relevant material.
Critical Assessment	• Focus on analysis and evaluation. • Identify weaknesses and areas of limited research. • To provide the opportunity to problematise current knowledge by challenging assumptions.
Identify Research Problem	• Develop an '*argument for a research gap*' based on the critical assessment. • Demonstrate the gap or '*problematic assumptions*' and their importance to be solved. • '*Formulation*' or '*framing*' into a research problem. • The revision of the research problem may trigger a NEW round of search and acquisition.
Identify Research Question	• Transforming the research problem into a specific research question. • Where answering the question in the study will help '*solve*' the problem. • Outlining the research question(s) to be empirically tested.

Table 2.2 Analysis and Interpretation (adapted from Boell & Cecez-Kecmanovic, 2014)

2.2   Overview of Platform and Digital Platform Literature

2.2.1   The importance of digital platforms

From McKinsey's annual IT strategy of organisations, digitalisation of a business has become more and more of an imperative in today's ever-changing competitive environment, to create '*tangible business value*' (Dhasarathy *et al.*, 2021). The term '*digital transformation*' has become very common in everyday vernacular as firms strive to change and remain relevant. McKinsey's view is that it is broad and far-reaching in a firm and goes beyond just thinking about technology and more of a '*way of doing things*' (Dörner & Edelman, 2015) or more recently as a far-reaching '*process*' (Vial, 2019) It can therefore be described as the process to enhance an organisations business model, and its value, by embedding digital technologies that change the products and services it provides (Matt *et al.*, 2015; Hess *et al.*, 2016; Sebastian *et al.*, 2017; Vial, 2019). In effect its focus is to also enrich the core business by changing its activities, processes, organisational structures, and skills by making them '*faster*' and '*smarter*' to increase performance (Schallmo *et al.*, 2017), to provide a different experience both internally and externally.

To illustrate the importance of this effort, IDC estimates the economic value of these digital transformations is circa. $19 trillion or 20 per cent of the global GDP and is continuing to grow at a similar pace to the last decade (Parker & Fitzgerald, 2019). Gartner's (2021) latest survey of CEO and senior business executives (n=115) show that 82% of them will again put the highest investment into digital capabilities, a trend that has continued since 2012. We find that platform-based business is dominating this transformation and are some of the most valued companies e.g., '*GAFAM*' - Google (Alphabet), Amazon, Facebook (Meta) and Apple and Microsoft (Constantinides *et al.*, 2018), that can also now include others like Alibaba. In 2020, these companies, as digital platform ecosystems, occupy the top five positions of brands (Forbes, 2020). Digital platforms such as iOS, Android, Facebook, PayPal, Apple Pay, Square, AirBnB, Uber to name but a few is an ever-growing list, and are increasingly important competitively to deliver on the transformed products and services (De Reuver *et al.*, 2017; Rolland *et al.*, 2018). Recent figures illustrate the growth of these digital platform companies has resulted in a combined market cap of $4.3 trillion and over 1.3 million direct employees and millions indirectly employed (Yablonsky, 2018). Digital platforms have risen as they facilitate a means to realise an economy of scale and have become synonymous with disrupting the '*natural order of things*' (Lowry *et al.*, 2017).

A more interesting fact, however, is that a large number of organisations struggle to digitally transform, with less than 30 per cent viewed as successful (De la Boutetière *et al.*, 2018). From MIT Sloan's 2018 online survey (1793 participants) conducted in partnership with McKinsey, found that '*digital transformations are even more difficult*' than organisational transformations. A simple search for '*digital transformation failure*' yields a wide range of reports, blogs, and industry-based studies, thus indicating the size of this problem and possible reasons for its occurrence. In 2013, Co-operative Bank cost themselves £300m by cancelling their legacy system replacement (Toesland, 2018). In 2013, the BBC shut down its Digital Media Initiative (DMI), with an overhaul of its data management system as central to the planned transformation. This resulted in £98.3m being written off (Toesland, 2018). Google Health was launched with a lot of fanfare to hold consumers information but failed as the health providers were not willing to use the platform (Van Alstyne *et al.*, 2016; Brunswicker *et al.*, 2019). It was subsequently discontinued in 2011. eBay pushed the Billpoint platform for digital payments but was replaced by PayPal in 2003 (Van Alstyne *et al.*, 2016). Other examples of high-profile struggles, such as GE, Lego, Nike, Proctor and Gamble, Ford, Sony, PlayStation Home. Garmin's NuviPhone. Johnson Controls' Panoptix for energy efficiency and Burberry among others (Van Alstyne *et al.*, 2016; Davenport & Westerman, 2018; Brunswicker *et al.*, 2019), thus showing the complexity of achieving this shift towards digital transformation.

Digital platform-based transformation presents more challenges with the ever-increasing demands from customers in terms of experience to raise the bar on what they must deliver in value and competitive advantage (Ehrlich *et al.*, 2017). According to McKinsey, a digital platform becomes a more difficult undertaking with the presence of legacy infrastructure, with the key challenge or '*hidden peril*' of technical debt (Dalal *et al.*, 2020) - I define this as the cost to modernise the organisation's outdated technology and then reduce the inherent complexity. As a result of these issues, I summarise the '*real world*' problem (Van de Ven, 2007) that firms face is being one where embedding digital technologies into their platform does not result in the expected level of enhancing the organisations business model. Where this can be evaluated by value capture (revenue and profits) or the value created for their customers (Zott *et al.*, 2011; Massa *et al.*, 2016). Being able to provide some insights to help organisations on how to approach these challenges, with more confidence, motivates my research. To help with identifying potential ways to solve, I looked first to the research in the area of platforms and digital platforms. A summary of these studies is outlined to provide a lead in to help illustrate where the literature doesn't fully provide the guidance needed.

2.2.2 Product Platforms, the precursor for Digital platforms

The platform literature provides characteristics to help in developing a deeper understanding of digital platforms. We find that research initially focused on '*product platforms*' and provided the early basis for understanding the topic. Examples such as the Sony Walkman with over two hundred models based on three underlying platforms gave an illustration of the impact of platforms on the product development process (Wheelwright & Clark, 1992). Other examples such as Kodak's single-use camera (Wheelwright & Clark, 1992), Scania Trucks (Meyer & Lehnerd, 2003) and Volkswagen (Simpson, 2004) further explicate the research into platforms and their impact on product design.

I propose that we assume that a product platform is made up of is a set of (1) components or subsystems and (2) interfaces to connect them such that it allows them to be shared among derivatives of the product (Meyer & Seliger, 1998; Robertson & Ulrich, 1998; Moore *et al.*, 1999, Meyer & Lehnerd, 2003). The components or subsystems are broken into those that are core, stable, generally long-lived and fixed with others that are more on the periphery and variable (Baldwin & Woodward, 2009). Organisations that adopt a platform approach will leverage "*common subsystems not only within product lines, but across them.*" (Meyer & Lehnerd, 2003:658) – Figure 2.3.
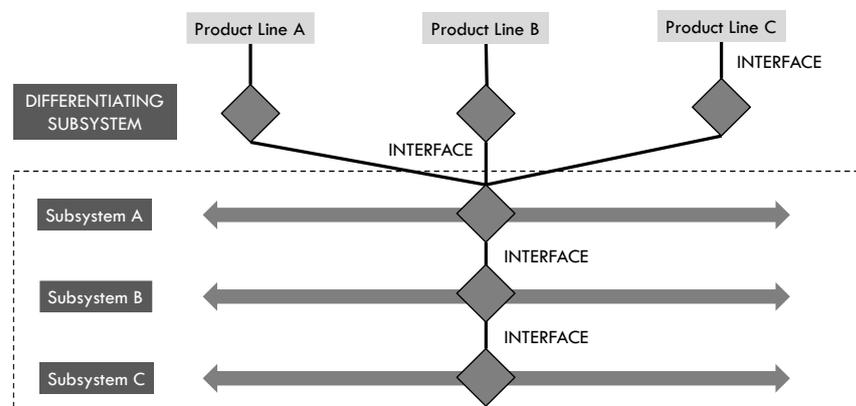
Figure 2.3 Shared subsystems in a product platform (adapted from Meyer & Lehnerd, 2003)

This allows a firm to make strategic choices on the combination to address specific offerings to customer segments. There can also be a further gradation (or scalability) in the performance or functionality with the subsystems to aid in targeting within a given market, achieved through '*plug-ins*' or '*add-ons*' (Meyer & Lehnerd, 2003). They can facilitate the organisation to be more flexible and responsive while also being very efficient by reducing the incremental costs to address market needs to further represent the benefits of a platform approach (Robertson & Ulrich, 1998). The emergence of platforms can therefore be seen as building blocks and engines

for innovation. They have helped redefine industry structures of products and services, a key trend that defines the modern economy (Gawer, 2009).

2.2.3   Digital Platforms (*Research Objective 1*)

The research on digital platforms reflects a next *'wave'* where they are seen as '*technological systems*' distinct from a product (Baldwin & Woodward, 2009). Tiwana (2010) builds on this idea and provides a definition that forms the basis throughout the subsequent literature (Ghazawneh & Henfridsson, 2013; Tiwana, 2015; De Reuver *et al.*, 2017; Wulf & Blohm, 2020), to outline the core characteristics of a digital platform:

> "*software based platform as the extensible codebase of a software based system that provides core functionality shared by the modules that interoperate with it and the interfaces through which they interoperate (e.g., Apple's iOS and Mozilla's Firefox browser)*."
>
> (Tiwana *et al.*, 2010:675)

Reflecting on the '*digital platform*' literature, we can see how it builds on the characteristics of the product platform. First, the use of the '***extensible codebase***' to create '***core functionality***' builds on Meyer and Lehnerd's (2003) work on shared subsystems. The digital core can be viewed at the integration of the '*shared*' software-based subsystems that in combination provide a product or service solution to the firm stakeholders (internal employees, customers, or suppliers). Tiwana (2010) went on to define **modules** as an '*add-on software subsystem*' that allows additional functionality to be available for the user. As the modules '*interoperate*' (in terms of the exchange of data and information) they facilitate the creation of **derivative products and services** (Ghazawneh & Henfridsson, 2013; Karhu *et al.*, 2018; Wulf & Blohm, 2020). The modules "*extend the functionality of the software product*" (De Reuver *et al.*, 2017:126) by leveraging the '*common resources*' or digital core that sit within the digital platform (Ghazawneh & Henfridsson, 2013). This reflects a second commonality with the previous research on product products by "*integrating specific features within product platforms to target market applications.*" (Meyer & Lehnerd, 2003:661).

Research during this period has progressed to study digital platforms as a central element of an '*ecosystem*' (Tiwana *et al.*, 2010; Tiwana, 2015; De Reuver *et al.*, 2017; Parker *et al.*, 2017; Tiwana, 2018). The combination of the digital platform and those modules that it integrates with, through specific interfaces, forms the '***platform ecosystem***' (Tiwana, 2010) – Figure 2.4.
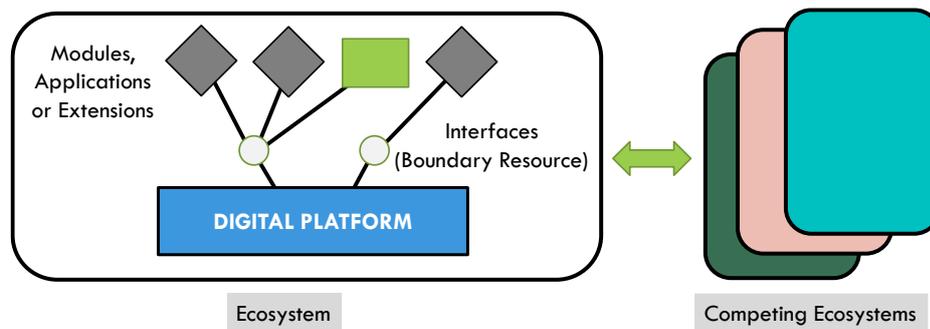
Figure 2.4 Digital platform-centric Ecosystem (adapted from Tiwana et al., 2010)

This shift to the platform as a technological system (Baldwin & Woodward, 2009) is illustrated by the emergence and importance of the interfaces in the ecosystem. In effect, they are a control mechanism (Tiwana, 2010) and are designated in the platform literature as **boundary resources** (Ghazawneh & Henfridsson, 2013; Gawer, 2014; De Reuver *et al.*, 2017; Wulf & Blohm, 2020). They serve to define the '*tools*' and '*regulations*' (Ghazawneh & Henfridsson, 2013) that manage the level and type of integration and interaction between the digital platform and those developing the modules. Examples of these resources include the application programming interface (API) protocol and software development kits (SDK) that provide access for the users to new features and functionality (Ghazawneh & Henfridsson, 2013). This has facilitated a transition, to allow third-party developers, external to the firm, to also develop solutions that are known as **applications** (Ghazawneh & Henfridsson, 2013; De Reuver *et al.*, 2017), **extensions** (Tiwana, 2015) or **complements** (Kahru *et al.*, 2018). They allow access to the core digital platform and create '*generativity*' over time with new and somewhat unprompted innovations due to this access (Yoo *et al.*, 2010). Some everyday examples include payment facilities (e.g., PayPal, Stripe), location-based services (e.g., Google Maps, Waze), messaging (WhatsApp, Viber etc.), accessing digital content (YouTube, Disney + etc.), fitness tracking and management (Garmin, Fitbit, Strava etc.) to name but a few.

This approach has facilitated the ability of the platform owners (e.g., iOS, Android, Windows, Facebook etc) to tap into and take advantage of the innovation and creativity of '*diverse outsiders*' (Tiwana, 2015) to the firm. It also provides a competitive advantage if the platform owner can become the dominant digital platform in a given space e.g., Apple iOS application with 1.8 million applications available worldwide (apple.com, 2021) or Google Play at 2.9 million (statista.com, 2021) are some of the well-known, everyday examples. Bonina *et al.* (2021) described these as innovation platforms with their ability to allow complementary solutions and technologies to build on the platform's foundation. Consideration for the platform owner in how

open to make the platform and its resources, especially for third party development (Karhu *et al.*, 2018). This decision impacts the platform owner's intellectual property rights (IPR) but is seen as creating innovation opportunities and '*induce complementors*' to create further value (Karhu *et al.*, 2018). The research focuses on the interdependency of the platform and the application i.e., the level of impact of a design change in one element on another, defined as '**coupling**' (Brunswicker *et al.*, 2019). Within digital platforms, Tiwana (2015) defines '*loose coupling*' to describe the situation of the interdependency being driven by the interface (e.g., API) and not embedded into the application. He goes on to also use the term '*decoupling*' when changes in the application do not harm its interoperability with the platform (Tiwana, 2015; Tiwana, 2018). '*Tight coupling*' as expected will result in the effect of a change in one element of the platform impacting on the functioning of the other (Brunswicker *et al.*, 2019). Digital platforms with boundary resources in an ecosystem bring forward some specific differences from a product platform. In a product platform, the modules helped drive change in the firm's product offering. Digital platforms reflect this but are shifting the business model to being built on access to the platform as this gives the application access to the user. This provides the means for the platform owner to generate revenue and profits based on access than on the '*product*' (i.e., application or extension).

Providing access to complementors leads the organisation to consider the digital platform boundary as a design decision to complement. Eaton *et al.* (2015) focused on the perspective of control to set the firms' digital platform threshold. The use of boundary resources is a means by which the organisation establishes the boundary of the digital platform. Tiwana (2018) put it in relatively simple terms as that which "*demarcates its exterior from its interior*" (p.831). In effect, it is the point that separates the internal architecture and the core capability of the platform from that of the external architecture that the platform will interact. It also reflects where the external resources will require the means to join with and access, i.e. the design to connect through the boundary (Eaton *et al.*, 2015). Gawer (2021) explored this topic and established that the organisations' digital platform boundary is based on strategic decisions around three interrelated boundaries. Drawing from other research, the digital interface (boundary resources) was identified as well as the '*scope*' of the platform (based on the firms' core focus, business model, assets and resources) and the platform '*sides*' (the target users or customers). Gawers' (2021) proposition is that a digital platforms' boundary is an interplay between these three interdependent areas where the firm must make strategic decisions. The output from this process results in the firms' digital platform boundary.

An further expansion of how a digital platform fits into an ecosystem is how it can impact as part of an '*organisational'* view (Selander *et al.*, 2013; De Reuver *et al.*, 2017) as it helps to link firms as they deliver products and services as a collective group. This organisational form has two aspects in the literature (Saadatmand *et al.*, 2019):

1) **Technology**, comprising of the core modules, interfaces, and extensions to bridge with the complementors (Baldwin & Woodard, 2009; Karhu *et al.*, 2018),

2) **Social processes**, involving the governance mechanisms to coordinate the actors and interactions between them in the ecosystem (Adner, 2017; Nambisan *et al.*, 2017).

Integrated supply chain management is a good example of taking advantage of a shared digital platform, such as SAP, to integrate into an **end-to-end organisational ecosystem** (Markus & Loebbecke, 2013). It allows companies to customise their business process while taking advantage of APIs to integrate and coordinate with their supply chain partners or to access the digital platform directly through a portal.

Another primary area of research into digital platforms is that of architecture. Tiwana (2010) defined the **digital platform architecture** as a '*conceptual blueprint*' to outline the configuration of the platform, the modules and the '*design rules*' that brings them together. The architecture of the digital platform provides two functions, (1) Partitioning the platform into its subsystems and (2) How the system integrates through the interfaces internally and externally (Wulf & Bloom, 2020). Architectural design provides the research on the logical organisation of the digital platform (the '*how*') to achieve the desired solution as targeted by the firm in the ecosystem (the '*what*'). Yoo *et al.* (2010) proposed the '*layered architecture of digital technology'* that conceptualised fluidity at the product level by realising different design hierarchies through the embedding and use of software. More recent research comes at the same question but in the opposite direction i.e., expanding the digital platform by adding "*physical resources (such as a new device)*" (Karhu *et al.*, 2018:479). Examples such as smartwatches with heart rate monitors and global positioning system (GPS) capabilities provide users, through applications on the iOS or Android platforms to a host of health solutions. Other examples such as the scanning of documents (receipts, credit cards, driving license, QR code for Wi-Fi router access) on a mobile device are becoming more commonplace that demonstrates this evolution.

With the background set out on digital platforms, the following is a view of the protocols in the '*search and acquisition*' steps carried out. This culminated in determining the research questions central to the study.

2.3 Search and acquisition of the literature

As the first of the hermeneutic circles (Figure 2.1), '*search and acquisition*' focuses on searching the literature, identifying relevant sources of information, and reading to develop understanding. The following section summarises the steps, with a more detailed outline in Appendix 1.

Sources – Selecting a bibliographic database was the initial decision before searching. From reviews of the various available sources, it came down to one of the primary indexing databases, Web of Science™ or Scopus®. As the "*largest abstract and citation database of peer-reviewed literature*" (Elsevier, 2022), Scopus® was selected. From here, leading IS journals provided the foundation of the literature review (Webster & Watson, 2002) through three '*rounds*'. The primary source considered was the '*AIS Basket of Eight'* (AIS, 2022), with a second iterative round of other highly ranked IS journals. While not as high in terms of the '*AIS Basket of Eight*' rating, these journals publish '*well-executed*' research, well regarded and with a '*3*' rating to justify their inclusion (Chartered Association of Business Schools, 2021). Another expansion of the sources in this second round included the proceedings from AIS conferences (https://aisnet.org/page/Conferences). As the primary conferences for IS academics and research-oriented practitioners, they provide an additional valuable source of literature. The third iterative literature round came about from the reading step and attending various online webinars, research seminars within the college, conferences, and many other interactions. The third grouping captures literature identified with potential interest and, if promising, was put forward for analysis and interpretation. While not large in quantity, the final two sources were academically published books and '*1st Tier*' of grey literature (Adams *et al.*, 2016). Although not peer-reviewed, tier-one grey literature generally has greater editorial control and confidence about the author's expertise. Examples include industry sources such as the International Data Corporation (IDC), Forbes, Gartner, and McKinsey.

Searching – the initial step was to identify protocols to find literature that would provide guidance from a digital platform or digital transformation perspective to achieve an outcome. A search on those '*scholars*' that are seen as '*specialists*' in platform research and highly regarded in the field (Figure 2.5) provided vital sources in this round.

Author
Ola Henfridsson
Kalle Lyytinen
Eric Monteiro
Amrit Tiwana
Annabelle Gawer
Michael Cusumano
Peter Evans
Marshall Van Alstyne
M. C. Boudreau
Youngjin Yoo
Geoffrey Parker

Key Search Terms
"Platform Design"
"Platform"
"Ecosystem"
"Transformation" AND "Digital" AND "Platform"
"User" AND "Acceptance" AND "Platform"
"Transformation" AND "Acceptance" and "Platform"
"Acceptance" and "Platform"
"Transformation" AND "Ecosystem"
"Platform" AND "Emergent" or "progression" OR "Innovation" OR "Unfold" OR "Gradual development"
"Platform" AND "Reuse" OR "Redesign" OR "Reusable"
"Intraplatform" OR "Intra-platform"
"Intraplatform" OR "Intra-platform" AND "Design"
"Architecture" AND "Mechanism" OR "Generative"

Figure 2.5 Key Authors and Search Terms

It, in effect, was recognising the '*conversations*' within which I would be contributing through the study (Huff, 2009). Next, the search terms were also broad in selecting those articles to explain choices or relationships within a digital platform. This was to provide insights on its impact across a broad spectrum, i.e., internal to the organisation, external to the firm and the outcomes observed.

Sorting and Selecting – Searching resulted in a total of *836* unique articles (Table 2.3). With such a large number, a '*practical screen*' for inclusion and exclusion facilitated a '*weeding out*' (Tranfield *et al.*, 2003; Denyer & Tranfield, 2009; Okoli & Schabram, 2010). The title's relevance and the source's academic rating primarily drove the down-selection. More recent papers from the identified key authors in digital platforms provided additional material for inclusion to complete the lineup for reading and data extraction.

Round	Initial search	Unique	Exclude	Include
Round 1	604	468	366	102
Round 2	307	296	260	36
Round 3	72	72	45	27
TOTAL	983	836	671	165

Table 2.3 Summary of the 'sorting' and 'selecting' steps

Reading and Data extraction – This set of steps was to position the literature within platforms and, more specifically, digital platforms. The critical part of this step was to provide the highly relevant papers and literature for subsequent '*analytical*' reading. First is an '*orientational*' reading step from references classified as '*include*' (Table 2.3). Data extracted at this point

included: (1) Key focus of the paper, (2) Context and the (3) Real-world problem being addressed. From here, a relevance assessment gave rise to rating levels, and the criteria for digital platform design are summarised in Table 2.4 – breakdown of the **165** documents.

Rating Level	Criteria	Quantity
HIGHLY RELEVANT	• Provides clear insights in multiple ways to leverage or explain. • Illustrates very good examples of connecting to the how and why for digital platform design. • Applicability is high at the architectural level.	**83**
MEDIUM RELEVANCE	• Provides some good insights • Applicability is present at a general level.	**38**
SOME RELEVANCE	• Provides limited insights. • Applicability is possible but low.	**44**

Table 2.4 Relevance Ratings

The level assessment was against the following characteristics or factors of the papers, considered within the lens of a digital platform, infrastructure, or ecosystem:

(1) **Examining and investigating a particular aspect within a digital platform, infrastructure, or ecosystem** – looking at and understanding its impact, influence, key drivers or required conditions. Presenting insights on specific elements, components, or attributes of a digital platform, infrastructure, or ecosystem. Defining the digital platform, organisational structure, or development processes to achieve a specific outcome.

(2) **Proposing design principles** based on a research endeavour.

(3) **Establishing a new or augmented theoretical model, conceptualisation, emergence of fundamental concepts or framework** – from analysis and proposals about design in a digital platform, infrastructure, or ecosystem.

(4) **Demonstrating a relevant 'A' that causes 'B'**. Where '*B*' was areas, such as achieving value-based outcomes, how specifics in a digital strategy influence design, interactions from stakeholders in a digital platform (customers, developers, other companies) etc.

Comprehensive data extracted from the literature classified as high or medium provided the material to map and classify. This required in-depth, '*analytical*' reading and the goal was to interpret and become immersed to achieve an understanding, the details of which are outlined in the next section.

2.4 Literature analysis and interpretation

2.4.1 Analytical reading, data extraction, mapping, and classification

Mapping and classification aimed to "*synthesise the relevant literature into a compact classification that describes major views/approaches, contributions, authors and sources*" (Boell & Cecez-Kecmanovic, 2014:266). The output from the '*analytical*' reading step provided the raw material for the mapping process and presented the topography and critical aspects of the literature. The recurring objective was expanding understanding of the field and highlighting the approaches taken in each study, their motivation, theories, findings, and contributions. A concept matrix was developed as a logical approach to "*grouping and presenting the key concepts*" (Webster & Watson, 2002:vvii). It systematically organises the data and presents it in a '*succinct form*' (Boell & Cecez-Kecmanovic, 2014). As each paper was '*analytically*' read, determining a set of patterns proved to be a highly iterative and reflective process – see Appendix 2 for detailed categorising of each reference and summarised focus. I made adjustments throughout the process as I allocated papers to their designated definition. Applying the KJ Method (Scupin, 1997) created a refined and expanded set of conceptual groupings from those initially created through the '*orientational*' reading process. The process (*also known as the affinity diagram approach*) entailed leveraging the four steps of the method: (1) capturing the core concept(s); (2) grouping based on patterns; (3) presenting the groups. Step (4) analyses and interprets the groups outlined in the next section (Section 2.4.2).

The first step was capturing the paper's essence(s) based on a synthesis from the data extracted (Table 2.5), described as the principal proposition(s) by the authors. While generally captured in the abstract, the paper's components helped form a more robust interpretation for the subsequent grouping step. All the data from this '*analytical*' reading were tabulated into a comprehensive table (in excel). It allowed for various forms of filtering and adding new columns when necessary.

Components	Definition
Key focus of the paper	Domain and main output or article goal.
Context	Type of study, timeframes, organisations involved or general situation
Real-world problem	Challenges or questions that are addressed by the study
Theory / theoretical lens / concepts	Theoretical concepts applied in the paper
Proposals / statements	How the theories are applied - frameworks or models to help in explanation
Key findings	Output from the study

Components	Definition
Contribution	Stated contribution from the study
Research questions	Stated research question
Relevance to HPEFS	Potential connection to case study
Relevance	High or Medium

Table 2.5 Data extraction from analytical reading

The second step was grouping based on "*broad conceptual categories*" (Scupin, 1997:234). The analysis leveraged Rousseau *et al.*'s (2008) integrative approach to search for patterns and connections between the studies. Denyer and Tranfield (2009) suggested that synthesis makes '*associations*' between the parts identified in the studies and '*recasting*' the information in new or different ways. Triangulation (Stake, 2006) and convergence provided the techniques used to develop associations through "*reflective interpretation*" (Rousseau *et al.*, 2008:3) of the literature groupings as they relate to:

(1) Offering guidance to the reader about making deliberate choices to transform a digital platform to achieve an outcome.

(2) Explaining choices or relationships on/within a digital platform and their subsequent impact through outcomes internal to the organisation or external to the firm.

It is also connecting the literature review to digital transformation by the focus on how the outcomes of the research connected to the process of enhancing an organisation's business model and its value by embedding digital technologies that change the products and services it provides (Matt *et al.*, 2015; Hess *et al.*, 2016; Sebastian *et al.*, 2017; Vial, 2019).

A total of eight broad conceptual categories were established through the grouping step, heavily influenced by the perspectives of designing a digital platform. The positioning of each paper in one or more of the categories was dependent on the proposition(s) determined in step one. As an iterative process, the quantity and definition of the categories evolved and updated the concept matrix (Webster & Watson, 2002). Adding three additional data sets captured the core information on the allocation to one or more categories (Table 2.6).

Table 2.7 provides a breakdown of the categories and their description (*step 3 of the KJ method*). They can be summarised as either influence within an organisation's activities to design, develop, and deploy a digital platform or considerations to achieve outcomes (e.g., value creation or competitiveness).

Heading	Description
Concept matrix category	• Assigned concept(s) for the paper.
Concept matrix sub-category	• How the core focus of the paper as it connects to the selected concept(s). • The central proposition(s) by the authors
Comments on the selection of category	• Providing text of the basis of the selection of the category in the concept matrix.

Table 2.6 Concept classification for a given paper

2.4.2   Analysis and overview of the categories in the digital platform literature

The literature to date is broad and, in the main, informs the choices an organisation should make when designing a digital platform. In other words, it advises the design choices that could or should be targeted by the firm, i.e., the '***What*** *we need to do'*. In turn, these ideas translate into the core design requirements that ought to deliver the desired business outcomes. This section provides an overview of the literature contribution and aligns with the conceptual categories.

[A] Value creation - Grönroos and Voima's (2013) definition of value creation focuses on the customer and what they call '*value-in-use'*. In their view, it is more than products and services; it is the end-to-end journey and experience that the customer accumulates over time. It also builds in the '*value-in-exchange*' between the '*provider' and 'customer*' and the '*co-creation of value*' from their interaction. Lusch and Nambisan (2015) confirmed this proposition by showing value co-creation as a critical element of a framework for service innovation within an ecosystem with a digital platform that delivers the services.

Ceccagnoli *et al.* (2012) looked at value from the co-creation perspective by small independent software vendors participating in the platform owner's ecosystem to develop new products or services. Suseno *et al.'s* (2018) study focused further on the interactions between the users in a social media digital platform to analyse and understand the '*value-creating*' practices. Their argument was built on a proposal of the hybridisation, or merging, of value categories (functional, social, emotional, epistemic, and conditional) to drive the "*utility of the final good or service to end users*" (Suseno *et al.*, 2018:335).

Similarly, Kyomuhangi-Manyindo *et al.*'s (2021) proposed study focuses on users and the tasks and environmental conditions in their study of learning management digital platform. They outlined several hypotheses to test in their study of the impact on usability by specifics such as the interaction between users and the platform's physical conditions (surroundings and space).

The ease and duration of a task, control of the task by the user and the frequency, among others, provide additional consideration to create value. Research from Kallinikos *et al.* (2013) approached the topic differently as they looked at the impact on the underlying value and utility of digital '*artifacts*'. Their proposition looked to modify the functional relationships driven by change or '*transfiguration*' of the artefact that impacts value. Lohrenz *et al.* (2021) identified mechanisms for designing digital platforms focused on the user's '*well-being*' to enhance interaction, communication, user experience and motivation. They identified autonomy (need for free will), competence (having confidence in ability to complete a task) and relatedness (need to feel part of a community in the platform) as fundamental construct to understand a user's well-being through the lens of self-determination theory (SDT).

Conceptual Category	Group description	
[A] Value Creation	What drives value that will influence design choice.	Value '*creation*' outcomes as an input to strategic decisions, at (1) Overall business level - Value-in-Exchange (2) User-focused – Value-in-Use (acceptance) *(Grönroos & Voima, 2013)*
[B] Competitive moves	Reacting to competition or competitive moves.	Business choices that are competition-driven as an input to strategic decisions.
[C] Digital design strategy and options	How to get to the future vision of the organisation.	Present a strategic intent to outline a high-level direction. Paper with elements that define the '*what*' and '*how*' of the selected strategy as steps to the future vision. Set at two levels: • *Level 0* = Represent a high-level strategy with a more generic and broad application, e.g., digital innovation. • *Level 1* = Strategic choices that focus on the approach, technique, playbook, or process as they apply to specific dimensions or elements that underlie and defines the action to be taken, e.g., service innovation. *(Hamel & Prahalad, 1995)*
[D] Design selection	(a) Making functionality based '*strategic*' decisions. (b) Design principles (lower level) to guide decisions.	Business choices on the platform – lower level as focused on more specific choices (functionality or capabilities) that will be platform-based to meet a business objective and highlighting their importance to the platform's outcomes. Includes: • Boundary resources and complementors. • Platform ownership and control. • Reconfiguration and interdependencies. • Designing for business processes and internal and external to the firm tasks within a socio-technical system (*Lyytinen et al., 1998; Lyytinen & Newman, 2008).*

Conceptual Category	Group description	
[E] Architectural design	Design at the architectural level of a platform.	The technical configuration choices for the digital platform at the architectural level. Includes: • Layered Modular Architecture *(Yoo et al., 2010)*. • Coupling – tight or loose. • Modularity – coarse or granular. • Access – direct, indirect, or open.
[F] IT Governance and Execution of the Software Development Lifecycle	The development process, i.e., getting it done.	Execution in the IT development process, research into specific IT activities and steps. Includes: • IT Governance • Software Lifecycle Development Lifecycle (SDLC)
[G] Socio-technical effectiveness	People and structure focus within the Socio-Technical System.	'*People*' aspects within platforms, digital platforms, and ecosystems, i.e., developing the skills, structure, shared values, beliefs, knowledge management etc. to improve the effectiveness of the firm's system development. *(Lyytinen et al., 1998; McLeod & Doolin, 2012)*
[H] Digitisation	Automation and digital embodiment.	Encoding of analogue information into digital format. *(Yoo et al., 2010; Lyytinen et al., 2016)*

Table 2.7 Conceptual categories for Concept Matrix

Another stream of research focused on valuation techniques to make optimal IT investment decisions and therefore impact the value from the firm's perspective. Taudes (1998) presented the application of '*real options*' modelling (net present value (NPV) decisioning tools). His case involved assessing the financial impact of introducing the option of electronic data interchange (EDI) as an add-on to an SAP/R3 migration where the benefit was not clear and was used to illustrate his proposal. Fichman (2004) built on these ideas by proposing a model for IT changes as a financial investment '*option*' and to value based on twelve factors drawn from four areas of organisational innovation. Khan *et al.* (2013) added the dimension of time to assess the impact on the '*realised value*' by the timing of exercising an '*option*'. The literature in this stream reflects a focus on a firm's value capture in revenue and profits (Zott *et al.*, 2011; Massa *et al.*, 2016) from making better investments and with '*value-in-exchange*' between the '*provider*' and '*customer*' (Grönroos & Voima, 2013).

A final perspective on value falls into the literature on technology and user acceptance. The Unified Theory of Acceptance and Use of Technology model for technology acceptance established by Venkatesh *et al.* (2003) represents the seminal work in this area. Value-in-use is shown in two of the four core determinants of acceptance in the model, i.e., to see some performance gains as a user and with a reduced effort. Abraham *et al.* (2013) presented the

concept of '*evolutionary psychology*' to augment the model of Venkatesh *et al.* (2003). The authors posed '*four drives*' (….to bond, defend, acquire, learn, and acquire) that provided an enhanced understanding of technology acceptance. Doll *et al.* (2004) examined a different aspect by measuring user satisfaction. They proposed an improved measure by applying four key dimensions (users, application type, platform, and modes of development) into the process. Claussen *et al.* (2013) looked at how platform owners (Facebook) can improve the value of the applications to users. The authors could show they controlled the level of notifications to reward designs for more '*engaging*' applications that gave rise to the value looked for by Facebook, thus, giving an insight into how a digital platform can drive '*value-in-use*'.

In summary, value as a research domain is broad, reflected in the broad range of literature presented in the review. We find that design choices on a digital platform need careful consideration of the type of value category to which they relate, i.e., functional, social, emotional, epistemic, and conditional (Suseno *et al.,* 2018). Generally, it will be co-created through the interaction on the digital platform where measures such as user acceptance and satisfaction can help act as a measure of value. On the firm side, value also derives from the outcomes that deliver the maximum return in revenue and profits.

[B] Competitive moves - Michael Porter contends that the "*essence of strategy formulation is coping with competition*" (Porter, 1979:137). In this seminal paper, he proposed one of the five threats to protect against imitation and the '*threat of substitute products or services*'. Looking more broadly at business model innovation, firms use '*isolating mechanisms*' to make imitation difficult for competitors and, therefore, a differentiated architecture (Teece, 2010). A strategic position built on differentiation and hard-to-imitate products and services will likely lead to a "*sustainable competitive advantage*" (Porter, 1996:74). With the right design choices, the literature reveals that digital platforms can provide a basis for a competitive strategy that is hard to imitate and can, therefore, act as an '*isolating mechanism,*' i.e., onerous for a competing firm to recreate. Gnyawali *et al.* (2010), in their study of social networking services (SNS) firms, put forward the strategy for co-development and alliances that result in the co-creation of digital platform solutions to maintain competitive advantage. Kazan *et al.* (2018) proposed that the digital platform's '*superior architectural configurations*' can drive competitive strategy. Architectures from their study on the UK mobile payments platform were value-creating (by the openness of the platform to co-creating partners, i.e., integrative or integratable) and also deliver value (by the type of access for co-creating partners, i.e., direct, indirect, or open). Foerderer *et al.* (2019) focus on digital platform development and co-creating '*stakeholders*'

within the enterprise software industry. Their findings concluded that it is the effectiveness in integrating knowledge across the ecosystem participants and, therefore, across knowledge boundaries that distinguishes a firm from its competitors. Anderson *et al.* (2014), in their study of the gaming platforms (Wii and Xbox), looked at what would drive a '*winning strategy*'. They found that platforms with more content and a lower core performance created a competitive edge to demonstrate the importance of an organisation's design choices.

Jimenez and Arenas' (2021) study highlights a different challenge facing some organisations to balance collaboration and competition when co-creating value in their digital platform. As digital platforms become more complex, not all platforms' modules may be developed by a single organisation. This has necessitated establishing alliances, some of which may be direct competitors. The authors provide insights into mechanisms and practices to manage these relationships and critical process considerations when designing the platform and making the appropriate competitive move.

In summary, striving for differentiation and making it difficult for others to '*copy*' a firm's digital platform capabilities gives rise to strategic choices. These include openness and access for third-party developers to the digital platform, information sharing between stakeholders as it develops, and balancing content and performance, among other areas. Therefore, the key takeaway from the literature shows that strategic design choices can drive competitiveness outcomes in the digital platform's architecture and the resulting configuration to make it hard to imitate and become a source of the firm's differentiation.

[C] Digital design strategy and options – the literature in this conceptual grouping denotes those papers that present a strategic perspective to enabling '*digital*' products and services. They provide the insights and considerations for positioning potential design choices where the digital platform can be an enabler. Strategy is another broad domain with extensive research with many key thought leaders that provide guidance. A firm's strategy can encapsulate how it deals with competitors and sets out actions to establish its position in the industry Mintzberg (1987). It also encapsulates strategic intents by capturing the '*essence of winning*', motivating '*rallying cry*' for the employees, and driving consistency of action over time (Hamel & Prahalad, 2005). The study presented by Woodward *et al.* (2013) proposed a conceptual model to formulate and execute a '*digital business strategy*'. They presented the key elements as '*design moves*' to describe the strategic actions of growing the firms '*design capital*' and creating "*digitally-enabled products or services.*" (Woodard *et al.*, 2013:538). The authors depict this as a cumulative '*stock of designs*' that can be realised and potentially reduce technical or '*digital*

debt'. I define this as the cost to modernise the organisation's outdated technology and then reduce the inherent complexity. Rolland and Mathiassen (2018) built on this work by studying a digital platform in a Scandinavian media organisation. They explored the strategic choices between '*digital options*' on their digital platform (new technical and informational functionality that will increase the platform's value proposition) and managing '*digital debt*'. In particular, they considered the choice between an internal legacy digital platform and several external, competing digital platforms with a recommendation to go with the latter.

Soto *et al.* (2021) looked more broadly and focused on those factors that have interdependencies and will influence success. They defined the strategic choices based on the configuration of (1) the level of outsourcing being employed, (2) how development is structured, (3) the threat of disruption the firm faces and how imminent and (4) decision making. Sawy *et al.* (2016) provide a different perspective from their study of Lego's decade-long digitisation journey. They presented insights into the building blocks for '*digital leadership*' that includes an enterprise platform (to manage transactions) and a complimentary engagement digital platform (to support digital-based interactions between Lego and the customer). The case presents how technologies such as the digital platform can change a firm's business model and generate "*value-producing opportunities*" (Sawy *et al.*, 2016:142). Sebastian *et al.* (2017) build on this work to show that a '*digital services platform*' can enable the firm to be more agile and innovate quickly on new potential solutions. Therefore, the right platform provides the means to execute digital strategies centred around customer engagement and digitised products and services.

Gupta and Bose (2022) outlined the importance of the digital platform as it represents a core element of the delivery of the digital business model. They developed a digital business transformation (DBT) framework by studying two entrepreneurial firms in the crowdfunding market (Wishberry in India and Hack-a-Joe Labs in the US). The DBT framework was built on the basis that information would flow from the business or operation environment. This influences the digital business architecture, comprised of a digital strategy and business model within which the digital platform would sit to drive the desired transformation.

Another subset within this grouping narrows the focus to the strategic approach or process that applies to specific technology-based domains defined in the studies. They provide insights and considerations that can influence design choices for the firm and the potential for application. Kathuria *et al.*'s (2018) study of 147 firms in India proposed a '*cloud appropriation model*' by outlining the macro-level steps they called '*cloud integration capability*' to realise value.

Henfridsson and Bygstad's (2013) seminal work on '*generative mechanisms*' helped explain how digital platforms and infrastructure evolve. They applied the influential studies of Hedström and Swedberg (1996) to conceptualise a firm's action through a '*configurational perspective*' from Pawson and Tilley (1997) to build a process view that explains the evolution. Huang *et al.* (2017) leveraged this work to analyse the rapid growth of the Chinese digital venture, WeCash. They were able to identify three mechanisms that could be broadly applied to help a firm to scale their digital platform: (1) having a data-driven operation; (2) the ability to make quick changes through 'instant releases'; and (3) power to change the core focus based on technology shifts quickly. Törmer (2018) followed a similar path to investigate the digitalisation journey of the LEGO Group. He identified three generative mechanisms to show how a digital platform can drive innovation speed and efficiency: (1) modular upgradability of individual sub-systems; (2) economics of substitution through reuse and recombination and (3) reproduction through the integration of external solutions. Kovacevic-Opacic and Marjanovic (2020) outline a digital platform strategy as an ongoing process in their study of an internal learning management system. The authors also followed the application of generative mechanisms. Up to the point of their study, they identified two key mechanisms: (1) grass-roots data collection and (2) cross-organisational fast feedback loops. They contend that these help to explain the co-evolution of the digital platform strategy in parallel with the digital platform.

Gregory et al. (2018) looked at the importance of IT consumerisation and its transformation of digital platform governance (focus, scope, and patterns). They found that everyday life changes in expectations and practices have implications for an organisation's platform design and IT activities. Gomber *et al.* (2018) developed a new framework for mapping Fintech innovation. Such a framework provides a means to assess the functionality of the effects of the technology across the dimensions of customer experience (complementary or disruptive). This gives the firm a supporting tool to gauge the potential for digital platform design choices.

In summary, papers in this grouping present a set of strategic perspectives that enable '*digital*' products and services by providing insights for a firm to consider and outline strategic approaches and processes. Generally, they sit within specific technology-based domains that allow the reader to position potential design choices within the firm's strategy, where a digital platform can enable these products and services to succeed.

[D] Design selection – this grouping presents insights at a more tactical level as they focus on a digital platform's specific functionality and capability to demonstrate the connection to a business outcome. The outcomes vary from the very specific, e.g., '*facilitating communication*',

'*driving network effects*', to the broad impact of '*firm performance*' or '*outperforming the competition*'. Literature highlighting digital infrastructures or ecosystems was included in this conceptual grouping because (1) digital platforms were named, or (2) the proposals or findings apply to choices on a digital platform. Finally, some of the literature in this conceptual grouping presents design principles based on their studies' findings that could guide decisions.

A line of research on '*boundary resources*' (e.g., application programming interfaces – APIs) that sit between the digital platform and third-party developers provides a view of this literature that focuses on functionality and capability. Ghazawneh and Henfridsson's (2013) highly impactful work analysed digital platforms and the design of '*boundary resources*'. The authors presented two processes of resourcing (enhancing the scope and diversity of the digital platform) and securing (managing and increasing control) to explain the actions that occur because of the platform owners and the third-party developers. Eaton *et al.* (2015) built on this work to describe stakeholders' resistance, tensions, accommodation, and their impact on the design as the '*distributed tuning*' of the '*boundary resources*'. Karhu *et al.* (2018) added further by looking at those developers that bypassed the digital platform controlling '*boundary resources*', called forking and the effect of more open access as a set of competitive strategies. Engert *et al.* (2022) looked at the platform boundary resources and complementor engagement in their study of e-commerce content management digital platforms. As with Ghazawneh and Henfridsson's (2013) work, they identified five types of complementor engagement and introduced the concepts of complementor securing and resourcing. They also outlined different types of platform boundary resources (PBRs) – (1) Standardised PBRs allow the barrier for entry for complementors to provide solutions to a platform to remain low and (2) Individual PBRs that are focused on specific capabilities or issues for given complementors. The authors content that this provides a source of differentiation of the platforms and is an essential set of design choices for an organisation to consider, whether acting as the platform owner or complementor. Halckenhäußer *et al.* (2020) investigated the challenge of complementors competition with platform owners when leveraging PBRs. They developed four hypotheses to outline the characteristics of a market that will increase the likelihood of more significant competition between complementor and platform owner. They include areas such as demand for a given niche, competitive intensity within that niche, the quality of the complementors and the innovation rate. Finally, Soh and Grover (2022) lens to study PBRs focused on the role '*distributed sensemaking*' in the development of PBRs. Driven by a large set of application innovations, they found that it is important to drive competitive performance by the shared understanding of the PBRs between

app developers. When looking for the integration of new solutions into the digital platform, appreciation therefore of the workings and design of a PBR are essential for more effective development outcomes.

The second research category focuses on how the modules (or sub-systems) combine, can be reconfigured, and have interdependencies to impact a digital platform. Um *et al.* (2015) found that the changing combination of digital components and interactions drives changes in the platforms '*topological*' structure. Their study of WordPress plug-ins from 2004 to 2014 illustrates how the digital platform re-arrangements and changes to the interrelations of the '*digital products*' within and between '*clusters*' drive the evolution. Module interdependencies' impact on evolution was also focused on in the short study by Hukal (2017) on GitHub data. His findings show that the impact of the introduction of new functionality is contingent on what exists already in the platform in the form of resources and capabilities. Sandberg *et al.* (2020) present the re-programmability concept to create a new organising logic from their study of ABB product platform evolution over 40 years. Their analysis demonstrated how product platform digitisation leads to structural or compositional changes in the system or product (denoted as phase transitions). The digital platform changes were further characterised by the evolution of the interfaces, the architecture and coupling, control, and design decisions rights and those involved (internal and external) in the development process.

Business process transformation forms a stream in the literature that makes it another consideration in the design process. Kathuria *et al.* (2018) highlighted the importance of business process alignment within a digital platform as part of their cloud computing appropriation model. This alignment is an underpinning component to the technological capability outlined in their study that directly impacts a firm's performance. Similarly, Tan *et al.* (2019) identified a model where the need to consider the business processes through a digital retailing platform to achieve speed, accuracy and cost is vital to achieving operational agility. Levkovskyi *et al.* (2021) come at this, however, in the opposite direction, i.e., from the digital platform perspective, to illustrate in their study that global companies target digital solutions to allow centralisation and standardisation of their processes. The relevant business processes, therefore, are an important element in the design of the digital platform.

Tiwana *et al.*'s (2010) seminal work gives a framework for studying platform evolution based on (1) architecture, (2) governance and (3) environmental dynamics. The presented conceptualisation provides several areas to consider when designing a digital platform, i.e., decision rights between platform owner and developers, control mechanisms and whether the

platform is proprietary or shared. Yang *et al.* (2012) studied the digital platform designed to enable the emergency system at the 2008 Beijing Olympics. It informed a set of design principles for an integrated information platform based on (a) capturing data, (b) comprehension of critical events and (c) projection of what will happen to allow action to follow. Lusch and Nambisan (2015) conceptualised service innovation and established a framework to inform the design elements of a service ecosystem and service platform and co-create value. Markus and Loebbecke (2013) presented several conceptual developments to realise a digital business strategy. In particular, they outline the design choices between:

(1) A '*customisable digital platform*' shared by many users, where some could be competitors of each other, e.g., platform such as Salesforce.com - accessed by many firms and can be configured to suit a given set of needs.

(2) A digital platform targeted at a '*business community*', all of whom use it for similar means. The New England Healthcare Exchange Network (NEHEN) provides an example of design based on users. In this case, health care providers, insurance companies and patients join and participate in a comprehensive digital platform to manage payments.

In summary, this grouping focuses on specific digital platform functionality and capability and demonstrates the impact of critical choices and their connection to a business outcome. It provides considerations for the firm on digital platform-based selections linked to specific business choices.

[E] Architectural design – this next grouping focuses on architectural level characteristics and looks at research aligned with the digital platform's design hierarchy (Clark, 1985). Drawing on several highly impactful studies has guided the lens of this conceptual grouping in assigning various papers. At the digital platform's core is the '*extensible codebase*', which helps create a set of central functionalities (Tiwana *et al.*, 2010). The application of modules as an '*add-on software subsystem*' provides the current functionality for the user and allows for additional if desired. As the modules '*interoperate*' (regarding the exchange of data and information), the products and services are delivered. By leveraging the digital core (as a set of shared resources), the firm can extend the functionality through interfaces, such as APIs, to new or enhanced modules (Song *et al.*, 2017).

Several examples of papers that fit this grouping begin with Rai *et al.*'s (2006) research on supply chains. They established that the '*unbundling*' of information and data from the physical flow of products resulted in more significant and sustained performance. They determined that achieving an integrated information flow from the IT infrastructure results in '*higher-order*

process capabilities' that leads to the observed impact. Kallinikos *et al.* (2013) found that changing the '*functional relationships*' between digital artefacts impacts appearance, form, value, and utility. While context is also an influence, the study stresses the importance of relationships between the components in a digital platform when making design choices.

Yoo *et al.*'s (2010) influential work on '*layered modular architecture*' for the application of digital technologies provide an additional foundation for this conceptual grouping as we look for insights on key design considerations. They described this as a continuum that does not have a product boundary. It is built on layers of devices, networks, services, and contents that embed vital digital technologies to deliver a product or service. The impact of this research and the establishment of this new architecture changed how organisations should organise their innovation. Um *et al.* (2015) also put forward the impact of layered modular architecture as a design choice. They see this architectural approach as part of a firm's digital innovation as solutions can co-exist in a platform based on an agnostic design due to the un-fixed design boundaries it facilitates. This allows the recombination of modules or '*digital products*' to yield new outcomes, as outlined earlier. Another recent definition focuses on the impact this design approach can have as it will "*allow participants to create value through data, complementarities and transactions taking place on the platform*" (Grover & Lyytinen, 2021:xi). Similarly, the concept of '*enterprise architecture (EA)-driven dynamic capabilities*' has been shown to drive '*compelling digital platforms*' (Van De Wetering & Dijkman, 2021). Data from 414 respondents from a web questionnaire (LimeSurvey) in the Netherlands allowed the creation of a research model by to confirm their hypothesis and, therefore, its importance in the design process.

Within this context, digital platform design can be viewed as an important '*enterprise architecture resource*' as it reflects an '*EA deployment practice*' that requires knowledge to allow the organisation to gain the desired benefit (Van de Wetering, 2019). Additionally, the contribution of the dynamic capability view (DCV) provides a theoretical perspective on modularity (Mikalef *et al.*, 2021). Firms with this capability generally have strategic options to reconfigure their business model as the business environment changes. As such, the digital platform design provides the opportunity to take advantage of modularity in the choices the firm considers.

 Brunswicker *et al.*'s (2019) study proposed a model to understand the impacts of coupling between components in a two-sided digital platform. Kallinikos *et al.* (2013) concluded that the relationship defined as the coupling level (tight, moderate, or loose) would have varying impacts depending on the design choice. Hukal (2017) described coupling from the perspective of the

type of modularity, i.e., the degree by which digital platform components can be separated and recombined. He uses the term '*coarse*' to denote the reduction in module dependency (making them loose) and '*granularity*' that drives greater structural complexity (and tightness). These lead to a trade-off for the organisation as the specific synergistic design in a granular configuration requires a high degree of effort compared to coarse modularity. In the coarse approach the limited dependency between modules means that innovation will be a much lower effort as the focus is more on the module. With granular modularity design considerations will be looking at the module, the overall digital platform and how each element integrates together thus making it a larger task for the organisation.

As a final example, Kazan *et al.* (2018) investigated the functionality of making the firms' digital platform open to co-creation with partners. Configuring the architecture to this capability with different access levels (direct, indirect, or open) proved to drive a competitive strategy in studying the UK mobile payments platforms. In summary, grouping based on studies that provide insights into configuring decisions for the digital platform at an architectural level gives an organisation an essential criterion to consider.

[F] IT Governance (ITG) and execution of the Software Development Lifecycle (SDLC) – the common theme in this grouping was an oversight and execution of the development process and application to digital platforms. This aligns with Tiwana *et al.*'s (2010) seminal paper that previously highlighted governance as one of the critical aspects of a platform's evolution. They defined governance as "*who makes what decisions about a platform*" (Tiwana *et al.*, 2010:679). They broke this into three key components (1) decision rights and how authority is divvied up, (2) formal and informal control mechanisms to drive good development decisions and (3) whether to retain proprietary ownership or allow shared and openness. Pacheco *et al.* (2020) also focused on a better understanding of ITG and its potential impact on '*IT Ambidexterity*' to make an organisation more agile to allow exploitation and exploration concurrently in their development activity. They highlight the influence of six archetypes of organisational-based decision structures on the success factors of ITG that generate a predictable return. Mulyana *et al.*'s (2021) more recent literature review highlighted the impact of ITG through several mechanisms consisting of structures, processes, and relationships to drive participation and collaboration. They conclude that they are antecedents and precede the development of a digital platform (as '*technology assets*') within a digital transformation.

Fischer *et al.*'s (2020) study of five companies' aligned governance and business process management (BPMgmt) as an alternative for digital transformation and execution. The BPMgmt

framework proved to be a basis for how '*work is performed*' and provided a basis for addressing a digital transformation. These ranged from strategic alignment, governance, methods, information technology, people, and culture. They found that all companies constantly cited the importance and impact of ensuring their processes drove strategic alignment and managed governance with clear rules and responsibilities.

The software development lifecycle (Mantei, 1989), in its simplest form, is broken into the three essential steps where the "*application is conceived, developed, and implemented*" (Mahmood, 1987:294). The studies touched on two significant decisions a firm makes to execute within these steps, i.e., the process to follow and who will carry out the work. While not a central focus of the study, Fichman *et al.* (2014) provided a broader definition of digital innovation and the development lifecycle. They defined it with a four-step process of (1) Discovery, (2) Development, (3) Diffusion and (4) Impact to influence the papers allocated to this grouping. As a first example, Keil and Tiwana (2006) loosely fits into the discovery phase with their study to evaluate enterprise packaged software and determine the key attributes. They established the most important attributes as (1) functionality, (2) ease of use, (3) cost, (4) reliability, and (5) ease of customisation. They also found that the firm must manage the trade-off between cost, quality, and functionality to be competitive. Yang *et al.*'s (2012) study of the emergency system at the 2008 Beijing Olympics established design principles to apply within the development phase of an integrated information platform. The authors identified participatory design (PD), software prototyping and component-based development as critical to the success of this digital platform. Berente *et al.* (2019), through an analysis of twenty-six case studies, provided a framework and theoretical explanation of employees' responses to large-scale enterprise system (ES) implementation. The authors presented a comprehensive understanding and recommendations to overcome resistance (congruent or institutional) in the diffusion of new technologies. Jiang *et al.*'s (2018) study looked a diffusion from the perspective of herding as social behaviour, i.e., whether users will follow predecessors' actions when selecting a digital platform. Their findings also focus on how moderators increase, e.g., through a digital platform's market share or decrease through regulation, among others, to influence adoption within peer-to-peer lending platforms.

This grouping includes studies that look at the structure in the Software Development Lifecycle (SDLC) process and on aspects around '*who*' executes. Ceccagnoli *et al.*'s (2012) research into 1210 Independent Software Vendors (ISVs) determined they will see an increase in sales and potential of an Initial Public Offering (IPO) by joining a digital platform ecosystem to co-create

value with the platform owner. Parker *et al.* (2017) looked at the decisions by firms on the level of openness, as a design characteristic of their digital platforms, to '*spur*' innovation. They demonstrated that this approach could '*invert the firm*,' i.e., shifting the balance to more externally generated innovation and value creation. As a strategic choice, it facilitates access to knowledge, skills and innovation from external development and allows potential spillover from one '*developer*' to another over time. Ye and Kankanhalli's (2018) study on mobile phone platforms highlights the importance of the user's perspective to help with the innovation challenges that firms face. They established that user-driven innovation is positively affected by '*lead*' users on a platform and provided the technology (toolkits) and policies/rules to enable it.

In summary, the literature captures critical insights into important aspects of the development process and the impact of '*who*' executes. In particular, we see the focus on integrating external development into the SDLC and the governance to manage throughout.

[G] Social-Technical effectiveness – the penultimate group provides insights into impacts on the efficacy of stakeholders participating in digital platform and ecosystem development. The lens of '*actor*', applying the socio-technical model of system development (Lyytinen & Newman, 2008), provides the common focus in the grouping. In this case, the term '*actor*' covers all stakeholders that design, develop or use the digital platform (Lyytinen *et al.*, 1998). These papers address a broad range of aspects connected to '*actors*' that include but are not limited to skills, shared values, beliefs, knowledge creation and sharing. Andersson *et al.*'s (2008) study of the Swedish transport industry developed a theoretical model illustrating the importance of '*collective effort*' and interaction between developers to create architectural knowledge. Tiwana (2010), looking into outsourcing projects, found that both formal control (pre-specification of the clients' needs and outcomes) and informal (sharing of values and beliefs) mechanisms influence the interaction between client and IT vendor. Lyytinen *et al.* (2016) build on this work by distinguishing four types of innovation networks, supported by digitisation, each with different ways to identify, share, and assimilate knowledge based on interactions between '*diverse actors*'. Tiwana and Kim (2016) studied the concept of '*concurrent IT sourcing*' to understand what gives rise to improved performance of the IT output. They identified a bi-directional mechanism that creates knowledge-sharing through interaction to understand the "*idiosyncratic nuances of the client's internal operations*" (Tiwana & Kim, 2016:125). Anderson *et al.*'s (2018) study of distributed product development identified integration and coordination strategies that include decision-making ownership, colocation of resources, and systems to help with coordination.

In summary, the studies in this conceptual grouping provide another view of digital platform development from the lens of '*actors*'. Their involvement and interaction have a vital influence on the skills, shared values, beliefs, knowledge creation and sharing to improve the effectiveness of development activity.

[H] Digitisation – the last conceptual grouping identifies those studies that in some way explain the embodiment of '*digital*' capability into products and services. Yoo *et al.*'s (2010) influential paper on digital innovation provides a broad definition of digitisation - "*the encoding of analogue information into digital format. Digitization makes physical products programmable, addressable, sensible, communicable, memorable, traceable, and associable*" (Yoo *et al.,* 2010:725). Despite not being the main focus of the papers in the group, it gives insights into what it is and how it may inform the strategy for the firm. Yoo's (2010) paper on experiential computing and the examples of the iPhone and Kindle highlight the potential to embed digital capability that facilitates price and performance improvements. Lyytinen *et al.* (2016) highlight that digitisation provides the opportunity to '*radically reconfigure*' a firm's products or services. Their example of the City Car as part of an '*intelligent transportation service*' viewed the transformative potential of embedding digital capability into many aspects of the traditional car design. Finally, Fichman *et al.* (2014) broaden the definition to '*digitalisation*' in their paper on platform governance. This expansion encompasses the impact of digitising processes that provide '*malleability*' and tailoring capability as additional areas of digital innovation.

The following sub-sections capture the final step of the KJ Method (Scupin, 1997) to present the analysis and interpretation of the conceptual groups. The critical assessment determines the gaps, limitations, and opportunities in the current research to derive the research problem (Section 2.4.4) that leads to the research question (Section 2.4.5).

2.4.3   Critical assessment

Mapping and classification provide an extensive view of the current knowledge in digital platforms. The literature, as expected, is extensive in many aspects of its impact on organisations, their strategy, and goals. The assessment process utilised two steps to complete the critical evaluation of the literature to support identifying the research problem (Section 2.4.4). The assessment process was iterative for each literature round until each was complete (Boell & Cecez-Kecmanovic, 2014), following these steps:

(1) *Identifying the value and strength*s – capturing a description (or narrative) and evaluating the themes and groups from the mapping and classification step. It also assesses the applicability to the research.

(2) *Identifying the literature limitations* – looking beyond the value and strength of literature in step (1) to outline the gaps, what the authors overlook, and questions that emerge that create the research opportunity. Highlighting the gap between what is known and what is needed to know in the form of critical knowledge gaps is the key output from this step (Webster & Watson, 2002).

Identifying the value and strengths – an extensive integrative analysis yielded eight broad conceptual categories heavily influenced by the perspectives of designing a digital platform (Rousseau *et al.*, 2008; Denyer & Tranfield, 2009). Looking more closely at the literature about digital platform design, we can further reduce the groups into three primary design domains through interpretative synthesis (Rousseau *et al.*, 2008; Denyer & Tranfield, 2009) – Figure 2.6.

To aid in the explanation, a definition of each follows with a description of its value and importance to realising outcomes. A few illustrating examples from the literature support these three thematic groups to complete the identification step.

(1) Digital Design Strategy - the first category groups the literature whose central theme presents research into business-level outcomes connected to '*digital-based*' strategy activities, processes and capabilities that inform a firm's own digital strategic direction (Hamel & Prahalad, 2005). The ***value*** of this literature is providing various perspectives to enable digitisation, i.e., embodying '*digital*' capability into products and services that can form the central tenet of the firm's strategic direction. Woodard *et al.* (2013) illustrated this with the proposed conceptual model to formulate and execute a '*digital business strategy*'. For an organisation, the authors offered the critical elements of '*design moves*' as strategic actions to grow the firm's '*design capital*' and create "*digitally-enabled products or services*." (Woodard *et al.*, 2013:538).

In addition, the literature presents the ***importance*** of the strategic focus on *competitiveness outcomes*. Driven by strategic design choices in the digital platform's architecture and configurations to make it '*hard to imitate*', they become a source of the firm's '*differentiation*' (Kazan *et al.*, 2018).
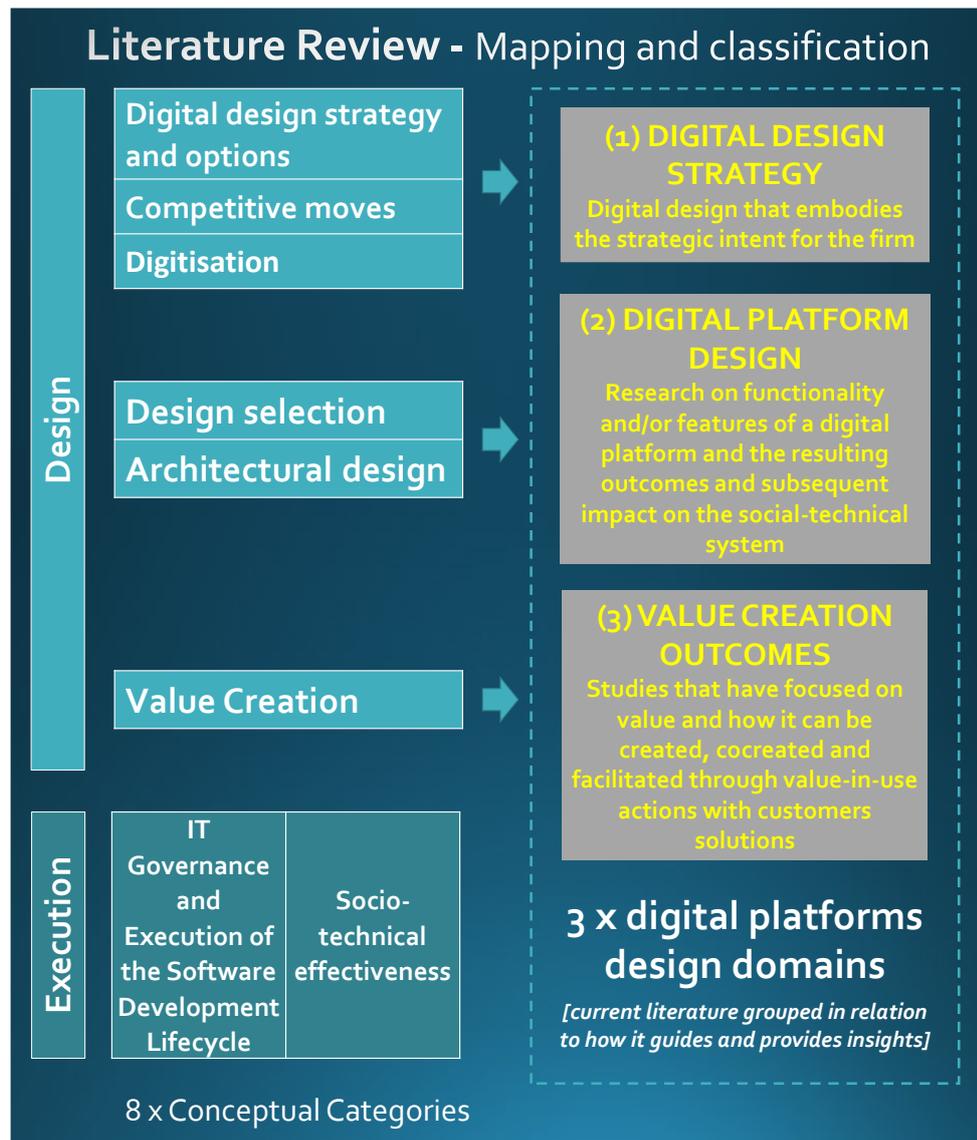
Figure 2.6 Consolidation of Conceptual Categories on Digital Platform Design

(2) Digital Platform Design - the second research domain revolves around functionality, features, the architecture of a digital platform, resulting outcomes and the subsequent impact on the socio-technical system (Lyytinen *et al.*, 1998; Lyytinen & Newman, 2008; McLeod & Doolin, 2012). It provides **valued** direction by demonstrating the effect of critical digital platform-based choices and their connection to business outcomes. The architectural dimension in this collection of papers also provides **essential insights** into aligning the components within the digital platforms' design hierarchy (Clark, 1985). As highlighted earlier, the highly impactful work of Ghazawneh and Henfridsson (2013) on '*boundary resources*' and Tiwana *et al.*'s (2010) seminal work on platform evolution provides food for thought about digital platform design choices when considering functionality or features.

(3) Value creation Outcomes - studies in the third domain focus on value creation, co-creation and facilitating '*value-in-use*' within customer solution design (Grönroos & Voima, 2013). While the value literature itself is extensive, several specific and important areas to consider for digital platform design are examined. The criticality of designing interaction and involvement of stakeholders to generate value shows the literature's ***importance*** to what a digital platform would need to deliver for the firm. The second important theme is measuring value and its application to the design process. The research highlights the impact of '*value*' measures such as user acceptance and satisfaction as essential design requirements or outcomes.

Similarly, design choices on a digital platform also need to consider the sought value type, i.e., functional, social, emotional, epistemic, or conditional (Suseno *et al.,* 2018). Another **critical** stream examined in the literature is making financial-based decisions and modelling IT investments to realise value. Examples from Taudes (1998), Fichman (2004) and Khan *et al.* (2013) presented the potential of different aspects of '*options*' modelling to help a firm in their decision-making process from a financial perspective.

In summary, we see that the literature can inform an organisation's design for a digital platform. A firm looking to transform its business will require, first, a strategic direction and second, a view of the functionality and features of its platform. Understanding and delivering value then presents the third key component to target desired outcomes. The large body of research within these three important domains illustrates a concentration and strength in the literature on the '***what'*** for a firm's digital platform design. In other words, from the perspective of digital platform design, the research informs very solidly what needs to be done by the firm.

However, when we position this in the broader context of digital transformation, we find that a large number of organisations struggle to digitally transform, with less than 30 per cent succeeding (De la Boutetière *et al.*, 2018). Digital platform-based transformation presents more challenges with the ever-increasing demands from customers regarding experience to raise the bar on what they must deliver in value and competitive advantage (Ehrlich *et al.*, 2017). So, why is this the case, given the strength of the literature in digital platforms? The second assessment step reflects on potential limitations and gaps that would allow this study to explore answers to help in the challenge of digital transformation.

Identifying literature limitations (building on step (1)) – understanding the gap between what is known and what is not known, seen as critical knowledge gaps, is the key output from this step (Webster & Watson, 2002). Applying a process model approach to digital platform design

allowed a deeper look into literature from the perspective of events and outcomes to identify gaps (Langley, 1999; Van de Ven, 2007). As an event-driven approach, the current research is sparse on **how** to make the best design choices about the configuration of the digital platform to realise targeted design outcomes. This was confirmed in more recent studies on the lack of clarity on how to design platforms from a service perspective (Hein *et al.*, 2018) and others, such as the under-research in the process of digital transformation strategising in the public sector in Sweden (Khriso, 2021).

We also find few studies extending to the architectural level of the digital platform to help explain how design choices impact outcomes. By way of example, Yoo *et al.*'s (2010) influential work on the '*layered modular architecture*' identified four loosely connected layers and contended that their designs are somewhat independent of each other. What is unaddressed in this study is how to achieve integration, which then presents an opportunity to assess if dependency impacts performance. Rai *et al.* (2006) created a similar predicament when they discussed '*unbundling'* information and data from the physical flow of products to achieve a higher order of capability in supply chain integration. What is missing from their insights is **how** to achieve '*unbundling*' through digital platform design at the architectural level to result in significant and sustained performance?

Similarly, this weakness applies to **how** to design choices on a digital platform to change the '*functional relationships*' between digital artefacts that impact appearance, form, value, and utility (Kallinikos *et al.*, 2013). Final examples of gaps show when designing coupling levels (Brunswicker *et al.*, 2019) and making a digital platform open to co-creation (Kazan *et al.*, 2018). Both provide the impact of the design decisions but no insights into *how* to choose. Consequently, several questions begin to emerge:

(1) **What** is '*in the choice*' of technology-based change in a digital platform to cause an outcome?

(2) **Why** does a particular design choice lead to an outcome for a digital platform?

Therefore, providing insights into **how** a firm should go about a digital platform design.

The gaps in the literature presented an opportunity to explore a deeper understanding of these choices in a digital platform context. In the broader context answering these questions could positively influence a firm's digital transformation and provide additional insights to guide change, a phenomenon still in its infancy (Vial, 2019). This indicates the potential importance of

the study if it can provide insights to increase the likelihood of success in these digital transformations, something explored in the next section (2.4.4) on the research problem.

2.4.4   Research problem

Positioning the proposed problem and the motivation for the study requires looking first at where it fits in a '*real world*' sense of digital transformation (Van de Ven, 2007). MIT Sloan's 2018 online survey (1793 participants) conducted with McKinsey found that '*digital transformations are even more difficult*' than organisational transformations. A simple search for '*digital transformation failure*' yields a wide range of reports, blogs, and industry-based studies, thus indicating the size of this problem and possible reasons for its occurrence. Recent high-profile struggles include GE, Lego, Nike, Proctor and Gamble, Ford, Sony, PlayStation Home, Garmin's NuviPhone, Johnson Controls' Panoptix for energy efficiency and Burberry, among others, all showing the complexity of achieving this shift towards digital transformation (Van Alstyne *et al.*, 2016; Davenport & Westerman, 2018; Brunswicker *et al.*, 2019). A firms' expectation for a digital transformation would typically be enhancing either or both value capture (revenue and profits) and the value created for their customers (Zott *et al.*, 2011; Massa *et al.*, 2016). Nevertheless, simply saying '*we need to become digital*' does not always result in the expected level of digital transformation enhancing the organisation's business model.

Looking closely at the literature, we see that the digital platform is a central '*building block*' (Vial, 2019) and a critical digital transformation element (Sebastian *et al.*, 2017; Bogea Gomes *et al.*, 2021). Therefore, we could consider a transfer of focus from digital transformation to designing more impactful digital platforms. In other words, it could provide potential sources of improving success by understanding the connections of how one can affect the other. The motivation for the research is to provide some additional insights from digital platforms as it centres around this '*real world*' problem (Van de Ven, 2007).

Thesis core argument – Based on the challenges faced by firms executing on digital transformations, the current research does not provide all the answers on successfully embedding technologies into a firm's digital platform and business model (as the core ***problem statement***). However, from the critical assessment, there is both a concentration and strength in the research informing the firm's design direction for the digital platform and overall transformation. At first glance, this seems at odds with the presence of challenges in various digital transformation efforts. However, with a gap in the research about ***how*** to make design choices on crafting a digital platform and ***why*** they impact outcomes (as the ***research problem***), we can infer that answering these questions could improve the potential for a successful digital

transformation. A hypothesis, therefore, emerges that some of the challenges of digital transformation could theoretically come about due to architectural choices in the digital platform. This leads us to the simple question: *What differentiates one choice to another?* This question's insights and answers could help organisations approach these challenges more confidently, thus motivating the research.

With the research problem set, the development of a research question and set of objectives was next in the process. A theoretical lens (or framework) provided a basis for the digital platform design choice as an '*action*' wherein the outcome is the impactful design to formulate a research question fully.

2.4.5   Research question and theoretical framework

Before crafting the research question, selecting an appropriate theoretical lens to help study the research problem is essential. With many potential choices, choosing a theoretical framework determines how the study will look at the research problem and offer explanations as we try to solve it. Consequently, it also influences the research design and data collection and analysis to reinforce its importance. With these perspectives, a literature search yielded the seminal work on '*generative mechanisms*' by Henfridsson and Bygstad (2013). While somewhat limited in its application in the literature, it provided a means to challenge and expand academic research on digital platforms. With this in mind, it presented the best way to enable new theoretical insights on digital platforms and why one design choice on a digital platform is different to another in its outcome to another while also striving for originality (Corley & Gioia, 2011).

Generative mechanisms are defined "*as causal structures that generate observable events*" (Henfridsson & Bygstad, 2013:911). As a primary theoretical framework (or lens) to explore digital platform design outcomes, it uncovers plausible explanations surrounding choice. A generative mechanism is an inherent property or characteristic of an object or action that possesses the '*power*' to cause or enable a change event and outcome (Sayer, 1992). The power exists whether it is activated (actualised) or not, i.e., there is internal potential within the action to generate the event (Pawson & Tilley, 1997; Archer *et al.*, 1998). The search for generative mechanisms is the most plausible explanation of causality (i.e., why we observe what we observe) amongst the indicators, correlations, co-incidental or spurious associations we find in the empirical data. Searching for plausible patterns behind observable events (Mingers, 2004), changes or outcomes, is how we identify the mechanisms that *'explain'* and *'endure'* (Mingers & Standing, 2017). It is further strengthened as an approach because the contextual conditions

in which the mechanism works would impact its effectiveness (Sayer, 1992; Pawson & Tilley, 1997) – Figure 2.7.

Applying this lens to digital platforms has led to the potential contribution of identifying and categorising impactful generative mechanisms. Identifying the mechanisms inherent in the choices can provide insights and explanations to explain *'why we observe what we observe'*. Overall, the following research question emerged addressed through the study:

> **For a digital transformation within financial services, how do enabling mechanisms influence the design choices of a digital platform?**

Adopting a '*configurational perspective*' from Pawson and Tilley (1997) means using their context-mechanism-outcome (CMO) scheme as the basis for analysis (Figure 1.2). They applied the influential studies of Hedström and Swedberg (1996) to conceptualise the casual paths and to illustrate that in specific contexts that outcomes can be traced back to a specific (or combination) of mechanisms (Henfridsson & Bygstad, 2013). The purpose, therefore, of this qualitative case study is to develop a deeper understanding of the design choices within the transformation of a digital platform. Within the single case of HPEFS's digital transformation between 2013 and 2019, I set several critical objectives to reflect the phases of the study and to achieve the purpose set :

Objective RO1)	To examine and contribute to the digital platform literature, its design and design choice treatment.
Objective RO2)	To complete a detailed investigation of the context, actions, events, and outcomes for the digital platform design (the phenomenon) within the setting of a Financial Services organisation (real-world context).
Objective RO3)	To explore and understand the underlying complexities of the critical events of the digital platform design outcomes based on a generative mechanism-based theoretical framework.
Objective RO4)	To propose a novel set of integration strategies at the architectural level that would realise the optimal design outcomes.
Objective RO5)	To provide a focused conceptual '*framework*' and set of '*design principles*' that guide the integration of the digital platform layers to generate value within the context in which it sits.

I translated the research objectives into specific sub research questions, Table 2.8, and subsequently operationalised them as part of the research design (detailed in chapter 3). Their establishment answered the main underlying elements of the leading research question.

	Sub-Question	Why selected
Sub RQ-1	How do generative mechanisms explain Information System (IS) change?	To gain a deeper understanding of the critical theoretical element to apply to the study
Sub RQ-2	How does context impact the type of design choices?	To understand the organisational driven reasons for the design changes.
Sub RQ-3	What conditions are essential to enabling an impactful technology-driven change?	To gain better insights into the situations that enable more impactful change.

Table 2.8 Research sub-questions

2.5   Theoretical Contribution

The study's contribution aims to improve theoretical understanding and address the knowledge gap identified in the literature (Webster & Watson, 2002). This study clarified critical elements of the digital transformation process as it centres on digital platforms. Figure 2.7 summarises the study's application of generative mechanisms to the digital platform domain and the design perspective. An expanded and more detailed outline of the contributions in Chapter 6 provides a basis for the implications for practice.
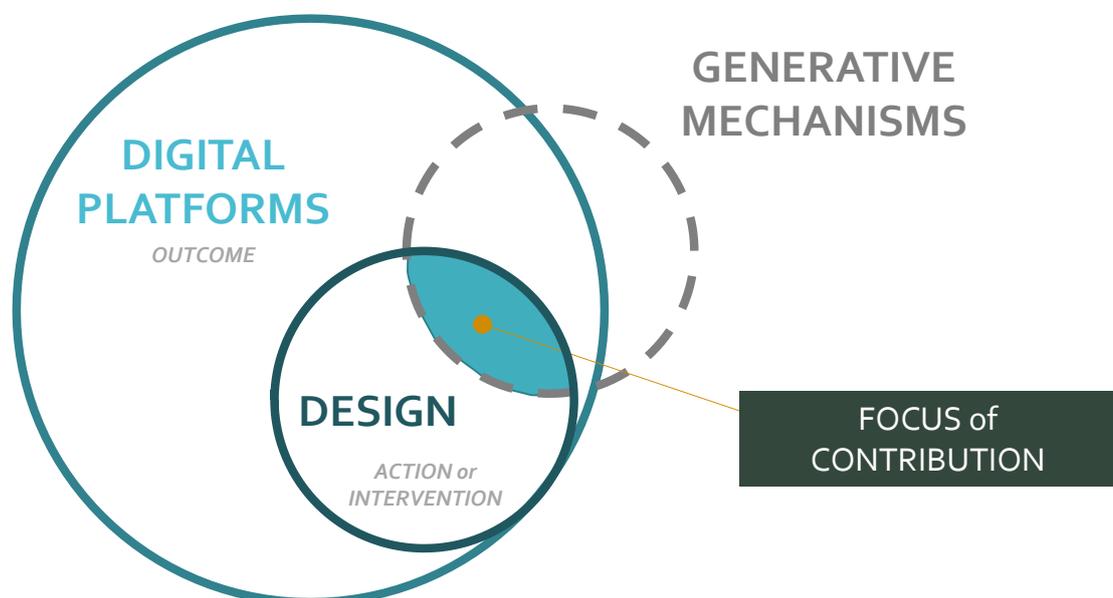
Figure 2.7 Focus of Contribution

In summary, the contribution demonstrates a configurationalist perspective characterising the enabling mechanisms in a digital platform, deemed to be core and proprietary to an organisation to:

(1) Extend the work of Henfridsson and Bygstad (2013) by identifying contingent mechanisms that underpin the design choices at the architectural level of a digital platform and the outcomes they influence. The mechanisms form the basis of the answer as to "***what*** *differentiates one choice to another?*"

(2) Contribute to the digital platform literature by increasing the application of generative mechanisms to provide a deeper understanding of different activities within a digital transformation. In other words, to address the knowledge gap about ***why*** a design choice leads to an outcome for a digital platform.

(3) Propose a conceptual framework and model for integrative mechanisms in a digital platform at the architectural level. To provide '*practical utility'* (Corley & Gioia, 2011) by identifying a method of ***how*** to make design choices, built on the contributions (1) and (2) above. The model provides a challenge to extant research on digital platforms to suggest it should expand beyond the ***what*** of design outcomes (Alvesson & Sandberg, 2011).

(4) To further contribute to (3) by outlining a set of digital platform design principles that can guide a firm's efforts in digital transformation.

2.6   Chapter Summary

This chapter presented the hermeneutic framework (Boell & Cecez-Kecmanovic, 2014) undertaken to complete a structured literature review. The process is built on mutually intertwined major hermeneutic circles of '*search and acquisition*' to attain information from the literature and '*search and acquisition*' to strive for understanding. Based on ***121*** high and medium relevant papers, more detailed analysis and subsequent critical assessment of digital platforms allowed for formulating a research problem and subsequent research questions.

The shortcoming in the digital platform literature centres on the process of formulating design choices. In effect, the research is to determine and understand the critical characteristics of these choices through a generative mechanism lens that can explain how design inputs connect to their realised outcomes. This will provide valuable insights given the importance of digital platforms and their influence on digital transformations (Sebastian *et al.*, 2017; Vial, 2019; Bogea Gomes *et al.*, 2021). The next chapter builds from here to outline the critical choices in the design of the research.

3   Research approach and methodology

3.1   Introduction

The goal for any researcher is to produce original knowledge, to help explain what we do not understand, and to generate insights that are useful in a practical way (Corley & Gioia, 2011). Conducting an empirical study within an existing body of knowledge can facilitate addressing problems in practice and provide solutions and insights to design appropriate solutions (Denyer & Tranfield, 2009). Theoretically this requires a rigorous methodology with a high degree of practical relevance, which can be described as '*pragmatic science*' (Hodgkinson *et al.*, 2001) or '*pragmatic management research*' (Tranfield *et al.*, 2003). The research design strategic decisions followed Saunders' research onion principles, Figure 3.1 (Saunders *et al.*, 2019:130). This was chosen as it provides a framework for discussion and guided decisions in a logical sequence going through each layer.
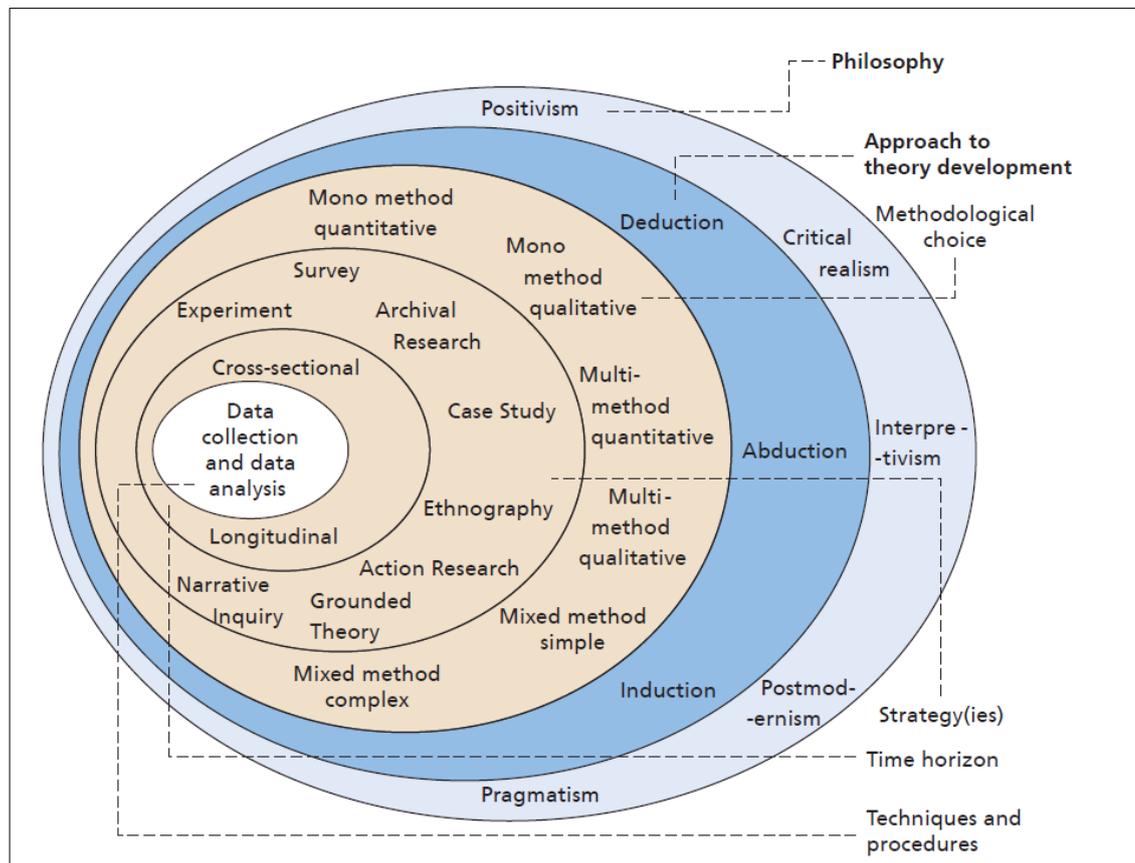
Figure 3.1 Multi-layered 'Research onion' (reference: Saunders et al., 2019:130)

The chapter is structured (Figure 3.2) to explore an understanding of the options layer-by-layer with justification for selection at each point. Considerations at each stage are based on the decision at the preceding layer to allow consistency of logic throughout. This reflects the

interdependence and interconnectedness between the layers to ensure an effective research design. From the research question, appropriate choices are made to facilitate the generation of an answer and to align the procedures accordingly (Bono & McNamara, 2011). The initial decisions are around the critical areas of research philosophy and theory development (Section 3.2). The methodological choice proceeds by exploring the research strategies (Section 3.3). The final part of the chapter outlines the activities taken for data collection and analysis (Section 3.4 and Section 3.5) and concludes with a summary of the research design strategy (Section 3.6).
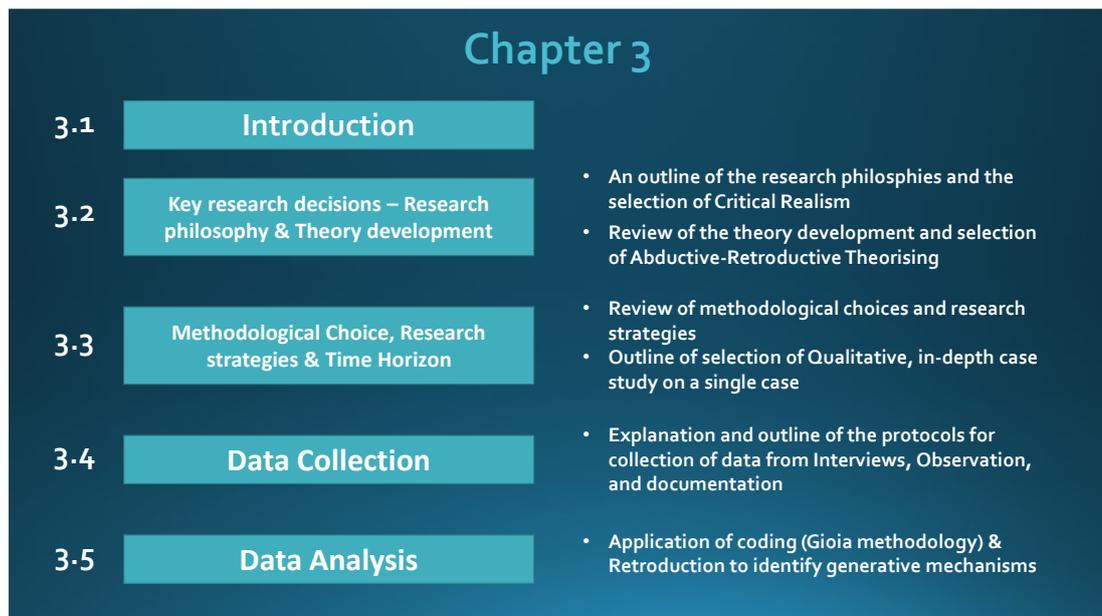
Figure 3.2 Overview of Chapter 3 – Research approach and methodology

To help navigate the chapter, Table 3.1 reflects the specific choices made, staying true to Saunders *et al.'s* (2019) research onion.

Section	Level	Approach
3.2.1	**Interpretative Framework (Philosophy)**	**Critical Realism**
3.2.2	**Theory Development**	**Abductive-Retroductive Theorising**
3.3.1	**Methodological Choice**	**Multi-method Qualitative**
3.3.2	**Strategy**	**In-depth CASE STUDY on Single Case**
	Time Horizon	**Longitudinal data from 2013 to 2019 (7 yrs)**
3.4 – 3.5	**Techniques and procedures**	**3.4 Data COLLECTION** – Interviews, Observation, and documentation **3.5 Data ANALYSIS** – Grounded analysis through Coding (Gioia methodology)

Table 3.1 Research Design summary

3.2 Research philosophy and Theory development

3.2.1 Research Philosophy and adopting a Critical Realism perspective

As with many research students, the first step to looking at research philosophy proved difficult with so many choices, each with its own merits. The philosophy will determine where the researcher believes the truth lies in terms of reality and the existence of knowledge (Saunders *et al.,* 2019). Making a considered selection on one or more positions will have implications for research design and areas such as the direction, purpose, goals, and outcomes (Huff, 2009; Creswell & Poth, 2018). It will also provide the means to interpret, determine relationships, and understand the consequences of what it found (Van de Ven 2007). To better explore the personal assumptions and beliefs that we bring to our research question requires looking more closely at the "*various theoretical and interpretive frameworks that enact these beliefs.*" (Creswell & Poth, 2018:15).

The research philosophies can be interpreted and understood based on their ontology and epistemology beliefs as central components of these frameworks. "*Ontology considers "what exists".*" (Huff, 2009:108). In other words, ontology reflects the researcher's beliefs and assumptions on what '*type of truth exists'* (Saunders *et al.,* 2019) or the '*nature of the phenomenon'* being studied (Van de Ven, 2007). Ontological beliefs can range from being only a single reality or truth to multiple realities constantly interpreted.

Epistemology beliefs centre on "*how we gain knowledge*" (Van de Ven, 2007:38), "*methods for understanding it*" (Van de Ven, 2007:36), and what we "*can know about what exists*" (Huff, 2009:108). In other words, our beliefs, and assumptions about knowledge, i.e., what is seen as acceptable, is legitimate, valid in each situation, and in the best form to be communicated (Saunders *et al.,* 2019). Therefore, measuring knowledge, the proper tools that can be applied, and how best to interpret meaning through analysis are pivotal to the researchers' epistemological beliefs. The ontological and epistemological positions will also guide the methodologies selection, as explored later in the report (Huff, 2009).

The set of ontological and epistemological beliefs combine to give a research paradigm as they provide a holistic view of the study's principles on knowledge. The results of different combinations of ontological and epistemological choices are generally classified across research paradigms. A paradigm is a '*cluster of beliefs*' (Bryman & Bell, 2007) that reflects the specifics of '*what'* and '*how'* in creating knowledge in a particular discipline. However, there tends to be limited agreement about using the terms '*paradigm*' and '*philosophy*', which appear to be used

interchangeably. (Saunders *et al.,* 2019). This is particularly true as both appear to have beliefs as a common component of their definitions. Comparing the statement that "*Philosophy means the use of abstract ideas and beliefs that inform our research*" (Creswell & Poth, 2018:16) to Bryman and Bell's (2007) definition above illustrates this point. For the chapter, and to avoid further confusion, I use the term '*interpretative framework'*, with the associated philosophical beliefs and approaches within each to illustrate the decisions taken (Creswell & Poth, 2018). This allows the discussion to focus on what guides the research, whether that be a '*philosophy'*, '*paradigm'*, '*set of beliefs'*, '*theoretical orientation'* or '*theory'* (Creswell & Poth, 2018). As the list of possibilities is ever-expanding, I focus on what could be deemed to be the five more popular frameworks in the social sciences, namely positivism, interpretivism, postmodernism, pragmatism, and finally, Critical Realism. (Saunders *et al.,* 2019:130). Critical Realism is the '*interpretative framework'* adopted in my studies. I outline the logic behind this selection as a suitable research framework (and philosophy) and how others do not appear to fit fully.

3.2.1.1   Positivism

A positivist perspective works on the basis that both the '*natural'* and '*social'* worlds can be observed within a set of *laws* explored and set through empirical inquiry (Saunders *et al.,* 2019). It sees social entities, such as people and structures, objectively studied using the natural sciences (Bryman & Bell, 2007). This is driven by positivists seeing them as '*real'* objects (Saunders *et al.,* 2019). Realism is the critical ontological perspective that applies, and '*science'* helps paint the researcher an accurate picture of the world (Gray, 2014). At the extreme of realism, within a positivist perspective, there is generally one true (or unique) reality to be considered about the phenomenon. Objectivism provides the foundation within a positivist framework when considering epistemology and the acquisition of knowledge (Crotty, 1998). This leads to one of the fundamental beliefs that the researcher and reality are separate, i.e., being external and independent and in a '*value-free'* way (Saunders *et al.,* 2019). Positivist inquiry rests firmly on scientific observation that gathers measurable facts, a central tenet to provide insight for the researcher (Gray, 2014). This demonstrates the alignment to a more quantitative methodological choice when adopting a positivist perspective.

Theories have a very interesting place within a positivist-based study. Careful consideration is needed as "*science does not begin from observation, but from theory, to make observations intelligible"* (Gray, 2014:21). Observations will be '*theory laden'* during a study, and the world is not a '*blank slate'* as "*Theories put phenomena into meaningful systems"* (Van de Ven, 2007:104). This may infer that theory creation is more difficult with a positivist strategy. One

way to overcome this is to "*think of it as one of erasing, inserting, revising, and re-connecting ideas scattered on many papers that are scribbled full of experiences, insights, and musings of ours and others*" (Van de Ven, 2007:104). A final aspect of the framework also pertains to theory. As one observation could contradict a targeted theory, the positivist view can only prove them false. Therefore, verifying theories as accurate is not objective in positivist research due to this uncertainty about truth (Gray, 2014). Finally, to illustrate an IS research example, the "*characteristics of strategy and a portfolio of systems that can be directly observed and measured*" (Henfridsson & Bygstad, 2013:910) would meet a positivist direction.

3.2.1.2   Interpretivism

This perspective emerged in the early and mid-twentieth century as a critique of the positivist approach and a "*term given to a contrasting epistemology to positivism*" (Bryman & Bell, 2007:16). Interpretivists contend that the physical and the social worlds we live in cannot be studied similarly (Bryman & Bell, 2007; Saunders *et al.,* 2019). The fundamental principle is that "*humans are different from physical phenomena because they create meanings*" (Saunders *et al.,* 2019:148), and studies within this view will capture this difference. More specifically, this type of research aims to look for an individual or group's interpretations of the social world (Gray, 2014; Saunders *et al.,* 2019).

Ontologically '*what exists*' (Huff, 2009) is within the meaning an individual or group gives to their experiences being studied. This richer understanding and truth are based on what is '*socially constructed*' by those being studied (Saunders *et al.,* 2019). Interpretivists must therefore manage multiple socially constructed realities, each of which can be deemed correct. Thus, driving the complexity that exists, knowing that each person has their own reality, which may, in fact, all be different, is one of the challenges of this approach. Attaining the '*truth*' from the research means focusing on things such as a person's narratives, stories, perceptions, and interpretations of the reality they have experienced (Saunders *et al.,* 2019:145). Lastly, to give an IS view, Henfridsson and Bygstad (2013) offered up how interpretivism could be applied to studies on digital platform design and evolution. They suggested it could focus on areas such as peoples '*sensemaking*' and how they interact with technology to illustrate the attention on meaning.

3.2.1.3   Post Modernism

The Post Modernism '*movement*' emerged in the mid-to-late twentieth century and is a rejection or attack on modernism. The post-modernist views lead us to accept that certainty and

long-standing realities are replaced with "*chaos, complexity, the unknown, incompleteness, diversity, plurality, fragmentation and multiple realities*." (O'Leary, 2007:212). It assumes there are no absolute truths, and the social structures that we create as a society are not necessarily true. This is evident in examples such as gender, religion, and diversity, to name but a few of the changes we have seen in recent times. Technology can play a significant role when you consider examples such as the switch to a service economy from being product-based, i.e., Spotify for music, NetFlix for movies, and how we acquire knowledge with the advent of the internet, i.e., YouTube, Google, and the digital currency of Bitcoin among others. All examples show a turning of old '*certainties*' on their head and demonstrate that nothing is sacred (O'Leary, 2007).

Researchers adopting this approach look to '*deconstruct'* existing, established, and dominant realities to highlight and expose potentially '*concealed hierarchies*' (Creswell & Poth, 2018). Moreover, they look to make what may be left out or excluded within the more prominent abstract theories and assert "*alternative marginalised views*" (Saunders *et al.*, 2019:149). Ontologically, as expected, the '*truth*' is complex, rich, and generally has a nominal-based set of multiple realities (Saunders *et al.,* 2019). Like the interpretative approach, the reality is '*socially constructed*' but with importance on language, power, power relations, and control (Creswell & Poth, 2018; Saunders *et al.,* 2019). The epistemological beliefs of the post-modernist centre on the processes of uncovering what may be seen as '*silenced'*, '*oppressed'* or '*repressed meanings*' about the truth. This is achieved by challenging the norm and exposing the power relations within these dominant realities (Saunders *et al.,* 2019).

3.2.1.4 Pragmatism

Pragmatism is a *'school of thought'* that emerged from American philosophers in the late nineteenth to the early twentieth century (Van De Ven, 2007; Gray, 2014). It "*asserts that concepts are only relevant where they support action*" (Saunders *et al.,* 2019:151). More specifically, the focus is on practical outcomes and consequences of the research study. (Gray, 2014; Creswell & Poth, 2018; Saunders *et al.,* 2019). A pragmatist would not see the insights as an actual reality if the insights do not have a practical utility. As a research framework, it also is viewed as one that should lead to positive results for society, thus emphasising where the value lies (Van de Ven, 2007; Gray, 2014). Ontologically, truth or reality is based on what guides successful action and prediction (Van de Ven, 2007). It is therefore embedded in the "*practical consequences of ideas*" (Saunders *et al.*, 2019:145).

Van de Ven (2007) outlined that meaning will arise from this more profound understanding of the connection between '*ideas*' and '*action*'. In turn, the researcher will need to be cognisant of

the temporal nature of reality within a pragmatist approach, i.e., "*Truth is what works at the time"* (Creswell & Poth, 2018:27). Careful thought is required as the research knows what drives results will invariably change over time. There is, therefore, a '*flux'* in what is deemed true from one period to another, which governs that reality will also be both complex and rich (Saunders *et al.*, 2019). Put another way, the current '*truth'* is a function of the current empirical data that best answers the question. From the epistemological standpoint, a pragmatist will see the research problem as the most critical determinant of the research design approach (Saunders *et al.,* 2019). Therefore, they have the freedom to select methods and techniques that best suit the study's needs and purpose. A pragmatist is not locked into any philosophy or methodological strategy as it is about solving the problem (Creswell & Poth, 2018).

3.2.1.5   Critical Realism

As outlined earlier in the chapter, the adopted '*interpretative framework'* is that of Critical Realism. I will start with a comprehensive explanation of Critical Realism to build a solid foundation for the theory development approach and methodological choice. To complete the narrative, I conclude with an outline of its selection coupled with a commentary on the exclusion reasons for the others.

Critical Realism originates from the 1975 launch of Roy Bhaskar's book, '*A Realist Theory of Science'* (Bhaskar, 2008). It acts as a middle ground between '*positivism'* and '*relativism'* (Van de Ven, 2007; Saunders *et al.,* 2019). It was claimed that Critical Realism could combine what are opposing perspectives and successfully bring together "*ontological realism, epistemological relativism, and judgmental rationality*" (Archer *et al.,* 1998:xi). It emphasises "*explaining what we see and experience, in terms of the underlying structures of reality that shape the observable events*" (Saunders *et al.*, 2019:147). More precisely, the critical realist is looking for '*causal structures'*, '*causal explanations'*, '*mechanisms'*, and insights to provide the explanation sought (Wynn & Williams, 2012; Henfridsson & Bygstad, 2013; Williams & Karahanna, 2013; Saunders *et al.,* 2019).

From the ontological perspective, the critical realist views assume the world is real and that this is separate from how people experience, see, and perceive it (Williams & Karahanna, 2013; Zachariadis *et al.,* 2013). In more basic terms, reality does exist, but it does not depend on people's perception of it, i.e., it is external and independent. The ontological beliefs are represented by "*three domains: the real, the actual, and the empirical*" (Zachariadis *et al.*, 2013:857). These are also '*nested'* within a stratified layer structure (Figure 3.3) to represent how each fit and aligns. The '***empirical***' inner layer is what the researcher sees, observes, or

experiences. These observed events are a subset of the '***actual***' events that have occurred (Williams & Karahanna, 2013; Saunders *et al.*, 2019). The outer layer is the complete picture of '***real***' i.e., it "*includes all physical and social entities (i.e., structures) that independently exist and their inherent causal powers (i.e., generative mechanisms) which may be activated in a specific context*" (Williams & Karahanna, 2013:935) as such reality is not directly accessible through observation. A good example to illustrate these concepts are the printed advertisements on a rugby field. On the television, the advertisements look correct to the eye due to the angle and position of the camera (i.e., what you observe). The reality, however, of what is painted on the rugby pitch is very different. Saunders *et al.* (2019) show that what we see are representations (the empirical) of what is real and that our senses can deceive us.
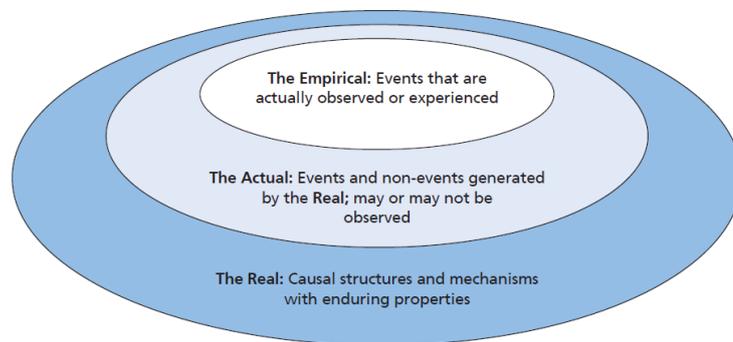
Figure 3.3 The Critical Realism stratified ontology (reference: Saunders et al., 2019:148)

Critical Realism's epistemological beliefs are '*interpretivist in nature*' that will be inherently subjective due to the '*empirical*' representing a portion of the actual events that occur (Van de Ven, 2007; Williams & Karahanna, 2013). Developing understanding is seen as a two-step process for the critical realist. Initially, it requires a deep focus on the events experienced to ensure full facts are attained. The second step is to '*reason backwards*' to identify the underlying cause. This is often described and referred to as '*retroduction'* by critical realists (Saunders *et al.*, 2019:147). Furthermore, the researcher gathers and infers this knowledge "*inferred by explicitly identifying the means by which structural entities and contextual conditions interact to generate a given set of events.*" (Wynn & Williams, 2012:787). [*Note: discussion in Section 3.2.3 will outline the often-interchangeable theorising of 'retroduction' and 'abduction'*].

3.2.2 Critical Realism as a selected framework

Similar to the aspirations of all research studies, I set the goal of producing knowledge that is original and useful in a practical way (Corley & Gioia, 2011). Having spent time delving into some of the more popular interpretative frameworks, Critical Realism is the best match to my own

beliefs and assumptions for defining reality. That is not to say it is better than the others, as each has its merits. It came down to where I felt it best aligned with the research question:

For a digital transformation within financial services, how do enabling mechanisms influence the design choices of a digital platform?

My consideration starts with a digital platform and, more specifically, with the design choices the organisation must consider to transform. This can be viewed as '*real*' and objectively studied as an outcome (Saunders *et al.,* 2019). Observable and measurable facts on these designs and changes over time lend themselves to a positivistic, pragmatic, or Critical Realism (ontologically) perspective for the study. The words '*design choice*' in the research question play an essential part in the framework selection. The resulting digital platform designs would seem a good fit with the ability to apply both realism and objectivism interpretations readily. Ontologically, the '*truth*' is rich and complex, where the researcher can be separate and external to the study. With the added desire to ensure a practical utility to the knowledge created in the study. This could potentially lend itself to a pragmatic view where the focus on relevant findings primarily drives useful actions (Creswell & Poth, 2018; Saunders *et al.,* 2019). This is particularly true as the design choices are the main observable event. If we now consider an interpretivist view, there are shortcomings to their beliefs for this part of the research goal, i.e., a lack of a realist perspective. Interpretivists would struggle to capture the true and full nature of the events and design choices as '*real*' objects, given their focus on meaning (Saunders *et al.,* 2019). Consequently, this led to its exclusion as a candidate framework in the study.

One of the study's goals is to determine the events (design choices) that help realise this evolution as step one (above). From here, I subsequently work back in a second step (Bygstad *et al.,* 2016) to study and explore in-depth the underlying mechanisms that are common, repeating, or unique. This reflects the central theme of the study, embodied in the research question, namely '*enabling mechanisms'*. Ontologically, the mechanisms that guide human choice for a design will not be a '*real*' or physical object (Saunders *et al.,* 2019). In this case, mechanisms reflect an '*internal potential*' in the socio-technical system to generate an outcome or event (Pawson & Tilley, 1997). From the epistemological standpoint, this potential cannot be truly observed, and it will be challenging to establish measurable facts that can be gathered. The '*causal powers*' within the mechanisms, under scrutiny, capture "*what 'makes it happen', what 'produces', 'generates', 'creates' or 'determines' it"* (Sayer, 1992:104). Causal mechanisms are a social construct as it denotes the perceptions, interpretation, and meaning of those that

experienced it (Sayer, 1992). Therefore, the positivist and pragmatic approaches can be excluded, given the central position of mechanisms in the study.

Furthermore, a mechanism can be present but unactualised (Archer *et al.*, 1998) and potentially not have perceived utility. This could present an additional issue for pragmatists, primarily focusing on practical outcomes and realised action. Critical Realism fits well with the research question with its interpretivist epistemology. As previously explored, it is due to the premise that there is a subjective-ness in the '*empirical*' layer (observed events) representing a portion of the actual events (Van de Ven, 2007; Williams & Karahanna, 2013) – Figure 3.3.

There is good potential in the post-modernist approach as it focuses ontologically on multiple realities, the complexity, and the richness of truth. All of which present a fit with the focus on mechanisms. It feels, however, more occupied and suited to subjects where the dominant realities may have power and control that the researcher may want to lessen or challenge (Creswell & Poth, 2018; Saunders *et al.,* 2019). It seeks to find "*alternative marginalised views*" (Saunders *et al.*, 2019:149) and on uncovering '*silenced'*, '*oppressed'* or '*repressed meanings*' about the truth through deconstruction and exposing these suppressions. Examples include diversity, gender, race, sexuality, and ethnicity. Based on the literature, mechanisms within digital platform design could still be viewed in their infancy compared to some of these domains. Within digital platform design and evolution, there would not appear to be any major dominant realities that cause oppression or silence, so the conclusion was to exclude this approach. While not applying post-modernistic thinking, it may be prudent to understand some of the methods to '*deconstruct*' and '*challenges*' that post-modernists employ that allow a challenge of dominant realities in the thinking around digital platforms (Creswell & Poth, 2018).

Critical Realism fits well with each part of the research question and is the assumed interpretative framework adopted for the study. A critical realist approach helps make the connection from mechanism to an event (or outcome) is the primary reason to select this approach. This is made possible by it being "*able to combine and reconcile ontological realism, epistemological relativism and judgmental rationality.*" (Archer *et al.,* 1998:xi). Haskamp *et al.* (2021) outlined that Critical Realism can also advance research in this area with its ability for multi-level analysis and how it helps provide an understanding of both change and transformation. A final part of the exploration into choice shows consistency with the other scholars who have utilised a critical realist perspective for similar types of IS research into areas such as digital platforms and infrastructure (Henfridsson & Bygstad, 2013; Williams & Karahanna, 2013; Bygstad *et al.*, 2016; Øvrelid & Bygstad, 2019).

To conclude, a critical realist perspective allows for an appropriate and comprehensive exploration of the mechanisms to drive platform design and evolution. It has subsequently influenced the suitable research methodological choices and strategies explored in the following sections of the chapter.

3.2.3 Approach to Theory Development

Theory development and the reasoning approaches therein are the next stage in the research design strategic decision process. Continuing with the principles of the Saunders' research onion, Figure 3.1 (Saunders *et al.*, 2019:130), three logical reasoning approaches underpin theory development. Van de Ven (2007) contends that theory-building involves all three that are iterative, non-linear, and build on each other towards a proposed theory. The first of these reasoning approaches is abduction, which is creative and focuses on the conception of the new. "*Abduction is an inferential procedure in which we create a conjecture that, if it were correct, would make the surprising anomaly part of our normal understanding of the world.*" (Van De Ven, 2007:101). It is usually triggered by some '*surprising fact'* or unexpected occurrence that is observed or experienced (Van de Ven, 2007; Saunders *et al.*, 2012; Mingers & Standing, 2017). This can be viewed as a consequence of '*something',* and the researcher would then construct reasons to explain why this occurs. It then requires subsequent testing and retesting through additional data to build a set of conclusions (Saunders *et al.*, 2012). It is a method of reasoning suited when there is a richness of information in one context but much less in the one under scrutiny, where creativity will help identify possible solutions (Saunders *et al.*, 2012).

The next activity is constructing or elaborating on the output of the abduction process. This requires deductive reasoning to establish a testable hypothesis that can be observed (Van De Ven, 2007; Saunders *et al.*, 2012; Gray, 2014). The simple goal is to confirm the hypothesis and, therefore, the theory regarding its consequences (Van de Ven, 2007). The last step is to justify and evaluate a theory through induction from the "*conditional consequences of the claim*" (Van De Ven, 2007:102) as a follow-on from the deductive step. Inductive reasoning effectively works in the opposite direction to deduction as the researcher starts with the research question, collects data, and arrives at the theory. This is generally done by looking for patterns and themes that can be abstracted into some form of generalisation (Gray, 2014). Thus, allowing the researcher to evaluate the strength of the argument and confirm the conjecture established in the abductive process (Van De Ven, 2007). This approach also allows the research to remain more open to all the possibilities that lead from the data and for additional abduction.

While not called out in the Saunders' research onion, Figure 3.1 (Saunders *et al.*, 2019:130), critical realists will reference the abduction approach as '*retroduction*', as introduced earlier. It can be interchangeable in the literature but can be defined as studying the surprising phenomenon (or event) and inferring the best explanation and hypothesis through underlying generative mechanisms that are deemed to have caused it (Archer *et al.*, 1998; Bygstad *et al.,* 2016; Mingers & Standing, 2017; Saunders *et al.*, 2019). As mentioned, it is reasoning back from the "*experiences to the underlying reality that might have caused them"* (Saunders *et al.,* 2019:147) – reference Figure 3.3.

The proposed approach can be described as Abduction-Retroduction Theorising. First, the study's creativity and inventive thinking to identify anomalies or opportunities (Sætre & Van de Ven, 2021) will come from abductive reasoning. Then second, inference to hypothesise and theorise on mechanisms reflects retroductive reasoning (Sayer, 1992; Henfridsson & Bygstad, 2013). As an iterative approach, it will essentially combine induction and deduction as the process moves back and forth to infer conclusions at each point (Saunders *et al.,* 2012).

3.2.4   Retroduction to identify the Generative Mechanisms

In chapter 1, I identified "*generative mechanisms as causal structures that generate observable events.*" (Henfridsson & Bygstad, 2013:911) as the primary theoretical lens of the study. This was further supported by exploring a range of studies in causal mechanisms within the broad area of digital platforms and infrastructures. Henfridsson and Bygstad (2013), Williams and Karahanna (2013), Bygstad *et al.* (2016), and Bygstad *et al.* (2017) followed a path of a longitudinal, in-depth case study based on a critical realist approach, thus helping to reinforce the validity of the selection of retroduction. This helped to reaffirm my critical realist approach and the use of the retroduction technique for theory development.

The configurational perspective of **Context-Mechanism-Outcome** (**CMO**) from Henfridsson and Bygstad (2013) provides the basis for the retroduction steps. Once the contextual triggers **[C]** are established, the focus turns to the digital platform designs **[O]** for the study's final analysis step. Retroduction of patterns of common characteristics of the digital platform are the pivotal step to identifying the mechanisms **[M]**. They are inferred from the critical incident events, the socio-technical actions, and overlaying the contextual triggers. As a result they provide a basis and foundation for the inductive and deductive rigour required and allow for abductive reasoning ('*retroduction'*) throughout. It also allows a balance between creating '*new*' concepts and being open to all possibilities while ensuring adherence to the process.

The contextual triggers, the patterns and connections of the mechanisms are then established through 's*ynthesis by integration'* (Rousseau *et al.,* 2008). Coding (Section 3.5.1) of the contextual triggers allows for '*reflective interpretation*' and to reason back to generate a feasible identification of the underlying mechanisms **[M]**. The final step applies '*synthesis by explanation*' (Rousseau *et al.,* 2008) and focuses on the type and form of generative mechanism that could answer the research question of how enabling mechanisms connect the design choices of a digital platform.

The process will be further aided by a visual representation of cause and effect – using two techniques from Yin (2018) that will prove beneficial to interrogating the data, i.e., '*logic models*' and '*time-series analysis*'. This will focus the analysis on identifying the critical chain of events over an extended period into what is called '*cause-and-effect patterns*'. This is built on the idea of a '*causal network*' and constructing '*cause-effect loops*', to do so visually (Miles & Huberman, 1994) and will be documented in excel tables to help with the analysis process. The output from this analysis represents the findings explored in Chapter 5.

3.3 Methodological Choice, Research strategies and Time Horizon

3.3.1 Methodological Choice

The following fundamental choice in the research design process is to consider qualitative and quantitative approaches. The qualitative approach positions the researcher directly into the field of study and within a more '*natural setting*' (Creswell & Poth, 2018). It is generally associated with interpretative research based on a subjective ontology, i.e., within the meaning an individual or group gives to their experiences being studied. Generally, qualitative research aligns mainly with inductive reasoning (Saunders *et al.,* 2012). Non-numerical data is collected with techniques such as interviews and analysed with procedures like '*categorisation'* among others (Saunders *et al.*, 2012).

Quantitative research, on the other hand, as a data research approach, focuses on numerical measurements rather than descriptive characteristics. Data will be quantifiable, and techniques such as surveys or questionnaires are used for collection. Data analysis will employ statistics and graphical representation to present in a numerical form. (Merriam, 2009; Saunders *et al.*, 2012). It is usually associated with a positivist or pragmatic interpretative framework and a deductive approach to test theory (Saunders *et al.,* 2012).

The overall approach selected is that of **multi-method qualitative** based on the key fundamental characteristics of Critical Realism. As covered, it combines "*ontological realism, epistemological*

relativism, and judgmental rationality" (Archer *et al.*, 1998:xi). Analysis of the design choices in digital platforms within the financial service context requires different approaches. Firstly, capturing the data on the events for digital platform design and evolution requires different qualitative techniques. A follow-on '*reasoning back*' step is used to determine how the events came about and lend itself to a qualitative approach due to the expected inference of these mechanisms. Testing and retesting the data to determine and confirm the underlying mechanisms extend the qualitative approaches to explore the research question fully. While adding complexity with multiple data collection and analysis techniques, the overall advantage comes from overcoming potential weaknesses in any one of the methods (Saunders *et al.,* 2012). Finally, quantitative methods will play a small part as understanding evolution requires more numerical information to help quantify key business metrics and demonstrate change over time.

3.3.2   Research Strategies

Before collecting and analyzing data, a researcher must carefully consider the research strategy. This represents the plan intended to answer the research question and defines the link between the interpretative framework (or philosophy) and the methods to collect and analyse data (Saunders *et al.*, 2012). A similar challenge with a philosophy is presented in terms of choice. Creswell and Poth (2018) conducted a detailed literature review of the many approaches available and presented what they felt were the ***five*** most frequently discussed and applied. To give due consideration, I looked at each in terms of definition, advantages, disadvantages, examples, and finally, the direction from a small number of high-quality IS research studies. Table 3.2 provides an overview of the five main approaches considered: *narrative research*, *phenomenology*, *grounded theory*, *ethnography,* and *case study*.

Strategy definition and Example	Advantages	Disadvantages or Challenges
Narrative Research **Examining the *'life experiences'* through *'stories'* and *'personal accounts'* of a series of events or actions of an individual. It will be driven by the willingness of the individual and their availability.** (Merriam, 2009; Saunders *et al.,* 2012; Oxford University Press, 2015; Creswell & Poth, 2018). **The key is capturing and maintaining the chronological nature and sequence of events to give a deeper understanding.** (Saunders *et al.,* 2012) **The narrative inquiry focuses on the nature or outcome of the storytelling as it relates to the focus of the study i.e.** **"***exploration of the social, cultural, familial, linguistic, and institutional narratives within which individuals' experiences were, and are, constituted, shaped, expressed and enacted"* (Creswell & Poth, 2018:68) **Example** The sense a woman makes of the events through the rearing of a child. (Creswell, 2007)	1. Can readily see how critical aspects of the study **evolve** with the stories held in chronological order. This allows for an assessment of the temporal nature of specific events and their bearing on the outcomes captured. 2. Can **identify major impactful events** as a 'time stamp' will be captured in the story. 3. The data will be very rich with the depth and personal nature. The research process allows for going deep and probing into areas over time.	1. **Investment in time** is Intensive as a heavy focus on each individual and capturing their stories in the required detail. 2. There is the unreliability of **people's memory** which may diminish with the reliability and validity of the data. The participant can also embellish stories. 3. Establishing **connections between themes** will require considerable validation and some form of triangulation, **given the personal nature** of the accounts. 4. **Confirmation bias** is a potential challenge with the **deep involvement with the participant**. Needs to be able to manage subjective views and complex when the focus is very personal. Depends on the nature of the topic. 5. It Is an approach that can be **difficult to replicate**, and the ability to generalise is a challenge due to the small number of participants in the study.

Strategy definition and Example	Advantages	Disadvantages or Challenges
Phenomenology **Examining and focusing on a socially constructed concept or phenomenon and its meaning for individuals. To create a description of the person's awareness or experiences about it to determine the commonality within the study. (Saunders *et al.*, 2012; Gray, 2014)** **Phenomenon (Oxford University Press, 2015)** noun (plural phenomena /fɪˈnɒmɪnə/) 1. a fact or situation that is observed to exist or happen, especially one whose cause or explanation is in question Example Understanding the phenomenon of an '*advisement relationship*' between a woman in a doctoral setting. **(Creswell, 2007)** **Others :** **'*Co-operative education*'** **'*Professional development*'**	1. The need to maintain a clear sense of the **phenomenon at the centre** of the study allows the researcher to create a **complete picture based on both the positive and the negative e**xperiences. In others, the researcher can keep bringing the focus back on the phenomenon if they stray. This enables a thorough exploration of potential solutions to the research problem based on the clear connection to the phenomenon. 2. Can establish a clear **understanding of the problems** of the participant as they '*engage'* with or '*experience'* the phenomenon, e.g., misunderstandings, lack of awareness. This should help inform future actions and support answering the research problem. 3. Can determine how participants see and **define value** from the phenomena and determine differences between individuals' perspectives. 4. Can look at the **temporal nature** of the meaning given to the phenomenon and what influences change.	1. **Selecting the right people** to ensure they have sufficient experience of the phenomenon (Creswell, 2007) 2. The researcher can **set aside their own beliefs** about the phenomenon, i.e., **bracketing** (Creswell, 2007) 3. Differentiating between those things are genuinely connected to the phenomenon and others, i.e., **other external factors that have significant influence**. 4. Handling **spurious meanings from participants may impact the quality of the study**. It may be challenging to spot, e.g. How the participant chooses to engage with the phenomenon. This can influence the outcome, thus giving potentially 'erroneous' data about the phenomenon.

Strategy definition and Example	Advantages	Disadvantages or Challenges
Grounded Theory **"*theory that emerges from, or is "grounded" in, the data — hence, grounded theory*" (Merriam, 2009:29). The focus is on theory-building from the systematic analysis of the data gathered. (Merriam, 2009; Saunders *et al.*, 2012; Gray, 2014)** **Example** Generating theory from the systematic data collected and analysed on the **processes** that **link** the **pressure for change** and the **policy decision**s in an academic setting **(Creswell, 2007).**	1. Greater transparency on the data gathering and analysis, i.e., easy to see and review, thus leading to greater validity and replicability. 2. Less likely to have researcher bias impact on the research outcome due to the systematic approach to data gathering and analysis. 3. Ensures the researcher goes into the study with an open mind and avoids creating preconceived ideas about the outcomes, i.e., the data leads the way.	1. A challenge for the researchers is to know when they have enough data, i.e., how to determine that the '*category identification*' are '*saturated*' and no additional data is required (Creswell, 2007) 2. While apparent, knowing that you have the correct data can be a challenge. This supports the likelihood that iteration is more likely with testing and re-testing from grounded analysis for validation. 3. Handling Error is time-consuming.
Ethnography **To study a group that would be regarded as "*culture-sharing*" e.g., Gen X, Baby boomers. More specifically, study the individuals as they interact with each other and the culture they live in. (Merriam, 2009; Saunders *et al.*, 2012)** **Example** Looking at how the work and talk of baseball franchise employees create and reinforce meaning for society and how it also maintains a '*baseball culture*'. **(Creswell, 2007)**	1. Focus on **cultural impact** and, therefore, on the complexity of group behaviours and shared beliefs in a given situation. 2. Looks at **common characteristics that bind a group together**. This can inform how we may take targeted action. 3. Greater understanding is created on the **influence of the 'culture' and its influence on the action**.	1. Researcher needs to be **very competent in the area of culture,** i.e., cultural anthropology and the social-cultural system they will face (Creswell, 2007). It is hard to observe the culture in action, i.e., the researcher gets told what they want to hear. 2. Shared patterns through action are difficult to see, so observation requires a keen sense of what is going on and being '*deeply connected*'. **Managing bias** becomes a knock-on impact for the researcher. 3. **Time to collect data is extensive and requires a significant amount of time** in the field of study (Creswell, 2007) 4. **Possible for the researcher to '*go native*'** (Creswell, 2007)

Strategy definition and Example	Advantages	Disadvantages or Challenges
Case Study **Examining particular instances of a phenomenon within a 'single setting' or 'real-live context'. (Eisenhardt, 1989; Eisenhardt & Graebner, 2007; Saunders *et al.*, 2012)** *"research strategy which focuses on understanding the dynamics present within single setting."* **(Eisenhardt, 1989)** *"A case study is an empirical method that investigates a contemporary phenomenon (the "case") in depth and within its real-world context, especially when the boundaries between phenomenon and context may not be clearly evident"* **(Yin, 2018:56)** *"In other words, you would want to do a case study because you want to understand a real-world case and assume that such an understanding is likely to involve important contextual conditions pertinent to your case (e.g., Yin & Davis, 2007)."* **(Yin, 2018:56)** **Example** Studying the exploitation of women labour in the 'Roseville' lawn bowls club by men. **(Creswell, 2007)**	1. With the probing required between the literature and the case(s), **creative insights can come from very different sources** (Eisenhardt, 1989) 2. The numerous verifications within the case study make any emergent theory **readily testable**. (Eisenhardt, 1989) 3. Adhering to the need for data to theory consistency **drives the case(s) to be empirically valid.** (Eisenhardt, 1989) 4. Can focus on more than one case to **broaden the view and as a mechanism to build on previous findings**.	1. Maybe **over-complexity in the theory due to the extensive level of data.** (Eisenhardt, 1989) 2. **The ability to generalise may be difficult** if the case represents to narrow a focus and unique. (Eisenhardt, 1989) 3. **Overcoming the challenge of case selection,** i.e., picking the right one to best support the study and considering if multiple cases may be better (Creswell, 2007). Knowing the number of cases is linked to the idea of 'generalisability'.

Table 3.2 Definition of Research strategies, advantages, and disadvantages

From the comparison between the various methodologies (Table 3.2), and after much consideration, an ***in-depth case study*** on a single case was the selected research design strategy. Hewlett-Packard Enterprise Financial Services (HPEFS) was deemed suitable with its focus on digital transformation and digital platform design choices over seven years (2013 – 2019). The choice was also influenced by the level of access from my role as Senior Director of Global Digital Transformation, Business Process and User Experience, and lead of a digital transformation team within HPEFS during the study period. This supported my acting as a '*fully engaged*', complete

participant (Bryman & Bell, 2007; Creswell & Poth, 2018; Yin, 2018), thus providing '*rich*' insights (Weick, 2007) or '*thick descriptions*' (Geertz, 1973; Stake, 2006) from the detailed reflections, observations, and data assembled during this time.

Generalisability, however, and the ability to make a theoretical contribution are questions that often surface when a single case is selected for a study. Flyvbjerg (2006) addresses this in what he described as a set of '*misunderstandings*' and puts the argument forward that it can be overcome by strategically selecting a suitable case. Several characteristics provide the basis of the appropriate case choice to meet his assertion. Firstly, a single case with both long-term and deep access is advantageous for identifying the underlying generative mechanisms (Henfridsson & Bygstad, 2013; Williams & Karahanna, 2013). Combining my position in HPEFS and adopting a '*complete participant*' role allows me to meet both the long and deep access. It additionally supports the retroductive approach for theorising and is aligned with the critical realist framework selected (Section 3.2.1). Longitudinal-based single cases provide the ability to study both the conditions, their '*underlying processes*', and how they change throughout the study (Yin, 2018). This helps strengthen the durability of the generative mechanism proposed in the research. Second, it facilitates the opportunity for '*intense observation*' within the longitudinal data that can lead to more discoveries from events under scrutiny compared to more general analysis from large groups (Flyvbjerg, 2006).

Third, the approach is appropriate if the single case can be shown to be of strategic importance to the general problem (Flyvbjerg, 2006). The case selection of HPEFS is a solid fit as it looks to address the challenges organisations face to make optimal design choices for their digital platform and can therefore be classified as a '*critical case*' to justify further its selection (Flyvbjerg, 2006; Yin, 2018). The single case approach is appropriate when it provides insights and broader inferences for other organisations and can therefore be '*unusually revelatory*' (Eisenhardt & Graebner, 2007; Siggelkow, 2007; Yin, 2018). As a result, it can be best described as a '*special case*' where the conceptual insights prove to be most impactful (Siggelkow, 2007). My conjecture is that the digital platform in HPEFS and the learning for the research apply to other '*normal*' organisations that have and are facing the same challenges.

A fourth important support for the in-depth '*single case*' is how it manages bias. As the lead of the digital transformation team, it is essential to manage any potential bias (e.g., experimenter, confirmation, or selection) as I capture my reflections on activities during this period. The single case strategy will '*falsify*' poor propositions due to the nature of the in-depth data and the test of the pre-conceptions, assumptions, and hypotheses that may be held (Flyvbjerg, 2006). My

role subsequently transitioned to that of the researcher ("*Participant-as-observer*" – Bryman & Bell, 2007:437; Creswell & Poth, 2018; Yin, 2018) in late 2019. This created a clear transition to the different standards and requirements to manage bias through the detailed data collection and analysis design to support validity (Rousseau *et al.*, 2008).

Finally, in a more general sense of selection, case studies involve specific contextual conditions grounded in real-life situations (Yin, 2018). The case study approach captures and emphasises the *'processes'* (or choices) as they occur in the context of a digital platform design (Hartley, 2004). We also find that a more profound understanding can be achieved when researchers immerse themselves within the context under scrutiny (Flyvbjerg, 2006). While not necessarily an obvious criterion, the case study allows much improved *'practical utility'* (Corley & Gioia, 2011). With the application to real-life situations, the potential exists for managers and practitioners to apply the output of the research as they can relate to organisations that are similar in activity or the industry in which they operate.

The selection is consistent with the critical realist perspective around a digital platform's events (design choices). It will be presented in a practical setting, and the underlying phenomenon (causal mechanisms) would appear to be best tested, in-depth, within a single rich setting. The next phase in the design process focuses on how the data would be collected and subsequently analysed in a manner appropriate to the case study as the research strategy.

3.4   Data Collection

A comparison of the five key research strategies shows they all employ similar data collection and analysis techniques and procedures (Table 3.3). The key differences are in the emphasis of specific techniques within a strategy and the extent of data collection (Creswell & Poth, 2018). The approach for the case study will generally follow **documentation** (archival sources – internal and publicly available), **observations,** and **interviews** to provide an in-depth understanding of the case (Eisenhardt, 1989; Stake, 2006; Creswell & Poth, 2018). Yin (2018) refines this list of sources to six – interviews, documents, archival records, physical artefacts, direct observation, or participant observation. This ensures we consider the case's many features and facets, i.e., context and environment for '*outside'* and the activities, among others for '*inside'* (Stake, 2006). With the potential need to use some or all, mastery of different collection procedures is also required (Yin, 2018). By overlapping data analysis with data collection, we can also take advantage of '*flexible data collection*' (Eisenhardt, 1989). This allows the option and freedom to tweak and adjust the data collection in case study research. Before delving into the detail

surrounding the procedures and techniques, it is crucial to understand the impact of the theory development approaches on data collection and analysis. In the next section, I explore how these reasoning processes and their application impact each stage of the evolving nature of the output.

	Narrative Research	Phenomenology	Grounded theory	Ethnography	Case Study
DATA COLLECTION	Primary source of interviews and documents	Main source of interviews with key individuals Observation and documents may be considered.	Interviews with a more significant number (approx. 20 to 60 candidates)	Primarily observations and interviews.	**Multiple sources of documents, observations, and interviews**
DATA ANALYSIS	Looking for stories within the data, identifying patterns and themes, and applying chronology as needed	Identifying significant statements, meaning, and identifying the 'essence'	Applying the '*Gioia methodology*' (Gioia *et al.*, 2013; Creswell & Poth, 2018) to code the data – Open, Axial, and Selective.	Focus on culture and themes around the group under study.	**Detailed analysis through the description of the case to identify themes**

Table 3.3 Data collection and analysis (reference: Creswell & Poth, 2018:105)

3.4.1 The Iterative and non-linear impact of theory development on data collection and analysis

When applied at each stage of the research process, the theory development approach has a direct impact and influence on data collection, data analysis, and the unfolding nature of the output. It can be described as iterative as each step builds on the previous and results in emerging and ever-developing ideas and findings. It is therefore consistent with Van De Ven's (2007) view on the nature of theory development, i.e., the combination of abduction, deduction, and induction that are part of iterative cycles. Additionally, reasoning back-and-forth is key to the retroductive process and conceptualisation of the generative mechanisms (Figure 3.4) to further support the iterative nature of the process. It could be best characterised as collective theorising within many iterations to establish findings through ongoing data collection and analysis. As the data collection and analysis are conducted, we find that the relevant theorising and reasoning influence different needs.
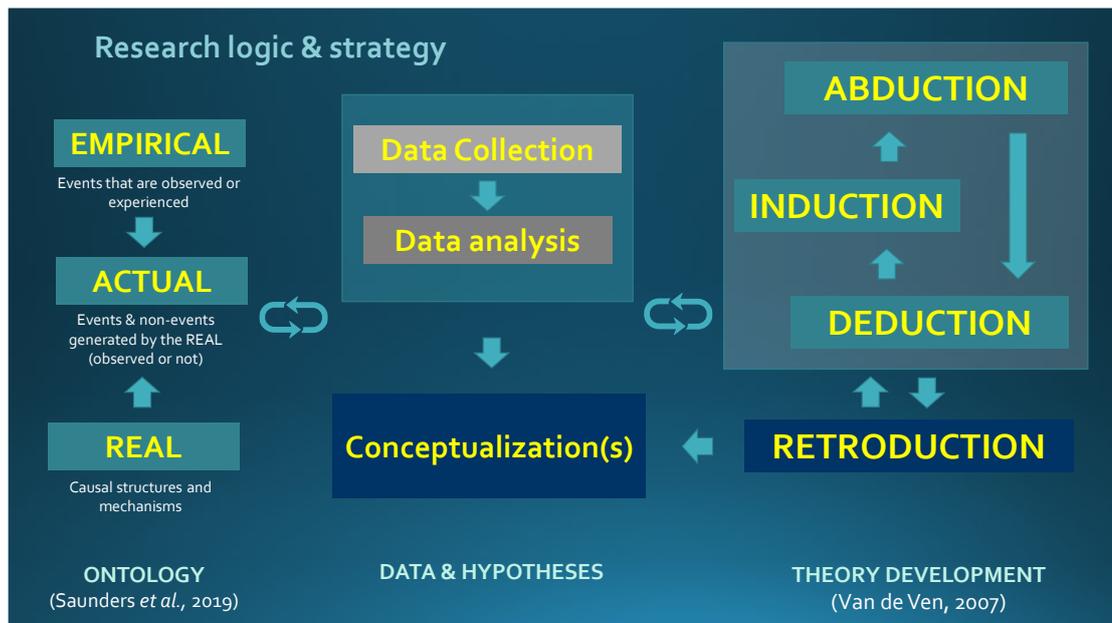
Figure 3.4 The research logic and strategy to facilitate the HPEFS in-depth case study

Firstly, there is an effect on the **specifics** surrounding the events, driven by the focus of the abductive and retroductive steps. This aligns with the critical realist perspective with the drive to understand "*what exists*" ontologically (Huff, 2009:108), based on events (either '*empirical*' or '*actual*') and the mechanisms that are '*real*' (Williams & Karahanna, 2013; Saunders *et al.*, 2019). As I progress through each study stage, the second characteristic becomes more critical. Increasing the '*explanatory power*' of the data is important to support validity and generalisability (Yin, 2013). The level of **depth** and **detail** (Mills *et al.*, 2010) helps to provide the '*rich*' insights (Weick, 2007) and '*thick descriptions*' (Geertz, 1973; Stake, 2006) to reinforce this goal. As the process is iterative, there is naturally an ongoing refinement of the testable hypotheses and what the data explains. This can highlight potential gaps in specific areas or shortcomings that, once identified, need to be resolved by further data collection and modified data analysis. Ultimately this leads to an evolution of the concepts, with the additional data to make the findings more solid.

Finally, there is a need to manage the potential for both bias and validation. Therefore, careful consideration must be addressed with different data collection and analysis forms. Positively, case studies generally follow multiple sources that can manage potential bias and promote strong triangulation for validation (Eisenhardt, 1989; Rousseau *et al.*, 2008; Yin, 2013).

Going a little deeper illustrates the iterative and non-linear nature of the process. A simplified view of the stages is outlined in Figures 3.5 and 3.6. The diagrams depict the steps in an overall logical flow throughout the study. There were two main phases, with the initial activity focused

on the literature on digital platforms and, more specifically, platform design and design choices with digital transformation. Theorising at this point was focused on "*heuristically selecting a solution that is known to be appropriate for the problem*" (Van De Ven, 2007:82). Data collection and analysis were utilised as a part of the initial conceptualisation of mechanisms.
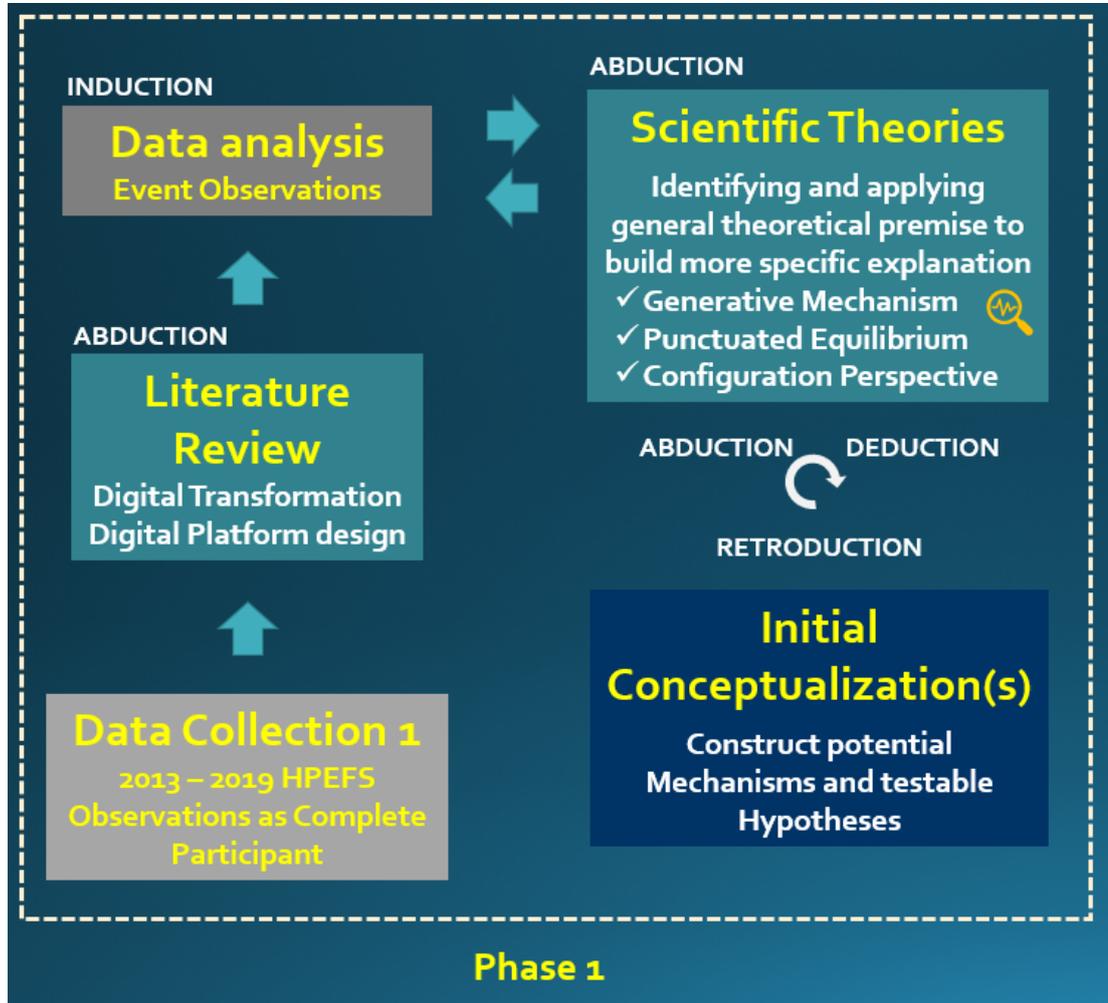
Figure 3.5 The iterative nature of the research – Phase 1

The second phase (Figure 3.6) centred on a more in-depth approach and a broader range of data collection aligned to adopting the case study strategy (observation, documentation, and interviews). The theoretical lenses of Henfridsson and Bygstad's (2013) '*generative mechanisms*' and Lyytinen and Newman's (2008) '*punctuated socio-technical change model*' provides the perspectives to explain the design choices for the digital platform under scrutiny. Within each step, however, there was a level of going back and forth to a previous step to help confirm the desired goal. This was particularly pronounced during the retroduction steps to '*reason back*' to the underlying mechanisms (Saunders *et al.,* 2019). The following sections give a more in-depth

view of the approaches to the data collection (Section 3.4.2 – 3.4.5) and data analysis (Section 3.5) and the relevant protocols employed across the two phases outlined.
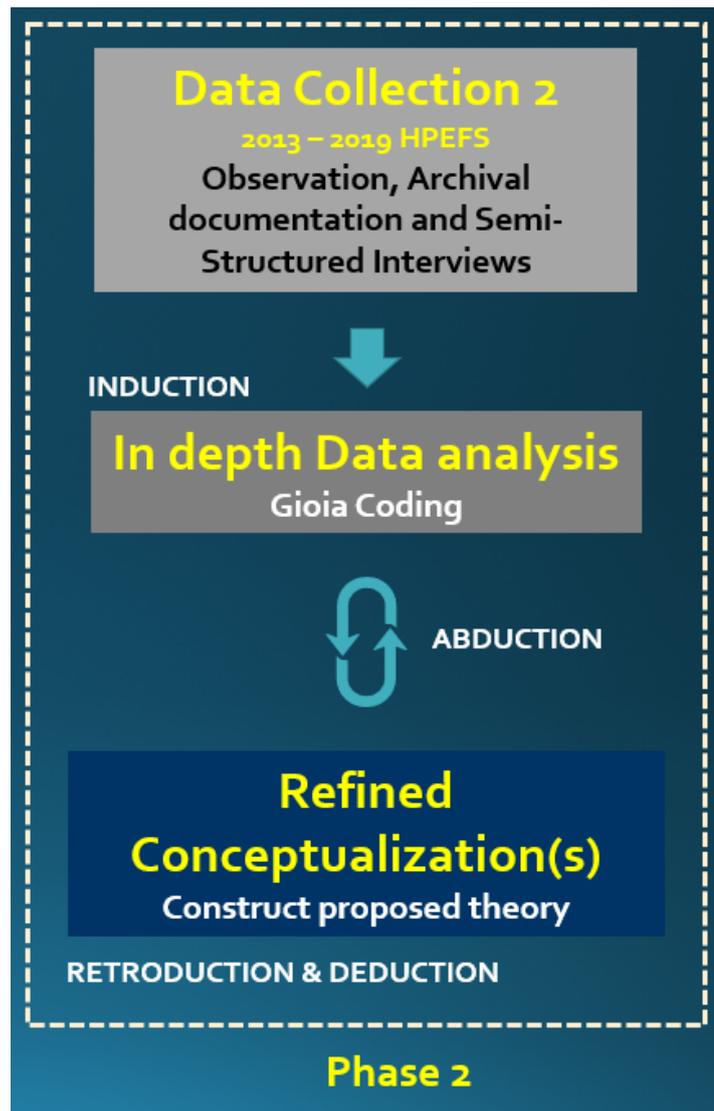
Figure 3.6 The iterative nature of the research – Phase 2

3.4.2   Data Collection

As summarised earlier, the approach for the case study will generally follow **documentation** (archival sources – internal and publicly available), **observations**, and **interviews.** The three approaches help provide an in-depth understanding of the case (Eisenhardt, 1989; Stake, 2006; Creswell & Poth, 2018), furnish the desired '*rich*' insights (Weick, 2007) and '*thick descriptions*' (Geertz, 1973; Stake, 2006) from the detailed reflections, observations, and data assembled during this time. Data collection procedures are consistent with the critical realist perspective on capturing events and behaviour (Yin, 2018). This section highlights the data collection methods and the protocols employed to ensure the case data could be analysed in a repeatable

manner and with the right level of rigour and transparency. The design of the collection process brought documentation (Section 3.4.2.1) and observation (Section 3.4.2.2) through the first part of the research. In phase 2, a more in-depth collection and analysis was completed of these two sources and then combined with interviewing (Sections 3.4.2.3 to 3.4.2.5). This additionally supported validation, managing bias, and identifying any potential gaps.

3.4.2.1   Archival documentation (Internal and Public)

Documents and data therein are generally directed to support, complement, and augment the overall data from interviews and observation (Saunders *et al.*, 2012; Creswell & Poth, 2018). In any study, internal documents can provide, if available, a significant input. However, the challenge for a researcher is navigating the commercial sensitivity and potential to diminish competitive advantage while attempting to extract the data and insights to help answer the research question. It requires carefully managing and restricting specific data to help make the organisation comfortable using it. Another critical data source can be documentation that the organisation and their competition publish publicly to reflect key activity and developments in capability. While the range of documentary information can be quite broad (e.g., emails, meeting notes, presentations, reports, blogs, and videos), the key consideration is its relevance to the topic under scrutiny (Yin, 2018). Secondly, data from documentation requires careful consideration of the conditions by which it was created and its accuracy (Stake, 2006), even though it is generally more explicit. Documentation provides several strengths as a data collection procedure - Table 3.4 (Yin, 2018).

	Strengths	**Weaknesses**	**Managing weaknesses**
Documentation	• Can be reviewed repeatedly throughout, i.e., is a stable source. • Independently created from the case study. • Strong when specific in terms of exact names, references, and details of the events. • Can cover long periods. • Can provide a strong source of validation and triangulation to other data sources, especially if publicly available.	• Selective bias if the full range of documentation is not complete. • Author bias • Confidentiality issues may be challenging to overcome – verifiability and integrity of the findings (access).	• The key to the protocol is to identify documentation to help overcome bias from both internal and external sources. • Normalise the internal data by creating a descriptive view of the content to avoid presenting competitively sensitive data. Included redacting where appropriate. • As with observation, triangulation was the primary tool to increase the validity of the findings.

Table 3.4 Documentation strengths and weaknesses (Yin, 2018)

It can provide a strong validation and triangulation to other data sources, primarily when publicly available. Generally, documentation can be immutable with readily identified and captured changes. However, as with all data collection procedures, there are limitations and

weaknesses regarding bias, as mentioned earlier, and confidentiality to consider. Managing these weaknesses is essential to ensure the validity and confidence of the study – Table 3.4 (Yin, 2018)

Document Category	Documentation Types
(1) Strategy	• **Annual Strategic plans** • **Program objectives and goals** • **Business priorities and key asks**
(2) Capabilities	• **Key features and functionality** • **Enhancements** • **Experience-based** • **Fixes and issue management** • **Roadmaps** • **Technology Roadmapping** • **New financial product offerings and programs** • **Country and regional assessment and requirements**
(3) Business Processes	• **Policies** • **Process and procedures**
(4) Go-to-market	• **Go-to-market (GTM) research** • **Customer and selling Partner feedback (includes surveys, feedback from sales and operations and direct engagement)** • **On-going promotion and selling of the HPEFS capability** • **Capability Overviews and Value propositions to Customers and Partners**
(5) Competitive position	• **Detailed Competitive analysis**
(6) Planning and Execution	• **Program structure** • **Deployment and implementation planning** • **Readiness planning** • **Status updates**

Table 3.5 In-depth internal documentation gathered in Phase 2

Internal and external documentation was assembled to extract the required detail from the digital platform events. A wide range of internal documents was collected from 2013 to 2019 (Table 3.5) and externally and publicly available data (Table 3.6). Where necessary, commercial sensitivity was carefully managed in terms of financial or strategic areas that would be deemed to provide a competitive advantage through redaction. In particular, to protect against the '*threat of substitute products or services*' (Porter, 1979) and imitation.

Document Category	Documentation focus
(1) Strategy	• **Public communication of critical changes in the HP, HPE, or HPEFS organisation.**
(2) Capability	• **Overview of the key features to message the benefits to customers and partners**
(3) Business Processes	• **Training material, videos, and other collateral help customers and selling partners.**
(4) Go-to-Market	• **Key HPEFS statistics** • **Overviews and value proposition of the financial products to customers or selling partners** • **Relevant go-to-market research from IDC, Gartner, and others to help message the value of the products and services.** • **Current landing pages and offerings (as of Oct 2019).**
(5) Competition	• **Review of the publicly presented data for the main competitors of HPFS.**
(6) Leasing Platforms	• **Overview of current leasing platforms to act as core systems and other third-party applications.**
(7) HP and HPE Financial Earnings	• **Quarterly earnings to provide insight into the financial results (revenue and profit) from 2013 to 2019**

Table 3.6 In-depth Publicly Available documentation gathered in Phase 2

The externally available data provides an essential source for the study. While its role for HPEFS is to help sell its value proposition to intended customers and partners, it provides a level of confirmatory evidence for the critical events under scrutiny, i.e., what was done and the timings. Thus, helping in terms of reliability and validity of the data collection realised during observation. Table 3.6 outlines the seven categories of documentation areas, and the sources include marketing literature, newsroom or press releases, Twitter posts, LinkedIn posts, demonstration videos, video webinars, and blogs. The data also provides a view into the internal triggers to develop the digital platform. The go-to-market material outlines the intended outcomes for the HPEFS customer or partner (value proposition) and gives an overview of the capabilities, features, and what they offer. Indicators of the impact of the digital platform are captured in the form of growth in the business (e.g., countries covered, number of partners or customers on

the digital platform) and the financial performance from the quarterly earnings releases. This complements the internal information collated for the same timeframes.

The specific protocol followed involved keyword search through a detailed internet-based search (see Table 3.7). Where necessary, a combination of keywords helped to source more relevant material. This was key to the competitive information as the specific names of product offerings or digital platforms appeared in searches.

Initial KEYWORDS	2nd round searches
HPEFS	**hpefs customer pledge**
HPE Financial Services	**hpefs customer brochures**
HPFS	**hpefs twitter customer portal**
Partner Connection	**hpefs twitter partner connection**
IT Consumption	**hpfs customer portal**
DaaS (Device-as-a-Service)	**HPE iQuote**
Pay as you Grow	**HP Financial Services strategy**
Customer Portal	**HPFS strategy 2016**
Partner Connection API	**HPEFS SMB**
HPE Technomics	**Dell Financial Services / DFS**
HPE Competition	**IBM Global Finance / IGF**
HPE Quarterly results / Investor relations	**De Laga Langan / DLL**
Leasing Platforms	**CHG Meridian**
HP Split	**ARROW**
	Equipment Leasing and Financing Association (ELFA)

Table 3.7 Digital platform capability keyword search (publicly available)

Examples of follow-on competitive keyword searches with these names also yielded more specific details e.g.

- Dell Financial Service's '*MyDFS*' (https://www.mydfs.com/)
- DLL's '*Express Finance*' mobile app (https://www.dllgroup.com/us/en-us/solutions/digital-solutions),
- CHG Meridian's TESMA® mobile solution (https://www.chg-meridian.de/services-products/tesma.html).

3.4.2.2   Observation

As a critical data collection approach, observation involves capturing and noting how the phenomenon under scrutiny and the participant '*behaviour'* come together (Saunders *et al.*, 2012; Creswell & Poth, 2018). Understanding the events that lead to a resulting digital platform design provides the opportunity to '*observe*' what '*people do'*. It was the primary data collection procedure employed and was influenced by my role within HPEFS. It was also supported through

my researcher role as a '*fully engaged*' complete participant (Bryman & Bell 2007; Creswell & Poth 2018; Yin, 2018) and by incorporating key documentation. All of which helped provide the desired '*rich*' insights (Weick, 2007), as highlighted earlier.

Stake (2006) considered observation one of the most meaningful data-gathering methods, but limitations and weaknesses as a data collection process need to be considered – see Table 3.8 (Yin, 2018). Overcoming potential bias by the observer through triangulation as a synthesis method with other data is one of the main items to manage (Eisenhardt, 1989; Rousseau *et al.*, 2008; Yin, 2013).

	Strengths	Weaknesses	Managing weaknesses
Observation (Direct and participant-observation)	• Capture events and actions as they occur • Strong in providing contextual data • It is insightful to gather interpersonal motives and behaviour	• Can be time-consuming and may lead to being selective • The bias of the participant-observer • Participant action may adjust if aware of being observed.	• Overcoming bias with data triangulation with the other data collection sources (Eisenhardt, 1989; Rousseau *et al.*, 2008; Yin, 2013) • Observation as '*complete participant*' was reflective and is best described as '*descriptive observation*' than direct observation (Saunders *et al.*, 2012) and creating a '*narrative account*' of events.

Table 3.8 Observations of strengths and weaknesses (Yin, 2018)

While the research strategy is an in-depth case study, the observation was completed with a '*narrative*' approach as the process was completed after the events occurred (2013 to 2019). It was designed around collecting detailed data to capture the chronological nature, sequence of events (Saunders *et al.,* 2012), and key aspects that helped influence the outcomes. Leveraging from Creswell and Poth (2018), I formulated a set of five steps in the observation protocol as a '*complete participant*' and built on a retrospective look back over the seven years. With the iterative nature (Figure 3.5), the structure and depth were expected to evolve through each cycle, thus requiring a level of flexibility in the process.

The steps were to:

(1) Seek approval to observe and gain access to use the events from 2013 to 2019.

(2) Define '*who*' or '*what*' to observe and the duration.

(3) Consider the data captured within the observation and the other sources (documentation and interviewing during both phases).

(4) Design an observation capturing protocol on the data with the ability to adjust and facilitate going more in-depth through the iterations of data collection.

(5) Produce narratively strong notes, '*rich*' and '*thick*' – both descriptive (summarising activities in chronological order) and reflective (reflections and potential themes for consideration).

3.4.2.3   Qualitative interviews

The interview is a technique where the researcher gathers data based on '*concise'* and '*unambiguous'* questions. The questions and subsequent answers are relevant to the research question and objectives. (Saunders *et al.*, 2012; Creswell & Poth, 2018). In the second phase of the case study data collection (Figure 3.5), I included qualitative interviews to provide an in-depth understanding of the events and evolution of the HPEFS digital platform. This facilitated a detailed and comprehensive set of data that could be compiled with the more detailed second round of observation and archival documentation.

The distinct approach adopted in the study was that of the **semi-structured interview** (or unstructured interview) than the structured interview, typically in a fixed and rigid form of the survey or questionnaire (Fontana & Frey, 2003). This was to allow both validation with the other data collected and to enable openness and the possibility of new findings (Fontana & Frey, 2003; Myers & Newman, 2007; Saunders *et al.,* 2012). More specifically, the design was to have prepared questions with the flexibility to improvise (Myers & Newman, 2007). It permitted an opportunity to investigate specific areas emerging from the observational and documentation data, subsequently embedded into the questions, and to allow for greater depth as I focused on uncovering the underlying causal mechanisms. This is consistent with the strengths of interviews by being targeted and giving insightful explanations (Yin, 2018). As with other forms of data collection, bias and poor recall by the interviewees need to be carefully considered (Yin, 2018) – the approach to how these are addressed in Section 3.4.2.5 as I outline the pitfalls and responses.

3.4.2.4   The Semi Structure interview (SSI) and protocol

The initial step in the process was to outline the main areas of information on where the SSI protocol would be based (see below). Consistent with the approach to defining the protocol questions (Yin, 2018), the design was influenced by both the '*verbal line*' of inquiry through the direct questions (described as also as level 1) and the '*mental line'* (level 2). Identifying potential generative mechanisms was driven by the mental inquiry that is non-verbal. More specifically,

it was driven by the reflection throughout on '*causal powers*', '*conditions*' and '*internal potential of a system*' (Sayer, 1992; Pawson & Tilley, 1997). The areas were conceptualised and are aligned with the research objectives (Section 2.4.5) as follows:

- Details of the platform functionalities, the intended business goals to be fulfilled by these capabilities, and the desired experience.
- The evolution of the platform over the timeframe of 2013 to 2019.
- An understanding of the design processes followed and, more specifically, the choices.
- A deeper look at the business drivers for introducing the capability and benefit to the business goals.
- Understanding success and failure from 2013 to 2019 provides a balance to the process and reduces potential confirmation bias.
- The view of the learning that occurred through the seven years of the study, fixing, and improving capability based on the learning.
- How the information and insights changed over time [Note: this was added after the three pilot interviews].

The interviewees were primarily located in the worldwide headquarters (Berkeley Heights, NJ) and the EMEA regional headquarters (Kildare, Ireland) within HPEFS. I identified those key individuals with the most proven knowledge about digital platform development at both a managerial level and the individual contributor level to ensure a breadth of the findings. I conducted **nineteen** semi-structured interviews, and due to the impact of the Covid-19 pandemic, the interviews were all conducted by skype™ for business, recorded and fully transcribed than face-to-face. The interviewees were effectively broken into two key groups in the HPEFS organisation, **eleven** members of the core business design team (Online Business Process Team and Senior IT members) - see Table 3.9. The interview focus for this group was more heavily on the functionalities of the digital platform as this group was responsible for translating the business needs and outcomes into the solutions deployed. The eight in the second group were key stakeholders (or subject matter experts - SMEs) from the business – see Table 3.10. While similar to the initial group, the greater focus was on business drivers, how these changed and evolved and what was seen as a success and unsuccessful from the realised business outcomes.

Given my role as Senior Director of Global Digital Transformation and lead of a Digital Transformation team, eight interviewees were direct reports. To manage any foreseen power

issues, I enlisted the support of a non-funded collaborator to help conduct the interviews and act as an observer only in the recorded interview and who participated in the post-interview analysis [*note: this was called out in the consent forms signed by each interviewee*]. This also influenced the need to have other stakeholders across the business and three senior members of the IT organisation. The questions were also crafted to be apolitical and designed not to lead the interviewee, thus avoiding confirmation bias. As highlighted, the publicly available information (Section 3.4.2.1) helped validate events and timeframes.

Key information and focus	Digital platform designs	Roles
• Functionalities, Business Goals, and experience • Evolution of the tool • Design Process • Drivers for the introduction of the capability • Understanding of success and failure • Learning, fixing, and improving • Data – information and insights – post-pilot	• Customer Portal • Partner Connection Tool • eSignature (DocuSign and Adobe) • Subscription • IT Consumption • FICO Credit Scoring • Partner APIs • End-of-Lease self-service for Customers • Omnichannel for partners • HPE Flex Capacity and Pay-per-use (Metering) • HPE Technomics Mobile App • Supplier Invoice Management (Basware)	7 x Online Business Process Team (mix of US and Irl). 1 x Senior IT Project 1 x Management (Irl) 1 x Senior Business Analyst (Irl) 1 x Senior IT Manager (Irl)
• The experience design approach and evolution • Experience design embedded into all the digital platform functionalities		1 x Senior Experience Design lead – Online Business Process Team (US)

Table 3.9 Design owners

I leveraged the dramaturgical model from Myers and Newman (2007) for qualitative interviews as the process was very much about '*social interaction*' (Creswell & Poth, 2018). The social interactions can be viewed as a drama where individuals (actors) in various settings (the stage) behave with norms, expectations, and rituals (or script). The interview as a social interaction allows us to view it as a drama. The interview protocol (or '*script*') guided the interactions with each interviewee (actors) while giving the flexibility to probe into the answer and move into related areas. The questions were tailored to the interviewees to match the specific areas of

involvement (as an example - see Table 3.15 – focus on the '*selling partner*' driven solutions within the digital platform).

Key information and focus	Organisational responsibility and Roles
• Business Drivers • The benefit to the business goals • Design choices • Successful and unsuccessful solutions • Data – information and insights – post-pilot	Credit Scoring / FICO business owners 1 x WW Head of Credit (US) 1 x FICO Business Model owner (US)
	Operations 1 x Customer Delivery manager - Channel in EMEA (Irl)
	Business Development / Go-to-Market /Sales 1 x Global Business Development Director (US) 1 x EMEA Channel Sales Leader (FRA) 1 x EMEA Business Development Director (Irl) 1 x WW Lead SMB Business Development (US) 1 x Business Development / HPE Ireland MD (Irl)

Table 3.10 Key business stakeholders

In the first step, the process was introduced, and the focus was on gathering information on the role(s) of the interviewee as it pertained to the development of the digital platforms (Table 3.11).

	Area	Question
Q1	**Background**	**For the purposes of the study, can you explain your role or roles between 2013 and 2019 in the development of the HPEFS Partner solutions** **…..such as Partner Connection, Partner APIs, HPE Technomics Mobile App as part of the SMB growth within HPEFS?**

Table 3.11 SSI Questions - Introduce and situate the interviewee

To guide the next step, the questions focused on functionality development in both what and how in terms of choice, evolution, and business drivers (Table 3.12).

	Area	Question
Q2	**Partner Connection**	**In somewhat of a chronological order Can you outline the <u>main functionalities</u> that was created to provide (1) a benefit to the <u>business goals</u> and/or (2) <u>better experience to Partners</u> with the design of the Partner Connection tool ?** **What drove the <u>design choices</u> such as Quoting, Automated Credit Scoring (FICO) and eSignature, Offers, New contract types etc. that you were involved in during this time ?**
Q3	**Partner Connection**	**How did the design of the tool <u>evolve</u> in the period from 2014 to 2019 ?** *[note: some overlap to Q2]* **What were the causes from your experience to drive this <u>evolution</u> i.e. who / what drove the designs to change ?**
Q4	**Partner Connection**	**Can you outline, the design process that was followed to help create the resulting design ?** **Pick an example and outline from '*Business Need*' (START) through to '*implementation*' (FINISH)**
Q5	**Partner Connection API's**	**If you can, how did the design of the HPEFS platform evolve to include Partner Connection API's with its launch in 2015.**
Q6	**Partner Connection API's**	**Partner API's - what do you see as to '*who*' and '*what*' drove the changes in its design ?**
Q7	**HPE Technomics Mobile App**	**What drove the introduction of the HPE Technomics Mobile App in 2019 ?**
Q8	**HPE Technomics Mobile App**	**How does the design in the mobile app reflect a change in how you design this type of solution ?**

Table 3.12 SSI Questions - Gaining a deeper understanding of key functionality

The third step was providing balance to the data from the interviewees by looking at what was unsuccessful in addition to success (Table 3.13). The importance of this line of questioning was to allow a degree of reflective testing of the proposed hypothesis to explain better what drives success but also failure from the perspective of the interviewee. Thus, strengthening the research outcome given the level of failure and challenge in making the best choices in digital platform design.

	Area	Question
Q9	**Partner Connection / Partner API's / Mobile App**	**What changes were successful in terms of what was intended ? *[include what does success mean from the view of your objectives and the business goal]*** **Why were they successful ?**
Q10	**Partner Connection / Partner API's / Mobile App**	**What changes were NOT successful (or not initially) in terms of what was intended ?** **Why were they NOT successful ? What was done to make it successful or fix or improve ?**

Table 3.13 SSI Questions - Interpretation from interviewees of successful and failed changes

The fourth step in the interview process explored the impact of design choices by the level of changes required to *'fix'* and *'improve'* through feedback and learning from the capabilities deployed in the digital platform. I also focused on understanding how learning from implementation and adoption could influence subsequent design choices to improve outcomes (Table 3.14).

	Area	Question
Q11	**Learning & fixing & improving**	**How has things changed since 2013 to make HPEFS better to design an 'optimal' solution and experience for your customers and partners ?** **How have you fixed things along the way when you didn't get it fully right at the start ?**
Q12	**Learning, fixing and improving**	**How have you changed the approach to design and implementation during this time ?**

Table 3.14 SSI Questions - Learning, fixing, and improving of the digital platform

The final step in the interview process was introduced after the eleventh interview. During the preceding interviews, it became clear that the information and insights available had a bearing and influence on the potential design choices from a number of the responses. As a result, I added a specific question for the remaining eight interviews (Table 3.15).

	Area	Question
Q13	**Data = information & insights**	**How has the type and amount information and insights changed over the time ?** **[Post-pilot Q]**

Table 3.15 SSI Questions - Exploring change to the information and insights

As each interview was recorded through Skype™ for business due to COVID19 restrictions, I could leverage otter.ai (www.otter.ai, 2021) to transcribe the interview from the mp4 files that captured the audio. The resultant text file was imported into MAXQDA (www.maxqda.com, 2021) for analysis (Section 3.5.2).

3.4.2.5   Accounting for pitfalls and difficulties with qualitative interviews

In qualitative interviews, several difficulties and pitfalls have to be accounted for in the design of the process (Fontana & Frey, 2003; Myers & Newman, 2007). They are not presented in order of importance, but all must be considered based on the context and studied area. Table 3.16 describes each and the actions to overcome and accommodate the study.

Potential difficulty / pitfall	Description	How they were approached in this study
1. Lack of entry / accessing the setting	The difficulty of getting access to the right interviewees in the organisation	Given my role as Senior Director of Digital Transformation, I worked to attain full permission and alignment with the organisation's senior leadership.
2. Elite bias / locating an informant	Focus is too heavily weighted on the senior leaders in the organisation, thus preventing a breadth of the potential findings.	The interviewees' selection included senior leaders (managers and directors) and individual contributors – all of whom played different roles in the design choices of the digital platform.
3. Lack of trust	One of the most critical challenges to overcome is to prevent the interviewee's lack of information/data.	As with item 1, I worked closely with all the interviewees over a long period. Additionally, the consent process provides an additional level of security and assures appropriate confidentiality.
4. The artificiality of interview / establishing rapport	A lack of rapport can exacerbate a lack of relationship and be seen as a '*stranger*'.	As with item 1, I worked closely with all the interviewees over a long period.
5. Time constraints	Insufficient time allocated to allow topics to be explored	The process was designed to allow for a 45min – 60min interview with a follow-up, if necessary, on specific areas.
6. Understanding the language and communication	Lack of familiarity with the language, acronyms, and the embedded culture presents a difficulty for the researcher to appreciate fully	This was overcome given my role as Senior Director of Digital Transformation in the organisation with over ten years of experience in the business.
7. Accurate reflection of the interview	Capturing the full details of the spoken word	Due to the impact of the Covid-19 pandemic, the interviews were all conducted by skype™, recorded and fully transcribed (through Otter.ai) All actions were captured in the consent form, signed by each interviewee.
8. Unintentionally guiding the interviewee	Interviewees may not have considered the areas highlighted in the interview. They may construct the story during the interview to not appear poorly.	The data from the interviews were triangulated with the observations and archival documentation to ensure validity and accuracy.

Potential difficulty / pitfall	Description	How they were approached in this study
9. Hawthorne effect	The potential for the research process itself to influence the behaviour over time of the interviewees.	The interviews were conducted at a time (June 2020) after the research period (up to November 2019) to ensure there was no impact on the study.

Table 3.16 Qualitative Interviews pitfall and difficulties

Another potential challenge is for the interview to go poorly and unintentionally offend the interviewee (Myers & Newman, 2007). Fortunately, this did not occur during the interview process. The other success factor is preparation for the interviewer, as it helps to "*produce a good or a bad performance*" (Myers & Newman, 2007:15).

3.4.3   Phase 1 data collection

As outlined in Figure 3.5 and 3.6, there were two phases of observation. The initial data collection set the study in motion against the backdrop of the challenge of digital platform design choices (see Chapter 2). Following the configurational perspective of **Context-Mechanism-Outcome** (**CMO**) from Henfridsson and Bygstad (2013), the key events and design platform designs **[O]** from 2013 to 2019 was the key focus on data collection as this stage to lay out the digital platform designs deployed during this time.

Before commencing the process, approval was gained from the senior leadership in HPEFS, and following initial analysis, the observation notes were built on detailed records and journaling captured in two primary sources :

(1) Annual and mid-year performance reviews that captured the details of the digital platform changes during each period of review (12 sets of detailed journaling – see an *example* for 2019 - Figure 3.7).

(2) The high-level strategic plans and updates for digital transformation (from the fiscal year 2013 to fiscal year-end 2019 – **62** documents – for examples, see Figures 3.9 to 3.11 and Appendix 5.2 provides a detailed list of these documents).
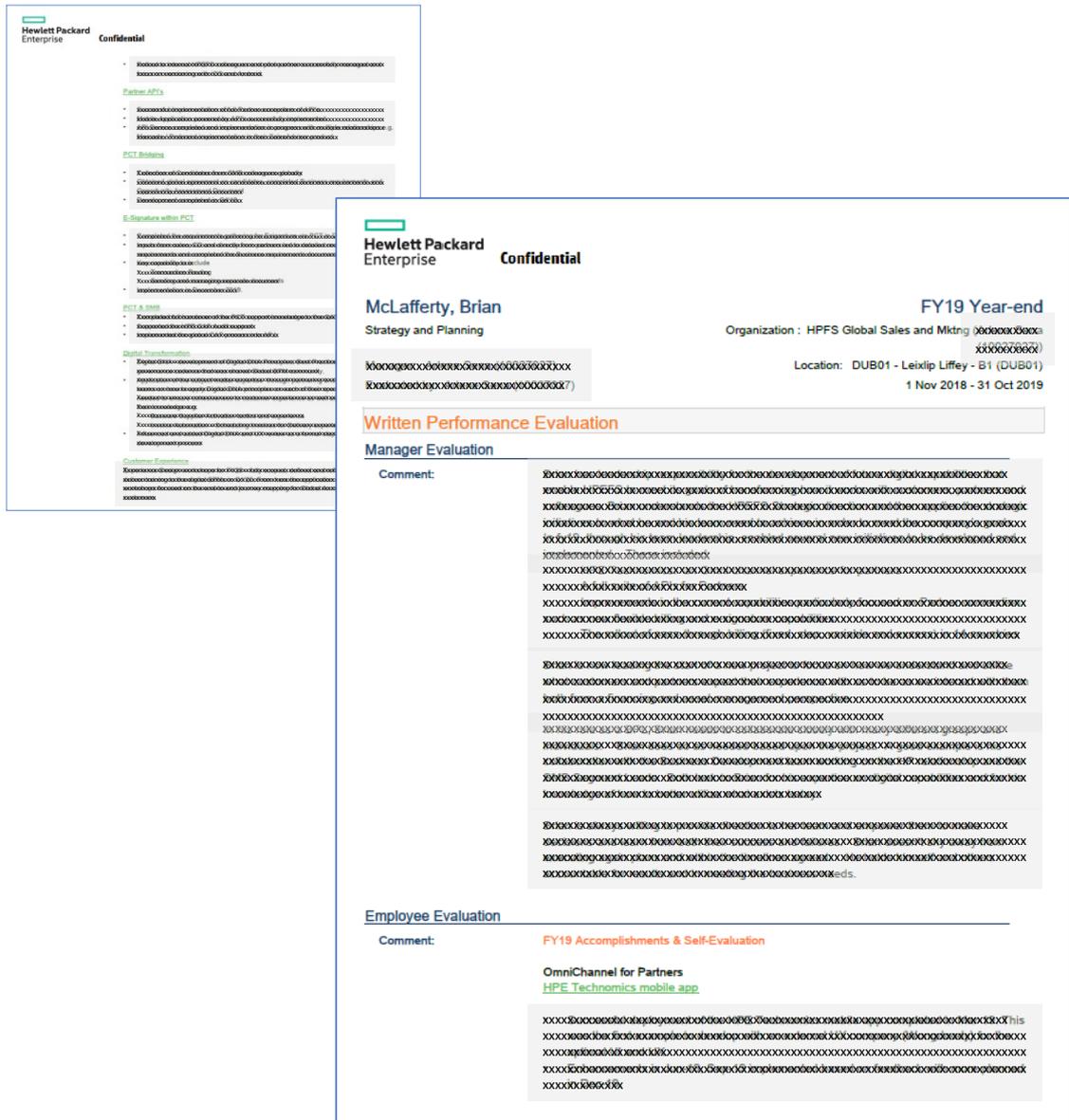
Figure 3.7 [REDACTED] Example (and excerpt) of annual progress review (October 2019)

The data provided the source for the detailed observation notes for the development of the HPEFS digital platform designs chronologically from 2013 to 2019. The notes produced a highly descriptive view of the application of digital technologies to enhance the HPEFS business model. (See Figure 3.8 as an example of an excerpt of this data – *note: a more detailed outline is presented in Chapter 4 and Appendix 4*)

[**Note**: *Information has been redacted in certain documents in the thesis text as the data contains financial information that would be considered commercially sensitive*].

Figure 3.8 [REDACTED] Example and exert of a detailed description of key events from 2013 to 2019

The strategic direction for 2013 in HPEFS was reflected in one of its main initiatives – "*Moving to an 'on-line' business*" (see Figure 3.9). This set out the overarching business outcomes the HPEFS digital platform would aspire to realise.
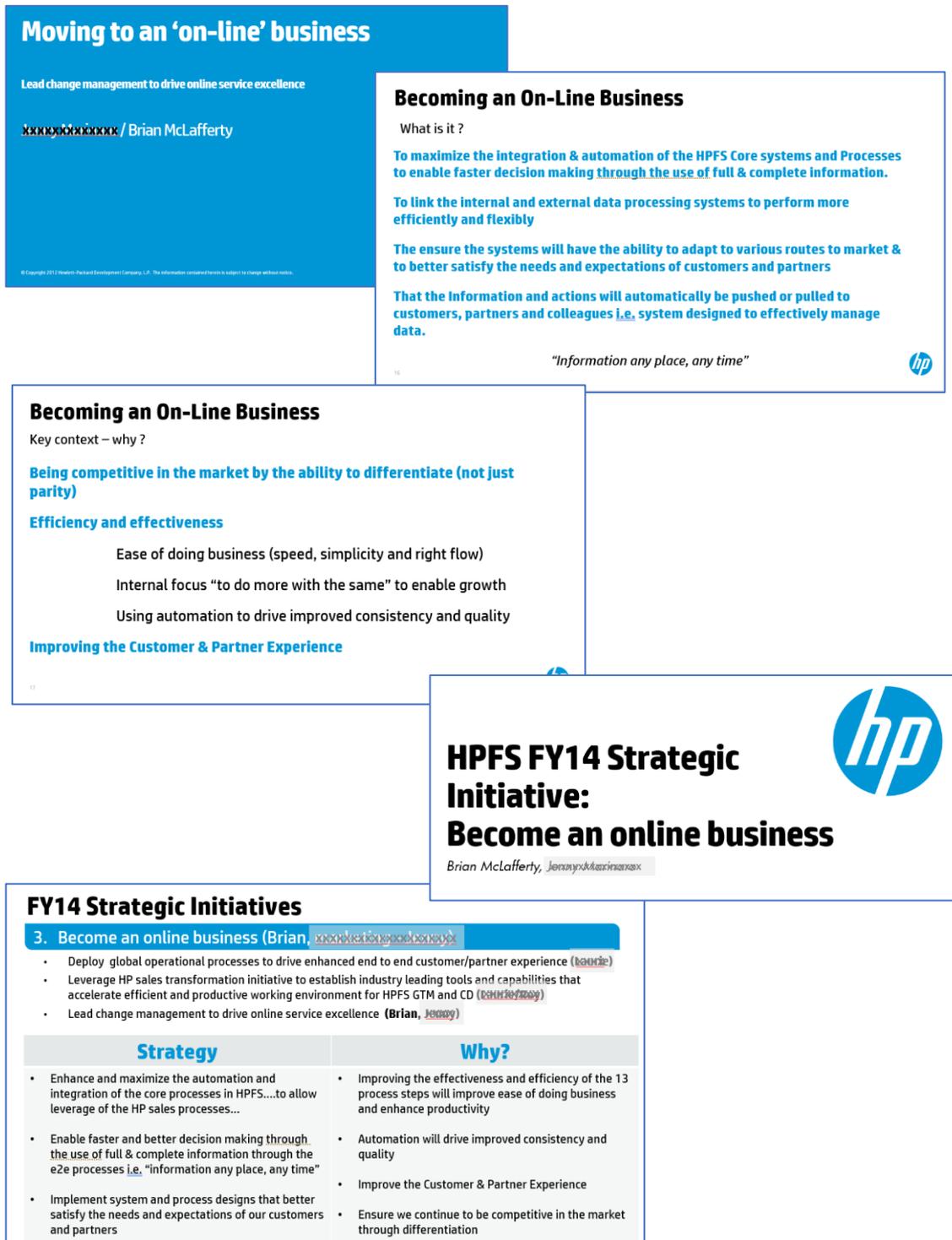
Figure 3.9 Strategic direction to drive digital platform design to become an 'On-line business' (2013 and 2014)

As with a lot of strategic plans, they emerged and changed over the years to become more focused on the key components of the digital platform and the business outcomes (Figure 3.10) [*Note: Hewlett Packard split November 2015 into HP Inc. and HP Enterprise (Cornell, 2015) and the subsequent branding change as is reflected in any of the documentation from that point on*].

Figure 3.10 Digital Platform strategic plans (2016)

By 2019, the evolution has moved to make '*digital*' the first approach to any change with the concept of creating a '*Digital DNA*' (Figure 3.11) as a means to improve the design choices of the platform.

Figure 3.11 Strategic shift in digital platform design approach (2019)

The data capturing protocol in phase 1 (Figure 3.5) was designed to provide the year of deployment within the digital platform and a comprehensive level of information around the key events. The detail within each year focused on:

- The specific digital capability and design characteristics in the HPEFS digital platform – its role in the process for HPEFS, customers, or selling partner

- Integration details within the overall HPEFS digital ecosystem.

- Business outcomes, e.g., User adoption, Sales volume (quantity and value), Countries adopted and customer benefits, selling partners, and internal processes in HPEFS.

The initial target was to provide two contemporary external-facing portals as key modules of capability in the overall HPEFS digital platform to facilitate engagement with customers and partners to create this new experience. The architectural platform vision was realised over the following years, with Figure 3.12 providing a chronological evolution of this digital platform's main components and modules.

OBSERVATION DATA
Deployment summary [2013 – 2019] of Digital Platform designs

| 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |

Above timeline: Customer Portal; Partner Connection Tool (PCT); IT Consumption; Partner API's; Circular Economy; HPE Flex Capacity and PPU (Metering); HPE Technomics Mobile App

Below timeline: eSignature (DocuSign); Subscription; FICO Credit Scoring; End-of-Lease self-service for Customers; Omnichannel for Partners HPE Technomics; Supplier Invoice management

HPE Financial Services

Figure 3.12 Key events from HPEFS Digital Platform (2013 to 2019)

3.4.4   Phase 2 Data Collection

The second phase (Figure 3.6) of data collection was driven by the theoretical lenses of (1) Henfridsson and Bygstad's (2013) '*generative mechanisms*', that mechanisms fit into and (2) Lyytinen and Newman's (2008) '*punctuated socio-technical change model*'. To facilitate the retroduction step of '*reasoning back*' to the underlying mechanisms (Saunders *et al.,* 2019), the events from 2013 to 2019 were dissected and unpacked to allow for in-depth analysis. Adopting Pawson and Tilley's (1997) **context-mechanism-outcome (CMO)** configuration perspective

provides the over-arching approach to breaking down the data in the case study. This offers the ability to construct explanations based on the causal paths that illustrate how specific mechanisms within a given context can generate outcomes from a digital platform (Henfridsson & Bygstad, 2013).

The data collection protocol (Figure 3.13) started with outlining the details of **[A]**, the observed (or observable) and realised digital platform design events, business outcomes, and effects. The reasoning and theorising process outlined provided the foundation to identify the likely generative mechanisms (or '*causal structures*') that generated the events observed and their effects (Henfridsson & Bygstad, 2013; Bygstad *et al.*, 2016; Mingers & Standing, 2017). As with the first phase, it was a combination of my role as a complete participant and a comprehensive set of documentation (Tables 3.5 and 3.6). Going through each year, events and an extensive number of documents allowed for the data to be extracted first on the situation that drove the outcome or, more specifically **[B]**, the contextual triggers or conditions (Pawson & Tilley, 1997; Henfridsson & Bygstad, 2013; Koutsikouri *et al.*, 2017). By unpacking each event and outcome, the goal was to identify that which provided the influence for the underlying generative mechanism to become activated as there was a contingent relationship between the two (Sayer, 1992; Bygstad *et al.*, 2016; Koutsikouri *et al.*, 2017).
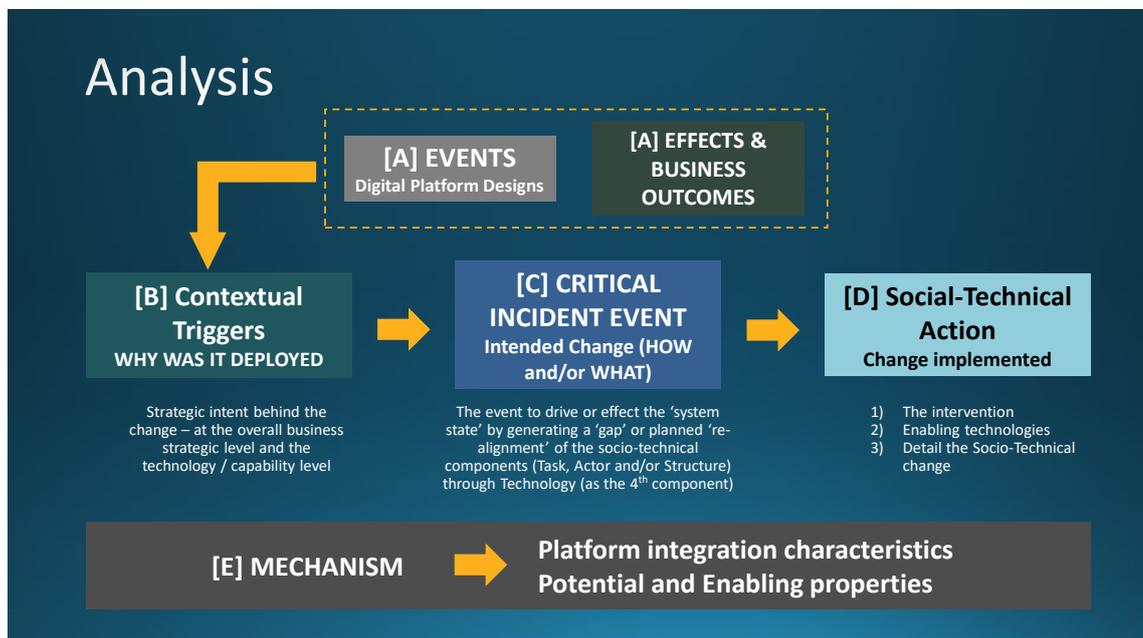
Figure 3.13 Data Collection protocol – phase 2

As discussed in Chapter 2, design choices are central to the impact of a digital platform that drives the Information system (IS) change. The '*punctuated socio-technical information system change*' model (Lyytinen & Newman, 2008) provides the basis to explore '*structural*

misalignment' in the socio-technical system and what they called the '*organisational environment*' through design choices made by the organisation.

Using these theoretical lenses, the data collection process focused on the following elements within each event. The data reflected the aspect of the digital platform design choices in both [C] Critical Incident Events and [D] Socio-Technical Action. The following provides a brief outline of the key characteristics of the data captured :

- **[C] Critical Incidents and Socio-Technical Gap (DESIGN CHOICE)**
    - **Critical incidents** – based on the socio-technical system, capturing the events that cause a '*gap*' or '*misalignment*' between the elements (Actors, Task, Structure, and Technology).
    - **Understanding if the change was intended,** i.e., strategically driven, or was a result of a previously caused misalignment.
- **[D] Social-technical action (DESIGN CHOICE)** – reflecting the '*building system*' that carries out and implement the change (Lyytinen & Newman, 2008)
    - The **actors [D1]** are involved and impacted by the design choices (Lyytinen *et al.*, 1998; Lyytinen & Newman, 2008).
    - The **technological solution [D2]** – outline of the digital platform change following the Yoo *et al.* (2010) model of '*layered modular architecture*' identified four loosely connected layers
    - The **enabling technology** embodied in the digital solution **[D3]** and other enabling factors (Jetzek *et al.*, 2013) as the key driver of change.
    - **Response** – **resultant structural realignment [D4]** from the socio-technical perspective and is the change seen as incremental or punctuated **[D5]**. It also reflects how the "*IS change re-configures a work system by embedding into its new information technology (IT) components*." (Lyytinen & Newman, 2008:592)
    - **Type of outcome [D6]** – (1) Event fails to give rise to a positive change, (2) A new equilibrium for the elements that are incremental, (3) New Deep Structure level change that is defined as 'punctuated' or (4) the new misalignment requires further action.

Table 3.17 provides an example of the data collection output for the introduction of automated credit scoring by integrating capability into the digital platform from FICO (HPE Financial

Services, 2015) as a third-party application through application programming interface (API) technology :

Data	Example – FICO Credit Scoring
[A] EVENTS	• PCT integration to FICO Credit Scoring, which allows < 1min decisioning (FICO - formerly the Fair Isaac Corporation)
[A] EFFECTS and OUTCOMES	• Ability to 'close a deal' faster enabled by Automated *'Credit Scoring in seconds.'*
[B] Contextual Triggers (at the overall strategic level)	• Defined Business strategic goals to grow the SMB segment (Business opportunity) - expansion • The strategic goal of the growing number of partners given the importance of the Channel to HPEFS (over 70% comes through this GTM route). • The strategic direction of nonlinear growth of sales team and operations to make this growth.
[B] Contextual Triggers (at the socio-technical level)	• Enhancing the Partner experience through identifying and implementing automation of the process throughout
[C] EVENT / CRITICAL INCIDENT (at the specific event level)	• Low-touch and fast decisions, i.e., to go from manual credit analyst decisions to automated.
[C] Intended / Planned Change [Strategically driven / Previously caused misalignment]	• TASK-ACTOR: No longer with Credit analyst to approve or reject a credit decision.
[D1] ACTORS (and STRUCTURE)	• Business Process Managers (designing business solutions) • IT Analysts • Credit Analysts (Subject Matter Experts) • Selling Partners (main external use of the capability)
[D2] TECHNOLOGY (IT Artefact)	• The credit request process to fully operate within the user interface (UI) of the Partner Connection Tool
[D3] ENABLING TECHNOLOGIES AND other ENABLING FACTORS	• External and secure credit scoring capability from a significant analytics company (FICO - formerly the Fair Isaac Corporation)
[D4] RESPONSE (REALISED 'STRUCTURAL RE-ALIGNMENT')	• TASK-TECHNOLOGY: Credit scoring is performed by the FICO Scoring model to provide automated decisions, which is presented in Partner Connection.
[D5] RESPONSE (INCREMENTAL / PUNCTUATED)	• PUNCTUATED
[D6] TYPE of OUTCOME	• Deep Structure change

Table 3.17 Data collection example – Phase 2

3.4.5   Validity and reliability in data collection design

As with all research, the goal is to produce reliable and valid findings (Merriam, 2009). In other words, can we trust the results, are they dependable, accurate, well-founded, and verifiable? (Merriam, 2009; Creswell & Poth, 2018). During the design of data collection, the authenticity and accuracy were tabled as a question with my role as a '*complete participant*' and the

possibility of bias that could weaken the findings. This necessitated a detailed look into the common forms of bias that a researcher would need to be managed (Table 3.18) and to build controls into the protocol where appropriate.

Type of Bias	Definition	Reference
Researcher bias and Observer bias	• A researcher allows their subjective views and disposition to influence their interpretations of data and responses in the observed setting.	**Denyer & Tranfield (2009)** **Saunders *et al.* (2012)** **Creswell & Poth (2018)**
Participation Bias	• Reduction in the level of participants due to extensive time commitment.	**Saunders *et al.* (2012)**
Observer Error	• Observer error - lack of understanding or overfamiliarity to unintentionally misinterpret the findings.	**Saunders *et al.* (2012)**
Interviewer bias (or Hawthorne effects)	• The interviewing creates a bias in how interviewees respond to the questions being asked. • The characteristics of the interviewer impacting on the responses of the interviewee.	**Bryman & Bell (2007)** **Myers & Newman (2007)** **Saunders *et al.* (2012)**
Interviewee or Response Bias	• The impact of the interviewee to not reveal and provide the necessary detail to support the in-depth exploration.	**Bryman & Bell (2007)** **Saunders *et al.* (2012)**
Non-response bias	• Having a poor response that questions whether there is a representative sample. • Those that do not respond may have different views or perspectives that could change the findings.	**Bryman & Bell (2007)** **Saunders *et al.* (2012)**
Selection bias	• The sample selected in the study does not reflect the targeted population, i.e., not random, making some of the population more likely to be selected than others. • An incomplete range of documentation.	**Van de Ven (2007)** **Bryman & Bell (2007)** **Creswell & Poth (2018)** **Yin (2018)**
Sampling bias	• Inaccurate or not comprehensive outline of the entire population from which a sample is taken. Leads to a deficiency in the sample.	**Van de Ven (2007)** **Bryman & Bell (2007)**

Type of Bias	Definition	Reference
Experimenter bias or Investigator bias	• Influencing the research and inadvertently communicating their preferred outcome and expectations through their participation.	**Van de Ven (2007)** **Bryman & Bell (2007)**
Confirmation bias	• Choosing to ignore potential anomalies and focus on those areas that confirm the researcher's opinions and views.	**Van De Ven (2007)**
Elite bias or managerial bias	• Not adopting a broad reach in respondents and overfocused on managers and those in high positions.	**Bryman & Bell (2007)** **Myers & Newman (2007)**
Social desirability bias	• Answers from respondents are driven by their perception of what may be socially 'desirable' for the focus area.	**Bryman & Bell (2007)**

Table 3.18 Common forms of bias in research

With the level of familiarity with the case, **researcher (or observer) bias** required careful consideration (Denyer & Tranfield, 2009; Saunders *et al.*, 2012). Triangulation of multiple data sources provides '*corroborating evidence*' to validate the findings (Wynn & Williams, 2012; Creswell & Poth, 2018). The publicly available information also provided the platform to match the internal data and '*descriptive observation*' completed throughout (Saunders *et al.*, 2012). To complement, strengthen and reduce **researcher bias** from data from the observation and documentation, nineteen semi-structured interviews were conducted (Section 3.4.2.4). **Elite (or managerial bias)** was reduced by the split between employees and managers with open, apolitical questions and full recording to eliminate the potential of **interviewer bias**. An additional approach in the interviews to reduce **confirmation bias** was the use of '*disconfirming evidence*' to look for unsuccessful changes in the digital transformation (Creswell & Poth, 2018). The outline of the semi-structured approach as a qualitative interview provided the final step in the data collection process followed in phase 2.

3.5   Data Analysis

The process of analysis requires organising the data, coding, and identifying themes, insights, or concepts that can represent the data and allow for interpretation (Saunders *et al.*, 2012; Creswell & Poth, 2018; Yin, 2018). Leveraging from Creswell and Poth (2018) and Miles and

Huberman (1994), the analysis process followed in the study breaks into three basic steps, all occurring concurrently and within iterative cycles:

(1) **Data reduction** – Prepare, organise the data, and translate (or reduce) to key concepts and themes.

(2) **Data display** – To represent the findings and data.

(3) **Conclusion drawing and verification** – deciding what things mean and verifying.

Yin (2018) outlined several analysis strategies that could be combined or singularly used for a case study. Several of these strategies were employed and performed in a series of iterations. As previously outlined, the theory development was proposed as a two-staged approach with induction, deduction, and abductive reasoning used throughout (see Figures 3.4 and 3.5). A grounded analysis of the data from the case appeared to be the most suitable method for formulating conclusions on digital platform designs. A '*ground-up*' strategy (Yin, 2018) facilitated the identification of concepts, from which patterns emerged that resulted in promising themes and insights as I repeated the analysis cycles. The patterns and themes were built around the theoretical propositions of '*generative mechanisms*' (Henfridsson & Bygstad, 2013) to influence the causal structures sought. Lyytinen and Newman's (2008) '*punctuated socio-technical'* model provided the foundation for analysing the events over the seven years of the study. This allowed for an emerging and ever-strengthening set of findings and '*promising'* concepts (Yin, 2018). Once the strategy was selected, relevant techniques were considered to best complete the analysis process.

The analysis techniques were designed to be completed in two phases. The initial analysis phase focused on identifying contextual triggers. As mechanisms act within a given context **[C]**, this allowed the application of these triggers, once established, in the second step of analysing the digital platform designs **[O]**. Identifying mechanisms **[M]** was a retroductive step through pattern analysis of the elements of the digital platform, made up of the critical incident events, the socio-technical actions, and overlaying the associated contextual triggers from phase one.

3.5.1 Coding protocol for Contextual Triggers

The primary analysis technique for the contextual triggers was through coding, commonly known as the '*Gioia methodology'* (Gioia *et al.,* 2013) – Figure 3.14. The '*coding*' technique followed a three-step approach (Gioia *et al.,* 2013; Creswell & Poth, 2018):

(1) **Open coding** – where the events and outcomes from the case are compared to each other to identify concepts, patterns, and categories.

(2) **Axial Code** – looking for relationships and describing and explaining higher-level themes.

(3) **Selective coding** – the final step to unify around a set of core or significant categories and form a larger theoretical scheme.

Throughout coding, I synthesised the data and applied a combination of three methods to accumulate, scrutinise and reflect on the data collected through the study (Rousseau *et al.,* 2008). '*Synthesis by integration'* focused on searching for patterns and connections that were a cornerstone of the output of the analysis. From here, '*reflective interpretation*' aligned with the reasoning processes to provide feasible explanations from the integrative activity. The final step applied '*synthesis by explanation*' (Rousseau *et al.,* 2008) focused on identifying the core categories of contextual triggers.
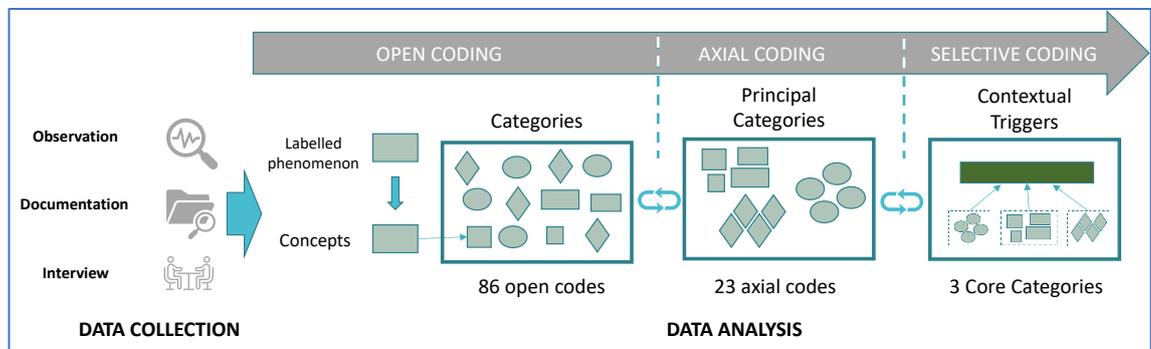
Figure 3.14 Abstraction from Coding to generate contextual triggers

To successfully code all the data collected, protocols and activity were defined while leveraging and staying consistent with the techniques from the '*Gioia methodology'* (Gioia *et al.,* 2013), pattern matching (Yin, 2018), and pattern codes (Miles & Huberman, 1994). The remainder of this section outlines the approach to identifying the core categories of contextual triggers.

"*The first step in theory building is conceptualizing*." (Strauss & Corbin, 1998:103). To achieve this, we go through '*open coding'* or '*first-order analysis*' of the data (Gioia *et al.,* 2013). This requires the identification of events, objects or interactions that can be subsequently grouped under common headings or classification (Strauss & Corbin, 1998). This grouping allows these phenomena to be labelled (Miles & Huberman, 1994), based on similarity of properties and dimensions, to a concept. From here, the attention turns to group the concepts or, more specifically, look at how the properties align across specific dimensions to form patterns (Strauss & Corbin, 1998) or, as Miles and Huberman (1994) referenced it, '*pattern coding*'. This leads to the identification of categories as the critical output at this phase of analysis (Figure 3.15), by looking at them under more abstract explanatory terms (Strauss & Corbin, 1998)
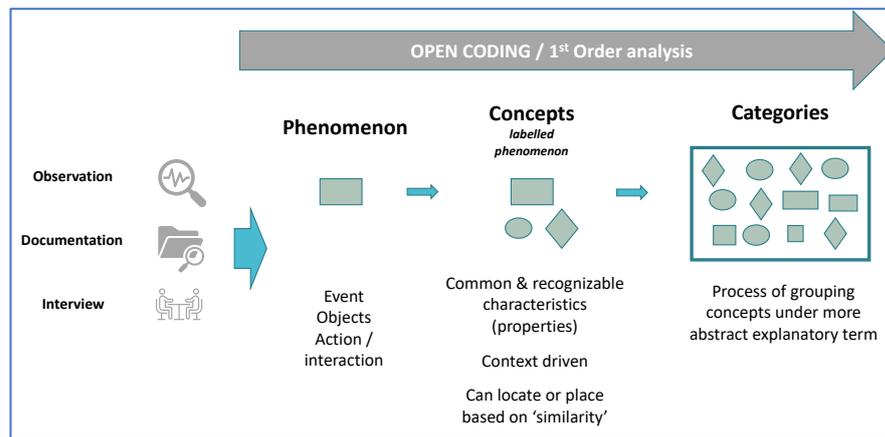
Figure 3.15 Open Coding (Strauss & Corbin, 1998) or 1st Order analysis (Gioia et al., 2013)

Gioia *et al.* (2013) state that staying true to the '*informant terms*' is essential in this analysis stage. The approach adopted by Bygstad *et al.* (2016) to apply affordances offered guidance on how to designate the contextual trigger and remain faithful to using more natural language. The terms captured were based on the reflection on the property of a design choice having an "*ever-present potential for action*" (Bygstad *et al.*, 2016:87). This involved looking at contextual triggers and what best captures that which stimulated the digital platform design choice (Bygstad *et al.*, 2016).

Code	Position	Tenure
OBPM_1	Online Business Process Manager	20
OBDM_2	Online Business Process Manager	19
OBDM_3	Online Business Process Manager	15
OBDM_4	Online Business Process Manager	11
OBDM_5	Online Business Process Manager	17
OBDM_6	Online Business Process Manager	21
OBDM_7	Online Business Process Manager	17
OBDM_8	Online Business Process Manager	2.25
SITPM	Senior IT Project Manager	9
SITBA	Senior IT Business Analysts	9
SITM	Senior IT Manager	19
HOC	WW Head of Credit	22
FICO	FICO Business Model Owner	6
GBDR	Global Business Development Director	21
ECSL	EMEA Channel Sales Leader	21
EBDD	EMEA Business Development Director	14
MBDA	Director of Marketing and Business Development, Americas	22
BD	Business Development	12
CDM	Customer Delivery Manager	15

Table 3.19 Research Informant coding, role, and tenure

As the analysis process began, it became apparent that several simple housekeeping actions were necessary. First, the coding of the informants in the semi-structured interviews that

formed the basis of how the data were coded (Table 3.19). This allowed for subsequent filtering on specific roles as individuals provided information on the digital platform design choices. The next step was to outline the codes for the key objects, events and capabilities that were the very visible digital platform designs within the HPEFS (Table 3.20). These formed the basis of design choices' outcomes (or consequences) and represented the terms used within the observations, documentation, and interviews. It aligned with the initial step of '*data reduction*' to aid in the analysis subsequently (Miles & Huberman, 1994).

OBJECTS / EVENTS [Code]	Platform capability	Description
CP	Customer Portal	A free, web-based digital portal and self-service asset management tool (Westcoast UK, 2014). Designed to provide 24/7 access to the customer's asset portfolio, which is constantly refreshed and up-to-the-minute.
ESIGN	eSignature through DocuSign or Adobe	The ability to sign contracts through a third-party eSignature application, DocuSign (HPE Financial Services, 2016) and Adobe (HPE Financial Services, 2017) using APIs (application programming interface) as the integration technology.
PCT	Partner Connection Tool	Allowing selling Partners and Distributors to present quotes easily, make credit applications, and generate documents for investments.
FICO	FICO Credit Scoring	Automated customer credit risk scoring within a minute (HPE Financial Services, 2017).
API	Partner Connection APIs	Allowing a Partner or Distributor to transact a financial solution within their own platform fully.
EOT	End-of-term self-service for customers	An end-to-end solution in the Customer Portal allows customers to select options at the end of a lease, receive pricing and select and fully process their decision.
ITC	IT Consumption ('as-a-service')	Various innovative financial products allow customers to pay for the IT services they 'consume' rather than purchasing the hardware.
SUBS	Subscription	
METERING	HPE Flexible Capacity and Pay-per-Use (PPU) Metered usage	

OBJECTS / EVENTS [Code]	Platform capability	Description
BASWARE	Basware (Supplier Invoice Management)	A third-party solution for the digital platform allows the automated receipt, review, and routing of supplier invoices.
TECHNOMICS_APP	HPE Technomics Mobile application	Free mobile application (iOS or Android) allows selling Partners and Distributors to easily present quotes, make credit applications, and generate documents for investments.
TECHNOMICS	HPE Technomics (Omnichannel)	A go-to-market strategy to provide a multi-digital-platform solution under the marketing umbrella of HPE Technomics (Rothman, 2019). The key objective was the ability for these digital platforms to work seamlessly together and allow users to move easily from one to the other.
CIRC_ECON	Circular Economy	It gives the customer a view of how they meet their sustainability goals while attaining value from refurbishing and recycling retired IT products.

Table 3.20 Main innovation events and objects within the HPEFS digital platform

The second phase of the analysis process for the contextual triggers was '*axial coding*' (Strauss & Corbin, 1998; Corley & Gioia, 2004) or '*second-order analysis*' (Gioia *et al.*, 2013). The goal was to identify relationships between the categories that emerged from the open coding step and coalesce into what is deemed to be '*principal categories*' (Saunders *et al.*, 2012). The primary outcome is to relate and connect the categories at the property and dimension level and their subcategories (Figure 3.16). The subcategories clarify the phenomenon of "*when, where, why, how and with what consequences, thus giving the concept greater explanatory power*" (Strauss & Corbin, 1998:125). As earlier, the properties represent general characteristics or attributes, while the dimension of a category depicts the location or position of a property on some continuum. To illustrate, Strauss and Corbin (1998) gave an example of '*frequency*' as a property of the category '*drug experimentation*'. They outlined that its use could be '*occasional*' or '*highly regular*' as the '*continuum*' positions to represent its dimension. The '*type of drugs*' would be a subcategory representing the '*what*' to give the concept more '*explanatory power*' (Strauss & Corbin, 1998). From the '*first-order concepts*' and categories, '*second-order themes*' emerge (Corley & Gioia, 2004). This allowed the focus to ask if the emerging higher-order themes are

giving concepts that explain what is being observed and those with limited explanation (Gioia *et al.*, 2013).
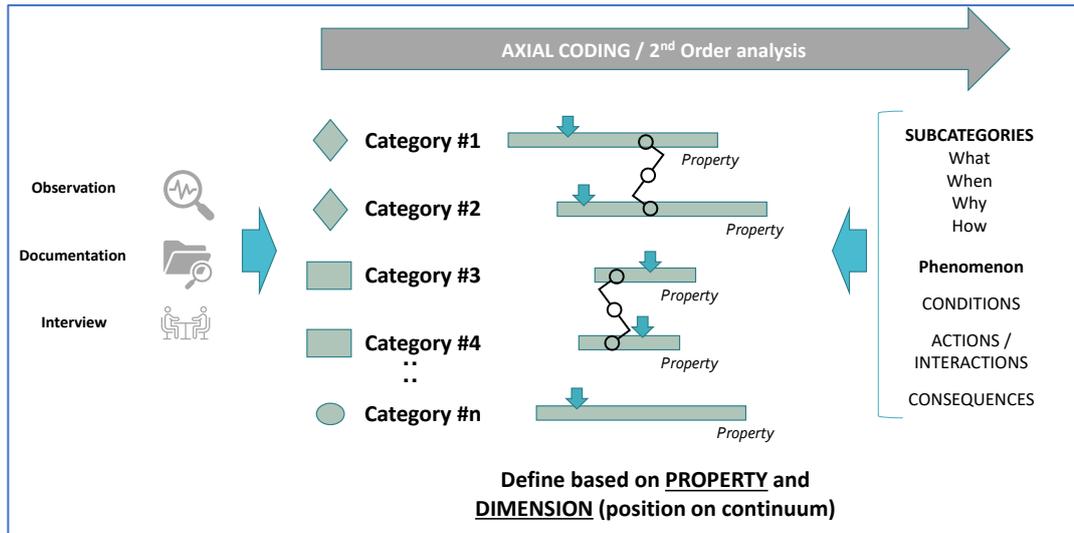
Figure 3.16 Axial Coding (Strauss & Corbin, 1998) or 2ⁿᵈ Order analysis (Gioia et al., 2013)

Gioia *et al.* (2013) state that second-order analysis brings the researcher into the '*theoretical realm*' as we look for explanations of the observations. Applying 's*ynthesis by integration*' and searching for patterns and connections and '*reflective interpretation*' provide feasible explanations for the integrative axial codes (Table 3.21). They are based on a synthesis and aggregation of sub-codes listed in Appendix 6.

CATEGORY [Label / Code]	CATEGORY description
MARKET-DRIVEN PLATFORM CHOICES [MARKET]	Digital platform choices that originate from the external market needs
ENABLING SALES GROWTH through DIGITAL PLATFORMS [SALES_GROWTH]	Digital platform design choices that are driven by different events and actions to result in increased sales growth of HPEFS financial products
Competitive Landscape drivers of platform design choices [COMP]	The competition of HPEFS drives design choices
Embedding improved USER EXPERIENCE in the digital platform [UX]	Platform choice is driven by the deliberate focus on improving the user experience-based outcomes and from direct 'asks'
Conforming to dominant third-party applications to aid integration to the platform [3rd_PARTY]	Choices that are driven by the need to integrate the third-party applications to deliver on the capability they provide successfully
Meeting REGULATION and maintaining COMPLIANCE [REGS_COMP]	External regulation and compliance-driven choices to the digital platform

CATEGORY [Label / Code]	CATEGORY description
Tech enabling transformation in core activity through the digital platform choices [CORE_TRANS]	Platform choices that improve the internal efficiency and effectiveness of HPEFS
Global Process Consistency choices for the platform [GLOBAL_CONSISTENCY]	A choice connected to the HPEFS strategy is global consistency in the processes employed in all geographies.
Performance Improvement cycles applied to the platform [IMPROVEMENT]	Improvement in key business metrics (e.g., cost, quality, revenue) that influence platform choices.
Build vs Buy – non-core applications decisions for the platform [BUILD_BUY]	Making design choices based on the alternatives of (1) to build internally versus (2) to 'buy' the capability externally
Replacing and retiring outdated solutions in the core legacy platform [REPLACE_RETIRE]	Managing technical debt
Improving the potential in data management and Insights from platform design choice [DATA_INSIGHTS]	Design choices to improve the availability, impact, and insights from data to business decisions and actions.
Platform changes from assessing the future Technology Lifecycle (Emerging_Growing_Mature_Decline) [LIFECYCLE]	Seeking out and adopting future capability to improve the digital platform and the impact on the products, services, and internal processing improvements that can be achieved.
Policies and Procedure alignment to the platform capability [POLICY_PROCESS]	Digital platform choices to drive alignment of the internal processes and policy of the business.
Rectifying Issues in the platform [CORRECTIVE]	Design choices that are required to return the digital platform to stability or drive incremental changes.
Challenges to realising the evolution of the platform [EVOLUTION_CHALL]	The specific design choice to overcome challenges to drive change and evolution of the digital platform
Additional drivers of the digital platform design choices [ADDITIONAL_DRIVERS]	Less prevalent design choices in the digital platform
End-to-end Software Development Lifecycle process [SDLC]	The overarching process to design, develop, deploy, and implement the digital platform (incl. structure)
Performance Improvement cycles and Issue management applied to the platform [IMPR_ISSUE]	Improvement in or rectifying issues in key business metrics (e.g., cost, quality, revenue), the experience of the user or underlying processes/tasks - that influence platform choice
Improving the potential in data management and Insights from the platform design choice [DATA_INSIGHTS]	Design choices to improve the availability, impact, and insights from data to business decisions and actions.

Table 3.21 Categories – Axial coding

The final coding step was '*selective coding*' (Strauss & Corbin, 1998; Saunders *et al.*, 2012). The main categories of contextual triggers that turned into '*core*' or '*central categories*' (Strauss & Corbin, 1998; Matthew & Price, 2010) were identified. To be classified this way, they had to be frequent in the data, and central, i.e., where all significant categories identified can relate to it. Ideally, the phrase selected should be sufficiently abstract to be applicable in other areas and can explain variation in outcomes. Consistent with the approach, the central category had to be clearly defined "*in terms of its properties and dimensions*." (Strauss & Corbin, 1998:157). These are summarised in Chapter 4 (Section 4.3.1).

3.5.2 Use of MAXQDA for coding Semi-structured interviews

A tool used in the process was **MAXQDA** (www.maxqda.com), which provided the capability to manage the coding process within the transcribed semi-structured interviews.
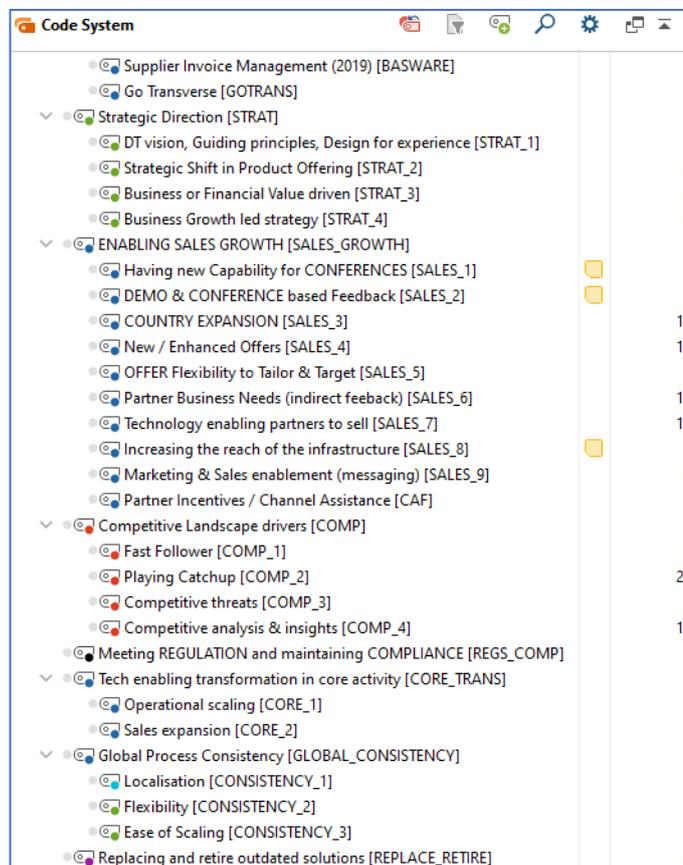
Figure 3.17 Excerpt from MAXQDA coding configuration

The tool's advantage was the ease of allocating and reallocating as I went through iterations of the analysis. Figure 3.17 provides an excerpt from the platform with both the open and axial codes applied. The software provides an easy capture of the grouping of the open codes within the axial codes (Appendix 6).

3.6   Chapter Summary and Conclusion

As outlined at the beginning of the chapter, the research design strategic decisions followed the principles of the Saunders' (2019) research onion, Figure 3.1. It guided decisions logically through each '*layer*' to lead research design, as summarised in Table 3.22. Slight adjustments were required as data was gathered, with some findings causing a degree of course correction at times. The information presented in the chapter tries to reflect on the iterative and non-linear aspects of this type of research design. I also try to illustrate the dynamic and, at times, haphazard nature of research, which aligns with being a critical realist where new information and events can change the direction of the study and where the researcher, to an extent, is in constant reflection as we jump between the '*empirical*', '*actual*' and '*real*'. Finally, theory development was found to be a deliberate activity were understanding what type of reasoning was applied proved critical to the process's success.

Level	Approach
Interpretative Framework) (Philosophy)	**Critical Realism** "*combines a realist ontology with an interpretive epistemology (Archer et al. 1998)*" (Henfridsson & Bygstad, 2013:911)

Theory Development	**Abductive-Retroductive Theorising**
	  • **Abduction** - Conceiving or creating a theory
	    ○ Combining **Deduction** (constructing or elaborating the theory) and **Induction** (Justifying, evaluating, and testing the theory)
	  • **Retroduction** - inference of mechanism to explain outcomes
	
	Propositional theory – mid-range

Methodological Choice	**Multi-method Qualitative**
Strategy	**In-depth CASE STUDY on Single Case (HPE Financial Services)**
Time Horizon	**Longitudinal data from 2013 to 2019 (7 yrs)**
Techniques and procedures	**Data COLLECTION** – Interviews, Observation, and documentation **Data ANALYSIS** – Grounded analysis through CODING (Gioia methodology) and Retroduction

Table 3.22 Summary of the chosen research design strategy

From here, Chapter 4 focuses on the detail of the case study of HPEFS, which leads to Chapter 5, where I explore the research findings.

4 HPEFS Case Study

Chapter 4 provides an overview of the case, data collection and analysis approach taken (Figure 4.1). Following the configurational perspective of **Context-Mechanism-Outcome** (**CMO**) (Pawson & Tilley, 1997; Henfridsson & Bygstad, 2013), the key events and design platform designs **[O]** from 2013 to 2019 (Section 4.1) lays out the digital platform designs deployed during this time.

Chapter 4

4.1	**Introduction to Hewlett Packard Enterprise Financial Services**	• An outline of the organisation in the Case – HPE Financial Services. • Brief introduction of the key events and digital platform designs that form the basis of the findings (Chp 5)
4.2	**HPEFS Case Data**	• Overview of the Phase 2 data collection completed in for each data source - internal documents, external documents and semi-structure interviews.
4.3	**Case Analysis**	• Overview of the Coding and Retroduction as the key techniques applied to the case data.

Figure 4.1 Overview of Chapter 4 – HPEFS Case Study

An overview of the in-depth Phase 2 data collected from the case study (Section 4.2) is presented following the research protocol described in Chapter 3. It provides the basis for the contextual triggers **[C]** identified (Section 4.3.1) following the '*Gioia methodology*' for coding. The retroduction process (Section 4.3.2) followed is outlined and employed to identify the digital platform integrations mechanisms **[M]** at the architectural level, detailed in Chapter 5, Findings, and discussion.

4.1 Introduction to Hewlett Packard Enterprise Financial Services

Hewlett Packard Enterprise Financial Services (HPEFS) is a division of Hewlett Packard Enterprise (NYSE: HPE) that provides financial solutions to the customers of HPE and works with business partners and distributors (selling '*partners*'), herein known as partners. The organisation's core objective is to inform customers of and sell financial products. The products present options for the customer pertaining to their Information Technology (IT) investment strategy, allowing them to choose the best suitable financial option for their need to acquire equipment such as servers,

storage, networking, desktops, and laptops. HPEFS customers are B2B (business-to-business) looking to secure finance to acquire IT equipment and solutions (hardware and software). They range from large global, multi-regional companies to local, small businesses – based on their employee count and annual sales. Partners represent a route to sell financial solutions as they generally provide IT equipment and solutions to Small-to-Medium (SMB) customers.

HPEFS currently has 1,500 employees worldwide and operates in more than 50 countries. In 2019, the division generated $3.6 billion in revenue (placing them within the size range of a Fortune 600). Approximately $6.2 - $6.5 billion of financial product sales, such as financial or operational leases (referenced as financing volume in the financial results), are made each year to maintain this revenue (Table 4.1 – SEC Filings represent the official and publicly available set of company financial results by quarter and year).

		PRE-SPLIT of HP to HPE (HP Enterprise) and HPI (HP Incorporated) in 2015						
	YEAR	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
ANNUAL FINANCIAL RESULTS	**REVENUE**	$3.626B	$3.498	$3.216B	$3.19B	$3.6B	$3.67B	$3.60B
	Growth y/y%	- 5%	- 3.6%	- 8%	- 1%	+ 13%	+ 2%	- 2%
	Non-GAAP Op $	$399m	$389	$349m	$336m	$304m	$290m	$305m
	% change y/y	2.84%	-2.51%	-10.28%	-3.72%	-9.52%	-4.61%	5.17%
SEC FILINGS	**Financing Volume**	$5.6B	$6.425B	$6.504B	$6.478B	$6.085B	$6.521B	$6.2B
	Financing Volume Growth Y/Y	-15.0%	14.67%	1.2%	- 0.4%	-6.07%	7.17%	-4.92%

Table 4.1 HPEFS Financial performance

[Note: SEC Filings – US Securities and Exchange Commission – www.sec.gov]

In 2012, the organisation began shifting towards digitalising the long-standing person-to-person selling approach**.** The strategic decision was driven to allow for double-digit growth without needing to grow the sales and operations teams by the same amount. The digitalisation solutions also supported enhancing customer and partner experience by having "*Everything Online*" as a key strategic initiative from 2013. Over seven years, HPEFS drove digital platform design changes to support this shift from face-to-face engagement to online through a digital platform both in terms of the service provided and the financial products available – this provides the common theme through the journey as outlined in the next section. The business and IT leadership envisioned designs that focused on four critical components of a digital platform from an architectural perspective: (1) the core system(s) – Leasing, Contract Lifecycle and Asset Management, and (2) a connecting infrastructure from the core system, (3) externally-

facing portals and (4) the use of third-party applications to provide certain required services. Table 4.2. captures the key events, the capability delivered and the targeted business outcomes from 2013 to 2019. The initial target was to deploy two contemporary portals (Customer Portal and the Partner Connection Tool) in the overall HPEFS digital platform to support customers and partners in creating an online experience. Figure 4.2 highlights the chronological evolution (with numbering [1] to [13] of the digital platform's key capabilities). The following section provides a brief overview of each primary capability and the evolution of the digital platform (see also Appendix 4 for a more detailed outline of digital platform deployment).
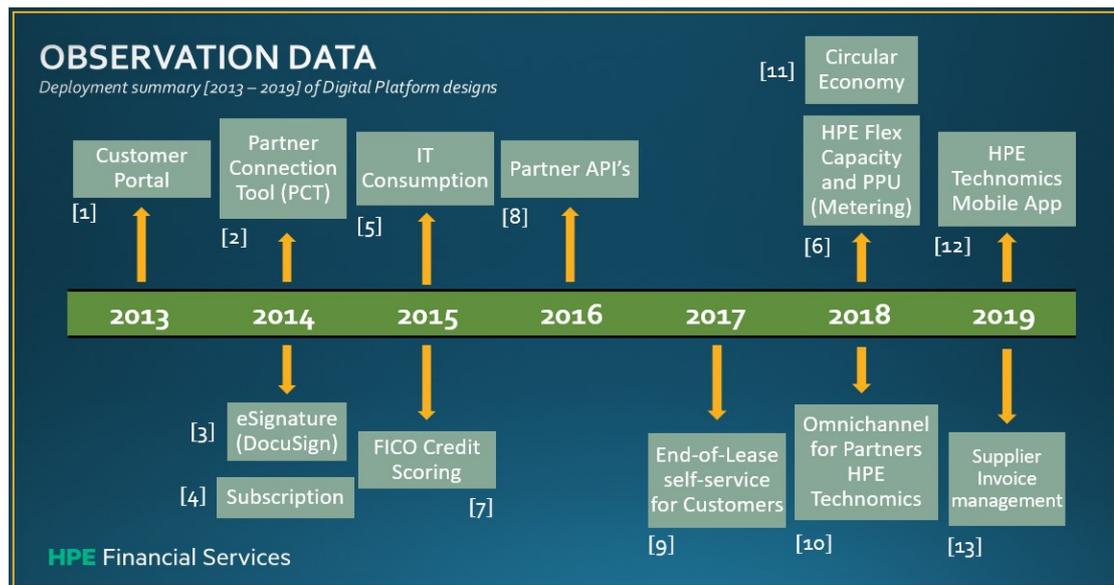
Figure 4.2 Chronology of Key Events – Digital Platform Designs

4.1.1 The evolution of digital platforms at HPEFS

Following the journey from 2013 to 2019, the following section gives an overview of the digital platform designs to position the findings outlined in Chapter 5. The HPEFS digital platforms' design integrates various capabilities rather than serving externally and internally. While presented as separate, they serve as different components of the overall platform to meet different needs of the products and services of the organisation. The following are thirteen of the capabilities denoted as key integration events in the evolution of the HPEFS digital platform.

[1] Customer Portal - The Customer Portal, released as a free, web-based digital platform within the HPEFS digital platform to givecustomers a self-service asset management tool (Westcoast UK, 2014). Designed to provide 24/7 access to the customer's asset portfolio, data was constantly refreshed and provided up-to-the-minute customer information. The core objective of the platform was to enable a customer, through online solutions, to track and manage assets

through the lifecycle of a contract and give complete transparency. Each year, features and functionality enhancements were driven by feedback gathered internally (sales and operation teams) and externally (customers). As a result, improved real-time access to account data, automated notifications, and standardised and customisable reporting were created (HPE Financial Services, 2016).

YEAR	Layered Module Architecture Design (Digital Platform)	Macro-level Business Outcome
2013	[1] Customer Portal	Enabling customers to easily manage their asset portfolios with HPEFS with ease, speed, and complete transparency.
2014	[2] Partner Connection Tool (PCT)	Allowing Partners and Distributors to present quotes easily, make credit applications and generate documents for investments.
2014	[3] eSignature (DocuSign)	Integrating DocuSign to allow the eSigning of financial contracts through the customer portal.
2014	[4] Subscription	Deploying the ability to present subscription payment structures (e.g., monthly payment) from Partner Connection
2015	[5] IT Consumption	Providing innovative financial products allows customers to pay for the specific IT services they 'consume'.
2015	[7] FICO Credit scoring	Automated scoring of a customer's credit risk within a minute.
2016	[8] Partner APIs	Allowing a Partner or Distributor to transact a financial solution within their own platform fully.
2017	[9] End-of-Lease self-service for Customers	Fully automated and self-serve solution in the Customer Portal to allow for pricing and options selection at the end of the lease.
2018	[10] Omnichannel for Partners (HPE Technomics)	Achieving seamless integration between the key elements of the digital platform – desktop (Partner Connection Tool), mobile (HPE Technomics App) and Partner APIs.
2018	[6] HPE Flex Capacity and PPU (Metering)	Consumption solution for the larger customers based on capturing 'metered' usage specific to the infrastructure and bill on a per-use basis.
2018	[11] Circular Economy	Gives the customer a view of their sustainability goals while attaining value from the refurbishment and recycling of retired IT products.
2019	[12] HPE Technomics Mobile App	A mobile app that compliments the Partner Connection tool that allows everything to be seamlessly connected.
2019	[13] Supplier invoice management	Embedding the Basware as a third-party solution to automatically process all forms of selling partner invoices to HPEFS (paper, pdf, electronic transfer)

Table 4.2. Evolution of HPEFS digital platform key capabilities

By 2017, new functionality was announced for customers, allowing self-service decisions and possible actions at the end of a lease. This allowed the customer to explore different options in extending, purchasing, or returning assets at the end of the contract term (HPE Financial Services, 2017). Further changes included alerts on progress and logistic choices for packing and shipping in 2019 (HPE Financial Services, 2019) and were offered in 16 languages.

[2] Partner Connection Tool (PCT) - The release of the PCT into the HPEFS digital platform expanded the transformation of HPEFS in 2014. As an additional digital platform solution, it allowed partners of HPEFS to seamlessly offer all the products and promotions in a '*low-to-no-touch*' way. This was a crucial solution in growing the Small and Medium Business (SMB) customer segment as it enabled '*indirect'* selling through the partner's own sales teams. The platform helped close deals quicker, allowing faster partner payment, an essential business motivator. It also presented the opportunity to add a lift in the margin for a given transaction, giving the partner a higher profit. By late 2015, the platform expanded to 18 countries, with seven languages supported and the company working with over 1800 partners (Cornell, 2015). In 2018, the Partner Connection Tool continued to focus on an enhanced '*low-to-no-touch*' design with the integration of **eSignature by Adobe**. By 2019, it continued to grow as a key capability in the HPEFS digital platform to 23 countries and supported 13 languages, acting as the key enabler of the SMB business growth (HPE Financial Services, 2019).

[3] eSignature (DocuSign) - In 2014, the digital platform introduced signing contracts through a third-party eSignature application, DocuSign (HPE Financial Services, 2016), using Application programme interface (APIs) as the integration technology. While not all countries recognised eSigned contracts, it was a significant change for both the customer experience and the internal efficiency where it was allowed. It provided complete visibility to the routing and progress of the contract throughout the signing process, i.e., who signed and who is next in the workflow to sign until complete. It enabled automated reminders for the document's pending signature. When used, it reduced the overall processing time and eliminated the '*print, sign, scan and upload*' steps (from an average complete the process of 2 weeks to completion in less than 24 hours). It also removed mailing costs from the legacy process that used paper copies to send and return originals.

Consequently, it was both a key benefit internally and to the customer. Designed to store the eSigned contracts in HPEFS Customer Portal automatically, the customer could view, download, or print them anytime. HPE strategically transitioned to integrate Adobe, the leading provider of eSignature, into the digital platform in 2017 (HPE Financial Services, 2017). Expanding the

platform capability to include the two dominant providers by retaining DocuSign gave the customers freedom to choose either based on their preference. Deploying further changes in 2019 further enhanced the experience by allowing email authentication of the user identity, further simplifying the process and, therefore, the customer experience.

[4] Subscription, [5] IT Consumption, [6] HPE Flex Capacity and PPU (Metering) – In 2014 and 2015, new IT consumption solutions were launched, supported by the digital platform's evolution. As a way to reduce capital, maintenance, and upgrade costs, it allowed the customer to only pay for what they used (Hewlett Packard Enterprise, 2015). This was emphasised in a 2016 IDC report quoted by HPEFS,

> *"A recent survey from IDC indicated that 79% of respondents want pay-per-use*
> *options that bundle equipment, software, services and maintenance."*
>
> (HPE Financial Services, 2018)

One of the first of these was the Subscription solution within Partner Connection (Middleton, 2016) that allowed for "*price per seat or per user*" in nine countries. HP marketed the solution as "*Device as a Service, Simplifying PC Lifecycle Management*" (HP Inc., 2016). Additionally, it was applied successfully to the print market (HPE Financial Services, 2016), demonstrating this shift by customers who paid for a service rather than buying or leasing an asset. By 2018, the digital platform had to handle different plans to accommodate flexibilities, i.e., pay for use, and an ability to flex up or down, among other functionality (HPE Financial Services, 2018). Further expansion of the IT consumption offers for other HPE solutions, such as Aruba products (wireless networking), appeared in 2018 (arubanetworks.com, 2018). Metered usage solutions (HPE GreenLake Flex Capacity and Pay-per-use (PPU)) also emerged (HPE Pointnext, 2018). Telemetry software within the digital platform collects and monitors data on consumption, allowing the customer to pay only for what is '*used*'. Specific measurements relevant to the hardware - e.g., Gigabyte used per month, the number of users on the network - provide the means to assign a cost per unit and then bill. Additional features require data collection and further developments within the digital platform and a broader ecosystem to accommodate a pay-per-use approach.

[7] FICO® Credit Scoring (https://www.fico.com/) – In 2015, the organisation's next evolution of the digital platform introduced an automated means of generating a credit score introduced to the partners of HPEFS from FICO (FICO: NYSE), formally called Fair, Isaac and Company. Leveraging and implementing this innovative credit scoring technology facilitated '*less than a minute*' decision (HPE Financial Services, 2017). It provided the capability on the digital platform,

as a complete end-to-end for all the process steps, to enter the relevant data into the Partner Connection Tool. The customer is matched based on details entered if existing or entered in the system, if new. Combined with a specific set of configurations for a given country, the customer and the data of the deal were transferred to FICO to take advantage of their scoring model. The customer data was also combined with data from a local country credit bureau and Dun and Bradsheet customer database (https://www.dnb.com/) to generate a credit score from which a credit line could be offered. This dramatically reduced the overall decision turnaround time from the original 24hr - 48hr commitment to partners for the countries where it was made available. By 2019, the automated credit scoring capability had grown from a single county in 2015 to 16 countries that used PCT as a key enabler for the double-digit growth of the SMB business (HPE Financial Services, 2019).

[8] Partner Connection APIs - In 2016, HPEFS announced the ability to allow direct platform-to-platform integration. The technology behind the integration was Application Programmable Integration (API), which would permit requests for data and responses from one system to another. Each API replicated the processes and specific steps available in the PCT capability in the HPEFS digital platform and allowed the partners to embed these '*web services*' directly into their order management systems. Partners with this functionality provided financing options to their customers, and the IT solutions they supply with little need for leasing knowledge with straightforward access.

"*With the HPEFS Partner Connection API, you can utilise a set of pricing and credit web services to streamline and automate your selling activities.*"

(HPE Financial Services, 2019)

In 2018, an eSignature API completed the suite of solutions to align with the processes of the PCT platform, which completed the API ecosystem.

[9] End-of-Lease self-service for Customers - This was a significant update to the Customer Portal that allowed customers to peruse the available end-of-lease options, allowing them to decide online (HPE Financial Services, 2017). The customer could extend the lease, return the financed assets, or purchase them. This experience allowed for a complete end-to-end process, self-serve on the customer portal, and complete without the customer interacting with operations teams. In addition, internal changes in the core systems provided more automation in completing the process to drive further operational efficiency. The changes allowed the

operation team to focus on the higher-value opportunities where negotiation on pricing would be expected.

[10] HPE Technomics - The strategy for providing partner solutions progressed to using an omnichannel concept at the end of 2018. The go-to-market strategy provided a multi-platform solution under the marketing umbrella of HPE Technomics (Rothman, 2019). The key objective was to enable these platforms to work seamlessly together and allow users to move quickly from one to the other.

"*The capabilities available across the interconnected platforms include instant online quote and pricing, real-time credit decisioning, mobile devices and proprietary system integration APIs, online billing statements, asset-level invoicing, standard and customisable reporting, and more.*"

(Rothman, 2019)

[11] Circular economy - The Circular Economy Report showed the value of asset recovery to customers in 2018 (HPE Financial Services, 2018). It provided IT and sustainability organisations within a firm with a tool to estimate and share the carbon, energy, and landfill waste savings from end-of-use assets. It provided a new capability to the platform with an environmental perspective that is very much in vogue.

[12] HPE Technomics Mobile App - The smartphone application allowed users to generate a credit-approval, financing quotations and contracts for customers (Rothman, 2019). All of which could be completed within the application, in real-time and finalised through eSignature. Findings from the Business Technology Performance Index Report for 2018/2019 (Capgemini.com, 2018) drove this need, where online processing and operational execution occupied the top five customer demands in the selling process.

[13] Supplier Invoice management – A similar '*low-to-no-touch*' change in 2019 introduced partners to better track and quicken payment through automated invoice submission (HPE Financial Services, 2019). Integrating Basware (https://www.basware.com/) to the HPEFS digital platform allowed the partner to provide the invoice they create in any form. The Basware application automatically captured, digitised the content, and transferred it into the HPEFS core system. This makes the processing of invoices more efficient and quicker, which ultimately allows the partners to get paid faster, a key business outcome and benefits their cash flow. Thus, this improved the firm's accounts payable (AP) structures and processes. Basware also provided a dashboard to the partners to manage and track the submissions to HPEFS.

The boundary of the HPEFS digital platform aligns with the three strategic decisions outlined by Gawer (2021). First, the scope aligns with the organisation's core purpose to provide financial solutions to acquire IT infrastructure. Second, access to the platform provides control and determines the digital platforms' '*sides*' (users), which is a business-to-business (B2B) based engagement. It is granted through an internally-driven process to control and ensure the legitimacy of the firms. Finally, APIs as a boundary resource allow the platform to connect to external third-party applications or selling partners to use the capabilities of the digital platform, where access is carefully managed through internally-controlled protocols. The interrelation of the three aspects led to a definition of the boundary of the digital platform in this case.

The leadership's foresight to move to a digital presence proved highly beneficial as the overall business results, throughout the period, remained steady. The double-digit growth in the SMB segment, powered by the digital platform, proved the HPEFS business vital (Figure 4.3).
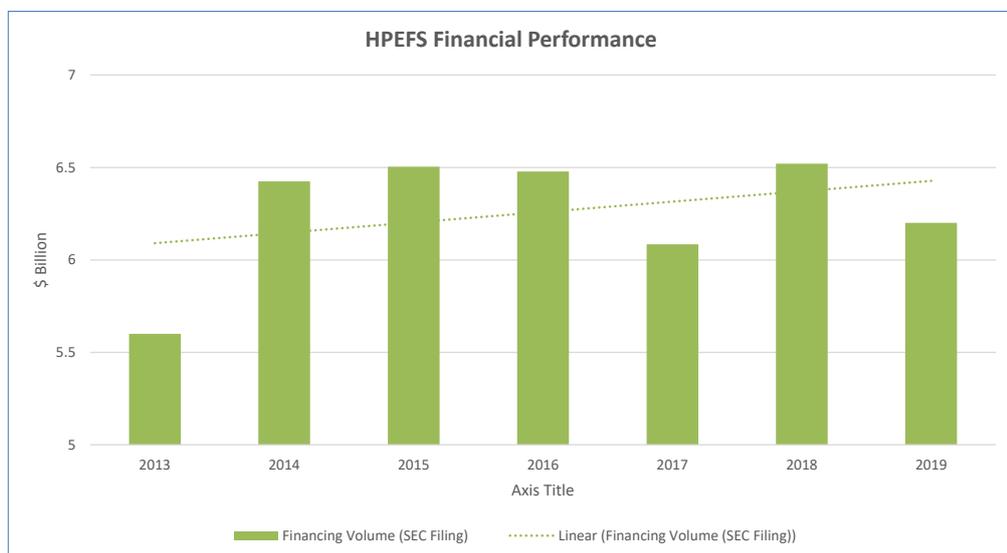
Figure 4.3 HPEFS Financial Performance (Annual Financing Volume) – Source SEC Filings

[Note: drop of 6.1% in 2017 due to lower financing volume associated with third-party and HPE product sales]

Into 2017, the organisation has pivoted and elevated its focus on experience and, more specifically, user-centred design. Design thinking, Journey mapping, personas and empathy mapping are some of the newer techniques in play that drive the next phase of the digital platform's evolution in HPEFS.

4.2   HPEFS Case Data – data collection

Following the research design protocol, the first data collection phase captured the detailed observations (Figure 3.5 and Appendix 4) and high-level strategic plans (**62** off internal

documents). The more involved and comprehensive data collection (Phase 2) was driven by the theoretical lens of generative mechanisms and the configurational perspective (Henfridsson & Bygstad, 2013). Each data element was captured and coded based on the key events and outcomes of the digital platform designs (layered modular architecture designs). **Twenty-four** events were captured and coded within each data element (Table 4.3 – 1010 codes applied over *837* documents and *19* semi-structured interviews), which represents the *micro-to-micro* output (Hedström & Swedberg, 1996) of **design choice** to **digital platform design** (Figure 4.4). These designs led to the business outcomes and results (*micro-to-macro*) enjoyed by HPEFS, its customers and partners.
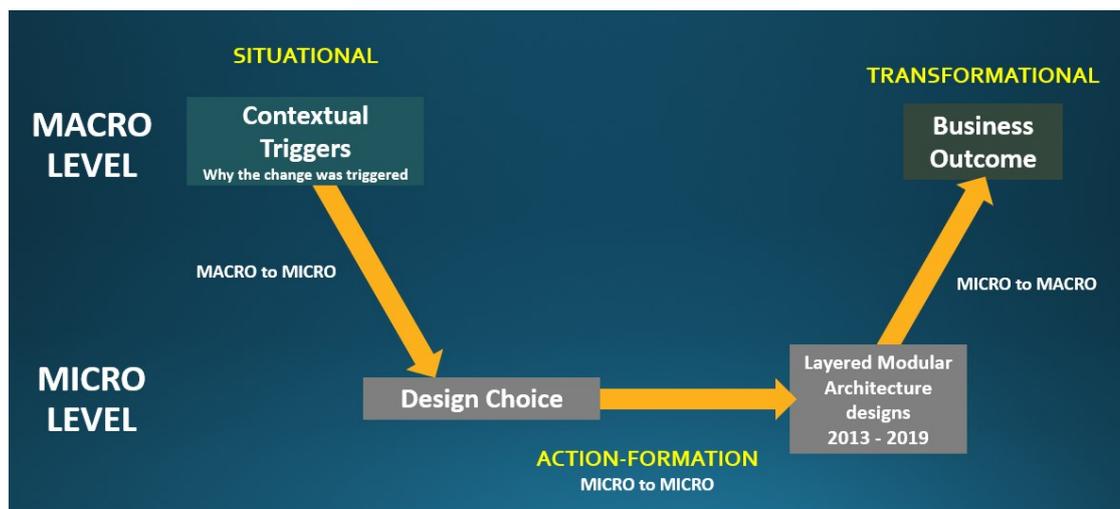
Figure 4.4 Causal Mechanisms (leveraged from Hedström & Swedberg, 1996)

The number of documents where each event occurs (internal and external), coupled with the number of times mentioned in the semi-structured interviews, was captured. The Customer Portal and Partner Connection Tool dominate heavily as the main capabilities in the HPEFS digital platform and are central to the evolution from 2013.

The **observations** captured in phase 1 (Figure 3.5 and Appendix 4) provided (a) the year of deployment externally to customers or partners within the digital platform and (b) a comprehensive level of information around the key events – the digital platform's capability, design characteristics, how it integrated into HPEFS and the business outcomes it drove. The chronology of the *13* key events from the complete list of *24* is presented earlier in Figure 4.2.

Section 4.3.1 outlines the contextual triggers built from open and axial coding applied to the data in Table 4.3.

Taking full advantage of my position as a complete participant, many **internal documents** were collected from 2013 to 2019 as part of the protocol outlined in chapter 3 (Section 3.4.2.1). *Six*

hundred and thirty-seven documents were collected, analysed, and first coded to the relevant business outcomes (Table 4.4). A detailed description of the categories and document types is outlined in Appendix 5.1. Some examples of the documents are highlighted in digital platform strategic plans from 2016 (Figure 3.8) and a strategic shift in 2019 to digital platform design (Figure 3.9). A sample of the detailed list of the documents is outlined in Appendix 5.2.

Sub-codes	Internal Documents	Semi-Structured Interview	External Documents	TOTAL
CORE SYSTEM [CORE]	23	1	0	24
Customer Portal (2013) [CP]	109	17	10	136
eSignature (2014) [ESIGN]	36	9	3	48
Partner Connection Tool (2014) [PCT]	210	52	21	283
Subscription / Device-as-a-Service (DaaS) Pay-at-your-Service (P@YS) (2014) [SUBS]	16	3	17	36
Asset Recovery Services in Customer Portal (2014) [ARS]	9	6	16	31
FICO Credit Scoring (2015) [FICO]	19	19	8	46
Small Ticket Solutions - PCT (2015) [PCT_SMALL]	3	0	0	3
IT Consumption product offerings (2015) [ITC]	16	10	21	47
Configurable Offers & Bundles in PCT (2015) [PCT_OFFER]	15	3	4	22
Partner API's (2016) [API]	21	32	16	69
End-of-Term Self-Service for Customers (2017) [EOT]	8	2	1	11
Robotic Process Automation - RPA (2017) [BOTS]	8	0	0	8
Flexible Billing (2018) [FLEXBILL]	37	7	2	46
Omnichannel Partner (2018) [TECHNOMICS]	9	18	5	32
Omnichannel Customer & Service Now (2018) [OMNI_CUST]	10	1	0	11
Paperless Invoicing (2018) [PAPERLESS]	4	0	2	6
Partner Connection eSignature (2018) [PCT_ESIGN]	16	2	2	20
Flex Capacity / Pay-per-Use (PPU) Metering (2018) [METERING]	17	1	2	20
Circular Economy (2018) [CIRC_ECON]	0	1	16	17
HPE Technomics Mobile App (2019) [TECHNOMICS_APP]	17	29	9	55
Portal + (2019) [PORTAL+]	15	2	0	17
Pricing Engine (2019) [PRICING_ENG]	12	0	0	12
Automated Supplier invoice management (2019) [BASWARE]	4	2	4	10
TOTAL	**634**	**217**	**159**	**1010**

Table 4.3 Coding of the digital platform designs (2013 – 2019)

The documents provide a comprehensive chronicle of the digital platform activity that complements the other data sources and supports triangulation. In addition to the documents focused on capabilities (category 1) and strategy (category 2), the business process (category 3) data focuses on the underlying policies, processes, and procedures. The go-to-market strategy (category 4) and competitive analysis (category 5) give an external view. Finally, the last group provides other aspects to plan and execute the digital platform changes (category 6). The change

in approach to improving the design of the experience design and emphasising issues faced (contributing to the larger document count) are represented in this category.

Internal Documents	Year							
By document category	2013	2014	2015	2016	2017	2018	2019	Grand Total
⊟**(1) Strategy**	**11**	**5**	**8**	**5**	**10**	**13**	**10**	**62**
Strategic Planning document [STRAT]	11	5	8	5	10	13	10	62
⊟**(2) Capabilities**	**56**	**59**	**46**	**50**	**34**	**67**	**52**	**364**
Supplier Invoice Management [BASWARE]							1	1
Core Legacy system [CORE]	4				1	2	1	8
Customer Portal [CP] Asset Recovery Services [ARS] End-of-Term Self Service in CP [EOT] Omni-channel & ServiceNow [OMNI_CUST] Paperless Invoicing [PAPERLESS] Portal + [PORTAL+]	27	13	11	9	2	5	14	81
eSignature - DocuSign & Adobe [ESIGN]	1	2	3	4	4	9	3	26
Flexible Billing [FLEXBILL] Subscription / Device as a Service [SUBS] IT Consumption [ITC] Flex Capacity / Pay-per-use [METERING] Circular Economy [CIRC_ECON]			7	13	7	24	13	64
Partner Connection Tool [PCT] FICO Credit Scoring [FICO] Small Ticket [PCT_SMALL] Offers & Bundles [PCT_OFFER] Partner API's [API] Partner eSignature [PCT_ESIGN] Omnichannel Partner [TECHNOMICS] Mobile App [TECHNOMICS_APP]	24	44	25	24	15	27	16	175
Pricing Engine [PRICING]							2	2
Robotic Process Automation [BOTS]					5		2	7
⊟**(3) Business Processes**	**2**	**9**	**3**	**1**	**1**	**1**		**17**
Policy & Process [POLICY_PROCESS]	2	9	3	1	1	1		17
⊟**(4) Go-to-Market**	**2**		**9**	**1**	**1**			**13**
Go-to-Market [GTM]	2		9	1	1			13
⊟**(5) Competitive Position**	**1**	**1**	**4**				**6**	**12**
Competitive Actions [COMP]	1	1	4				6	12
⊟**(6) Planning, Execution & Structure**	**27**	**35**	**19**	**11**	**10**	**30**	**37**	**169**
Experience Design processes [EXPER_DESIGN]	12	11	12	4	2	12	15	68
Driving Financial Value [FINANCE_VALUE]		3	1		1	5		10
Improvements & Issues [IMPR_ISSUE]	12	17	4	5	7	8	7	60
Execution process [PLAN_EXECUTE]	2	4	2	2		3	6	19
Software Development Lifecycle [SDLC]	1					2	9	12
Grand Total	**99**	**109**	**89**	**68**	**56**	**111**	**105**	**637**

Table 4.4 Internal Documents

From the extensive keyword search on the internet, **104** external documents and collateral were publicly available from 2013 to 2019 (Table 4.5). This also provides a basis for triangulating the events from the observations and internal documents. Additionally, **16** documents covering the quarterly and annual financial results published for the seven years of the study for HPE and HPEFS completed the search. This provided the overall financial results for HPEFS (Table 4.1) to illustrate the overall impact of the digital platform as part of its digital transformation. Details of

the documents, the categories, and their content are outlined in Appendix 5.3. with an example of the tracking table in Appendix 5.5. As these documents are externally focused, most outline the capabilities available to the customers or partners, focusing on the benefits and value proposition to drive sales and adoption.

2013	2014	2015	2016	2017	2018	2019
1	4	13	22	6	22	36

Table 4.5 External Documents - HPEFS

The main driver of competition came from five key competitors (Dell Financial Services (DFS), IBM Global Finance (IGF), De Laga Langan (DLL), CHG Meridian and ARROW). *Eighty* documents (Table 4.6) across this group, coupled with the internal analysis, provided the direction to design features and capability on the digital platform to meet or exceed the competitive offering.

Dell Financial Services (DFS)	IBM Global Finance (IGF)	De Laga Langan (DLL)	CHG Meridian	ARROW
28	8	24	15	5

Table 4.6 External Documents – Key competition of HPEFS

Finally, **19** semi-structured interviews were conducted to identify critical decisions throughout the seven years of the study to provide additional validation and triangulation between the data sources. Following three pilot interviews, the process was carried out as outlined in chapter 3 (Section 3.4.2.4). The interviewees were coded as shown in Table 4.7:

Code	Position	Tenure
OBPM_1	Online Business Process Manager	20
OBDM_2	Online Business Process Manager	19
OBDM_3	Online Business Process Manager	15
OBDM_4	Online Business Process Manager	11
OBDM_5	Online Business Process Manager	17
OBDM_6	Online Business Process Manager	21
OBDM_7	Online Business Process Manager	17
OBDM_8	Online Business Process Manager	2.25
SITPM	Senior IT Project Manager	9
SITBA	Senior IT Business Analysts	9
SITM	Senior IT Manager	19
HOC	WW Head of Credit	22
FICO	FICO Business Model Owner	6
GBDR	Global Business Development Director	21
ECSL	EMEA Channel Sales Leader	21

Code	Position	Tenure
EBDD	EMEA Business Development Director	14
MBDA	Director of Marketing and Business Development, Americas	22
BD	Business Development	12
CDM	Customer Delivery Manager	15

Table 4.7 Research Informant coding, role, and tenure (n = 19)

Each interview was transcribed and inputted into MAXQDA for coding each interview – see redacted examples (Figure 4.5) – to facilitate the subsequent analysis as outlined next.

Position code - MBDA

Position code - BD
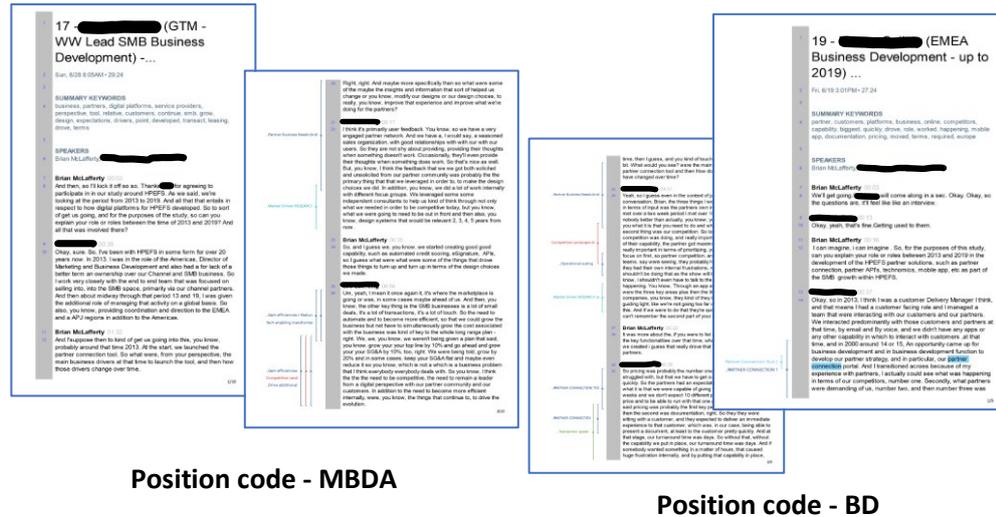
Figure 4.5 Example of MAXQDA output from two of the Semi-structured interviews

4.3 Case Analysis

The case analysis involved a two-step approach aligned to the configurational perspective of **Context-Mechanism-Outcome** (**CMO**) from Henfridsson and Bygstad (2013) – *Research Objective 2*. The initial analysis phase identified the contextual triggers (Section 4.3.1), which allowed the application of these triggers to the digital platform designs and applied retroduction to identify the digital platform integration mechanisms. The findings and discussion on each are presented in Chapter 5. A summary of the codes applied and the flow from Outcomes [O] to identifying and classifying their contextual triggers is outlined in Figure 4.6.

4.3.1 Contextual triggers

Following the key events or design outcomes **[O]** coding, identifying the contextual triggers **[C]** represents the first step (Figure 3.13). This involves initially open coding the internal documentation, external documentation, and semi-structured interviews with sub-codes

(Appendix 6.1) as outlined in Section 3.5.1. Leveraging the Bygstad *et al.* (2016) approach, relevant codes were allocated to each item to capture the stimulating or releasing conditions reflected in the design choice (as the '*action*') presented in the data. This illustrates the internal potential possessed in the design choice that was either planned (when the documents were published) or subsequently delivered. Axial coding is followed to provide a synthesis based on the relationship and higher-order themes to present contextual triggers. A final step (selective coding) was used to unify into core categories (Gioia *et al.,* 2013; Creswell & Poth, 2018).

Each data item was analysed using more natural language or '*informant terms*'. A description of the contextual driver(s) behind the proposed design choice was expressed (Gioia *et al.,* 2013). This generated many different terms and descriptions, thus leading to many categories with **86** codes (Appendix 6.1). From the open codes, *23* axial codes (Appendix 6.2) or '*second-order themes*' emerged (Corley & Gioia, 2004) to represent the case's principal categories of contextual triggers. Examples of open codes such as '*ease of use*' [UX_3], '*simplicity*' [UX_4] and '*effortless experience design*' [UX_9] provided a means to classify the data where these characteristics (outcomes) represent the triggers to the design choices for the digital platform. They embody those properties of a digital platform that embeds an improved user experience strategy, which became the axial code [UX_STRATEGY]. As a second example, presenting new digitally-enabled offers to customers [SALE_4], new solutions to allow partners to sell [SALES_7], and solutions to increase the reach of the digital platform to new segments [SALES_8] were specific triggers to drive business growth. Again, the open codes combine to generate an axial code or theme that summarises into enabling sales growth through digital platforms [SALES_GROWTH]. In other words, digital platform design choices driven by different events and actions result in increased sales growth of HPEFS financial products. The values in Appendix 6.2 represent, for each axial code, the count of open coding assigned within each data source. The higher values represent those areas that had a more significant impact on the design choices of the HPEFS digital platform.

The final coding step is '*selective coding*' (Strauss & Corbin, 1998; Saunders *et al.*, 2012). Three '*core*' or '*central categories*' (Strauss & Corbin, 1998; Matthew & Price, 2010) explain key triggers to the design choices of the digital platform from the case study. As with the previous step, the relationship between the axial codes and the selective codes provides a level of abstraction that explains the differences in the contextual triggers in the digital platform design process.

OUTCOMES

Digital Platform Design (Layered Modular Architecture Designs)	[Label / Code]
CORE SYSTEM	[CORE]
Customer Portal (2013)	[CP]
eSignature (2014)	[ESIGN]
Partner Connection Tool (2014)	[PCT]
Subscription / Device-as-a-Service (DaaS) Pay-at-your-Service (P@YS) (2014)	[SUBS]
Asset Recovery Services in Customer Portal (2014)	[ARS]
FICO Credit Scoring (2015)	[FICO]
Small Ticket Solutions - PCT (2015)	[PCT_SMALL]
IT Consumption product offerings (2015)	[ITC]
Configurable Offers & Bundles in PCT (2015)	[PCT_OFFER]
Partner API's (2016)	[API]
End-of-Term Self-Service for Customers (2017)	[EOT]
Robotic Process Automation - RPA (2017)	[BOTS]
Flexible Billing (2018)	[FLEXBILL]
Omnichannel Partner (2018)	[TECHNOMICS]
Omnichannel Customer & Service Now (2018)	[OMNI_CUST]
Paperless Invoicing (2018)	[PAPERLESS]
Partner Connection eSignature (2018)	[PCT_ESIGN]
Flex Capacity / Pay-per-Use (PPU) Metering (2018)	[METERING]
Circular Economy (2018)	[CIRC_ECON]
HPE Technomics Mobile App (2019)	[TECHNOMICS_APP]
Portal + (2019)	[PORTAL+]
Pricing Engine (2019)	[PRICING_ENG]
Automated Supplier invoice management (2019)	[BASWARE]

CONTEXT

Axial Coding - Contextual Triggers	[Label / Code]	Selective Coding
Strategic Direction	[STRAT]	**Digital Design Strategy** [Business driven activities, processes and capabilities that inform a firm's own digital strategic direction & focus on competitive outcomes]
ENABLING SALES GROWTH through DIGITAL PLATFORMS	[SALES_GROWTH]	
Competitive Landscape drivers of platform design choices	[COMP]	
Meeting REGULATION and maintaining COMPLIANCE	[REGS_COMP]	
Tech enabling transformation in core activity through the digital platform choices	[CORE_TRANS]	
Global Process Consistency choices for the platform	[GLOBAL_CONSIST]	
Build vs. Buy – non-core applications decisions for the platform	[BUILD_BUY]	
Replacing and retire outdated solutions in the core legacy platform	[REPLACE_RETIRE]	
Policies & Procedure alignment to the platform capability	[POLICY_PROCESS]	
Challenges to realizing the evolution of the platform	[EVOL_CHALL]	
Additional drivers of the digital platform design choices	[ADD_DRIVERS]	
MARKET-DRIVEN PLATFORM CHOICES	[MARKET]	
	[UX_STRATEGY]	
Embedding improved USER EXPERIENCE in the digital platform	[UX_INSIGHTS]	
	[UX_DESIGN_PROCESS]	
Conforming to dominant 3rd party applications to aid integration to the platform	[3rd_PARTY]	**Value Creation Outcome** Generating interaction and involvement of stakeholders for design input (Internal or External)
Platform changes from assessing the future Technology Lifecycle (Emerging_Growing_Mature_Decline)	[LIFECYCLE]	
Issue impact on Experience	[EXP_ISSUE]	
Product Offer driven experience	[PRODUCT_EXP]	
Platform change driven experience	[PLATFORM_EXP]	
Improving the potential in data management and insights from platform design choice	[DATA_INSIGHTS]	
End-to-end Software Development Lifecycle process	[SDLC]	EXECUTION
Performance Improvement cycles & Issue management applied to the platform	[IMPR_ISSUE]	CORRECTIVE

MECHANISMS

- CAPABILITY APPROPRIATION MECHANISM
- LAYER COMPLEMENTARITY MECHANISM
- VALUE HYBRIDISATION MECHANISM
- CORRECTIVE MECHANISM

Figure 4.6 Code Summary from the Outcomes and Events

(1) **Value creation outcomes** - digital platform choice is driven by the deliberate focus on improving user experience-based outcomes. Key activity gathers market intelligence and engages with users to identify experience needs in order to deliver value and incorporate future trends.

(2) **Digital design strategy** – inform and align the firm's digital platform's strategic direction to enable the business strategy, outcomes, and competitiveness.

(3) **Driving improved performance (incl. corrective action)** – processes to measure and analyse performance, undertake improvements, and resolve issues to meet the stated business goals of the digital platform.

The contextual triggers of '*value creation outcomes*' and '*digital design strategy*' were found to be the primary drivers of the design process and determine the targeted capabilities for the digital platform. Whereas those '*driving improved performance*' were generally more reactive in nature and drove changes to existing capability in the digital platform.

4.3.2 Retroduction to the mechanisms

The second phase involved the retroduction of the platform integration mechanisms (*Research Objective 3*). Once the contextual triggers were applied to each design platform design, the '*socio-technical action*' was detailed to follow the design choices for each digital platform capability. The characteristics of the changes were captured as they pertained to the digital platform. For example, special characters (umlauts) were added to the digital platform to accurately present the German language in documents, integrating Adobe eSignature into the Partner Connection tool through APIs and modifications to the user interface (UI) for the user, among others.

As outlined in chapter 3, '*reasoning back*' to the underlying mechanisms (Saunders *et al.,* 2019) was employed where each event was dissected and unpacked, similar to the examples from the critical perspective of the characteristics of the digital platform change. Determining the mechanism was then based on reflecting and inferring the emerging platform integration patterns required to achieve the design or business outcome. The patterns of these retroducted findings form the basis of the digital platform integration mechanisms **[M]** at the architectural level and are outlined in Chapter 5.

4.4   Chapter Summary

Chapter 4 provides an overview of HPE Financial Services (HPEFS) and details the key events in the digital platform evolution from 2013 to 2019. The comprehensive case data collected is outlined (Section 4.2) across the sources of internal documentation, publicly available documents, and semi-structured interviews. Data from 2010 to 2020 provided a solid base for coding with the '*Gioia methodology*' (Gioia *et al.,* 2013), creating the basis for analysis (Section 4.3.1). The final step in the analysis is the retroduction process (Section 4.3.2) which supports identifying the digital platform integration mechanisms that are outlined in the next chapter. These and other findings from the case study are explored in chapter 5 as they provide answers to the research question.

5   Findings and discussion

A range of findings from the case study was established following the data analysis step to offer an answer to the research question posed at the beginning of the research. Signposting the chapter is presented below in Figure 5.1, which begins with the first set of key findings of the case of the three **digital platform integration mechanisms** that have emerged (Section 5.1). These mechanisms underpin the design choices observed in the HPEFS digital platform and the business outcomes of its digital transformation. A new concept of the **Corrective Mechanism** is outlined in Section 5.2 that influences design choices that are incremental adaptations of the digital platform based on issues and improvements.

Figure 5.1 Overview of Chapter 5 – Findings and discussion

Section 5.3 provides insights into the contextual triggers established during the case analysis as a critical element in establishing the mechanisms. The second part of this section provides insights into positioning within the digital platform literature and how the triggers could be translated into situational mechanisms in the future (Henfridsson & Bygstad, 2013). As a longitudinal case study over seven years, the insights from critical observations tied to the evolution of the digital platform are explored in Section 5.4.

A conceptual framework and digital platform design model are built on the case findings (Section 5.5). This delivers the means to model the end-to-end design process for a digital platform that can be used to overlay onto a firm's digital platform design journey. As an interconnected model, it also outlines the cause-and-effect to help explain and theorise what an organisation will

experience through this journey. The last two sections of the chapter offer the translation of the case findings and generative mechanisms into a set of practitioner applications. The three design principles translated into the three mechanisms (Section 5.6) can help improve the digital platform design outcomes and help overcome the challenges organisations face in their digital transformation. The final set of findings (Section 5.7) identifies several common categories of design considerations when integrating architectural layers in the digital platform. A chapter summary is outlined in Section 5.8.

5.1 Types of digital platform integrations

The study has extended the work of Henfridsson and Bygstad (2013) by applying their model of generative mechanisms to the context of digital platform design. The configurational perspective of **context [C]**, **mechanism [M],** and **outcome [O]** guided the dissection and unpacking of each digital platform event. From the perspective of the characteristics of each change event, three digital platform integration mechanisms have been identified. It was achieved by reflecting and inferring from each event towards an emerging set of platform integration patterns and changes that reflect the characteristics of a layered modular architecture (Yoo *et al*., 2010). The patterns that emerged through the study, using a retroduction method of analysis, form the basis of the digital platform integrations mechanisms **[M]** at the architectural level. The three mechanisms are grounded in the concepts of (1) appropriation, (2) complementarity and (3) hybridisation. They help explain how the layers within a digital platform are integrated to deliver different types of outcomes, driven by the context within which they act. This is an extension of the innovation mechanisms developed by Henfridsson and Bygstad (2013) as they go deeper into the '*technical malleability*' and the '*recombination*' of the infrastructure. The proposed mechanisms demonstrate malleability through the choices at the architectural level and shows the impact of changing the combination of digital components on outcomes (Um *et al.,* 2015). Each mechanism generates a different level of impact as the casual influence on the resulting platform design varies. They also explain the '*internal potential*' that given design choices possess. In this case, the study clarifies the critical elements of the digital transformation process when it centres on digital platforms. The three digital platform integration mechanisms (*Research Objective 4*) can be defined as:

1) **Capability appropriation mechanism** - the process of activating the linkages between layers at the feature level in a digital platform to deliver on the intended value of the business process and desired service of the platform. Where needs-based or functional-driven contextual triggers activate it. (Section 5.1.1).

2) **Layer complementarity mechanism** - the process of making design choices within layers that create complementarity between capabilities as they interact in the platform to drive higher-level outcomes. (Section 5.1.2)

3) **Value hybridisation mechanism** – the process of deriving value through synergies, created by integrating the layers of the platform into a unified or total solution for the user journey – where the sum is better than the parts (Section 5.1.3).

5.1.1 Capability appropriation mechanism

Over seven years, there is clear evidence that a number of the changes in the digital platform were narrow in nature, i.e., delivering a specific feature and, therefore, functionality. The typical pattern of these changes to the digital platform was to add value by appropriation through the specific features that yielded a single desired outcome. By leveraging this concept (Ceccagnoli *et al.*, 2012; Woodard *et al.*, 2013; Kathuria *et al.*, 2018), we can explain the link of the digital capability to add value to the changes in the underlying process. It is relatively easy to connect the design choice to the resulting outcome in the digital platform due to its singular nature. This is particularly evident in the 2013 to 2015 period as they accounted for the more considerable volume of change in this time. Generally, the outcomes are task-oriented for the customer, partner, or internal colleagues in HPEFS. In these cases, there is a degree of '*translating*' the process and making it digital, i.e., linking the digital solution to performing the task ideally in an automated and better way. This enhances the value of the underlying business process and the platform's service in terms of (1) the function's availability on the platform and (2) ease and speed for the user. The identified mechanism appropriates value from the internal potential of the '*design moves*' to add new features and create digitally enabled products and services (Woodard *et al.*, 2013). Many examples collected during the analysis phase pointed to specific functions added to the digital platform that provided value to the organisation, customers, and partners.

Upwards of 150 changes resulted in a relatively large number of small functional changes across the digital platform. Every three months, upgrades were deployed as part of a '*quarterly release*' where '*user stories*' and their changes were realised. To illustrate, growing the Partner Connection Tool's impact required adding specific features to the digital platform to allow expansion from the initial two counties (North America and the United Kingdom). While the underlying business process steps remained constant, specific enhancements were implemented to meet a country's needs. For example, automatically applying stamp duty in Malaysia (2014), following local accounting rules in Italy for finance lease (2014) and generating

a specific set of loan documents in Mexico (2015) facilitated this growth with a large number of changes across the other countries. As the Director of Marketing and Business Development, Americas [Code: MBDA] reflected this growth: "*the digital platform that we've developed has been highly successful. And I look at a couple of things there, (i) this business segment has grown double digits for the last three to four fiscal years; and (ii) this functionality has now taken us to a place where we can make firm commitments to the partners where we work and meet their expectations, and then simultaneously be able to drive some efficiencies internally…*". During this time (2014), a new distributor mode was introduced to grow the Partner Connection tool's reach beyond partners and other changes such as the ability to change the salesperson assigned to a given deal. This represents a very small subset of the type of changes made in the Partner Connection and the continued move towards digitally '*embodied experiences*' (Yoo, 2010).

Similarly, a sizable group of specific changes in the customer portal were made where the focus was on changes focused on the user, tasks, or the environment (Kyomuhangi-Manyindo *et al*., 2021). Some examples include adding the ability for a customer to request a quote (in 2013) for asset returns and to initiate the request through the Customer Portal. Providing the customer with the ability to customise, run, filter, and export leased asset reports was a meaningful change deployed in 2013. Automatically revoking access for inactive customers, emulating customer accounts, and allowing read-only access in 2014 helped internal operations manage and support customers when they had queries on the platform. Saving a recurring customer's recipient list for future use in eSignature provided the internal operations team with an important efficiency benefit in 2014. Processing a '*wet signature*' through DocuSign in the customer portal allowed taking advantage of the tracking and notification functionality while still allowing those customers to sign a physical contract (2015). Another change involved reusing previously withdrawn eSigned envelopes (2015).

The value creation outcomes (as the contextual trigger) for these changes were driven through three primary sources from 2013 to 2015 to get users' input and feedback on the digital platform's design choices. In each case, the focus was on identifying features to be deployed into the digital platform that is driven by the interaction of stakeholders within the platform (Suseno *et al*., 2018). A customer portal survey was given to active customers where the participant would rate task difficulty, overall experience, and degree of effort for specific tasks. The second approach was to gather direct feedback from focus groups of the internal operations and sales teams that support customers and partners daily, given their intimate knowledge of their asks and frustrations. Lastly, a feature-by-feature comparison of the competitor's features

completed the input based on publicly available information. The output from these activities generally resulted in a needs-based and function-by-function approach to the platform design for customers, partners, and internal colleagues. In effect, it created an ever-improving value proposition for the customers as part of the organisation's focus on value creation (Saarikko, 2015). This aligns with the changes seen in the digital platform in this period and further still with the contextual trigger of digital design strategy. The 2013 strategic initiatives drove the design direction to have '*everything online*' as the strategy's tagline and provide '*fully functional*' and '*easy to use tools and information'* to customers and partners. In addition, the improvements in the business processes to enable the changes for customers and partners allowed the realisation of higher-order process capabilities (Rai *et al*., 2006).

In summary, the findings lead to a **definition of the capability appropriation mechanism. It defines the underlying potential of a design choice based on the linkages between layers at the feature level in a digital platform. Such that the design can deliver on the intended value of the business process and the desired service in the platform when activated by needs-based or functional-driven contextual triggers.**

5.1.2 Layer complementarity mechanism

The second causal structure in the data is similar to the capability appropriation mechanism but generates a broader and more impactful set of outcomes. When analysing the main events (24 off), we find that these broader changes begin to emerge from 2014 onwards. Following a similar approach to dissecting and unpacking each digital platform event, I identified 14 of the 24 outcomes from these events as demonstrating a different type of integration in the platform to help understand the more widespread changes observed (8 examples out of the 14 are outlined in Table 5.1). **The solutions integrate wide-ranging, more impactful capabilities at the layer level into the digital platform. The '*designed*' relationship between the platform layers from these capabilities allows them to grow the mutual benefit with each other. This, in turn, delivers a broader set of outcomes on the digital platform, demonstrating complementarity** (Tiwana, 2015; Tiwana & Kim, 2016; Tiwana, 2018). The first trigger to explain the difference in the observed platform integration was a shift in the digital design strategy by 2014 to constitute driving more significant business volumes through the Partner Connection Tool. This was based on a strategic direction to become a self-service tool with little to no need for HPEFS colleague's interaction to complete a deal (Figure 5.2).
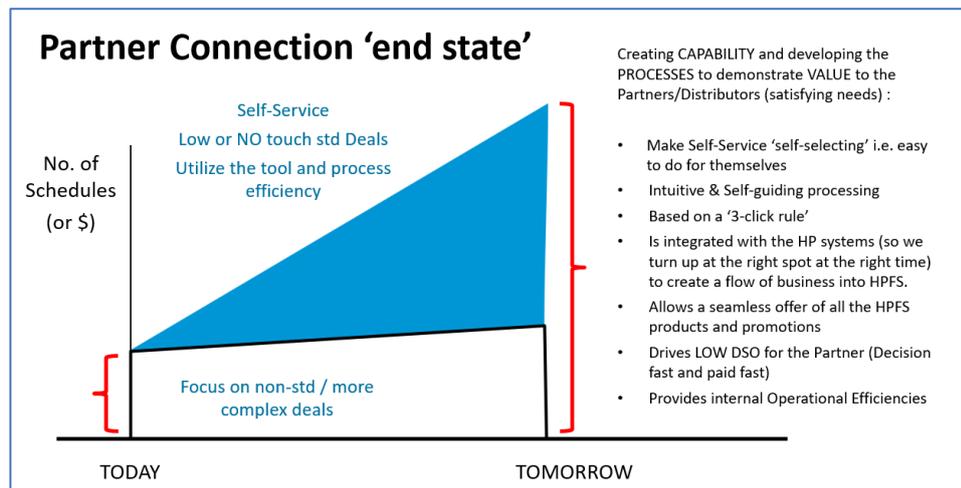
Figure 5.2 Partner Connection 'end state' (May 2014)

The online business process manager [Core: OBPM_7] outlined the essence of the strategy and the support business strategy to "*have a self-service tool that would allow us to grow the SMB business. So, by having the self-service tool, we wouldn't have to grow sales force, so we've got partners and distributors self-serving and doing the business for us.*" The capabilities integrated into the digital platform reflected this strategy in the digital design and outcomes observed, i.e., platform capability, financial products and offers. It was also coupled with a second trigger, i.e., adopting the '*effortless experience*' framework (Dixon *et al.*, 2013), for customers and partners from the beginning of 2014 (Figure 5.3). This shift added to the existing approaches to identifying and gathering stakeholder input to determine value creation outcomes. The six elements (see below) became the lens by which all design choices were assessed.
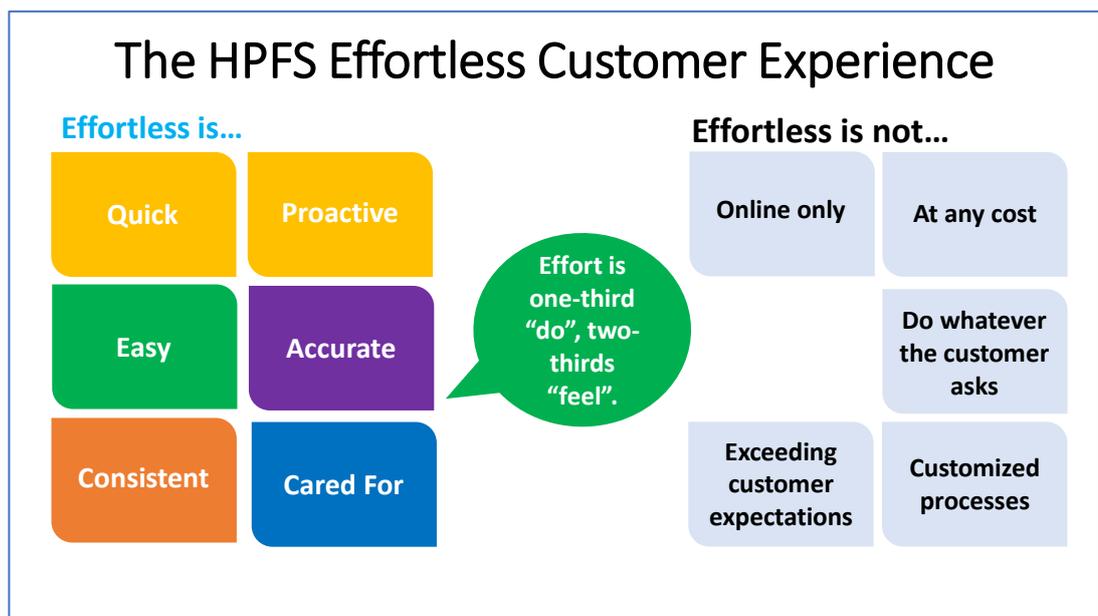
Figure 5.3 The Effortless Customer Experience Framework (January 2014)

Having introduced the concept of the '*Customer pledge*' in 2014 (HPE Financial Services, 2013), the effortless experience framework also became embedded into a '*Partner Pledge*' (HPE Financial Services, 2015) to communicate the organisation's commitment. Thus, it exemplified the further push for those solutions within the Partner Connection Tool. While surveys and focus groups continued, the concept of '*low effort*' became a central theme and main tenet of the experience strategy, which influenced the design choices of the HPEFS digital platform. Irv Rothman, the CEO and President of HPEFS, reinforced the drive for this approach due to the value it presents to customers:

"*The creation of and execution on a genuine value proposition is the true source of sustainable competitive advantage and the best chance of retaining a customer for life…which should be an imperative.*"

(Meier, 2013)

The third contextual trigger shift during this time was the strategic changes in the products and offered services. Between 2014 and 2016, the concepts of '*pay-per-use*' and '*IT consumption*' became commonplace (HPE Financial Services, 2015; HP Enterprise, 2015; Rothman, 2015; HPE Financial Services, 2016; Middleton, 2016). Financial products such as subscriptions (HP Financial Services, 2014; HP Financial Services, 2015) and Device-as-a-Service (HP Inc., 2016) drove an additional need for changes in the digital platform and, therefore, the mechanisms that underpinned the design choices.
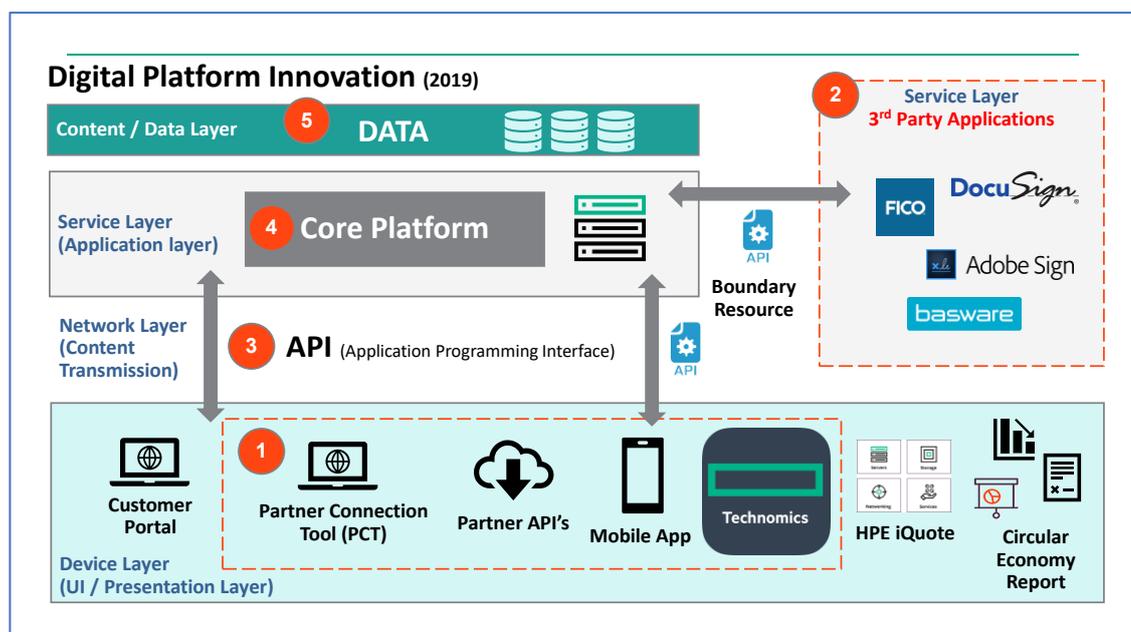
Figure 5.4 HPEFS digital platform (2019)

Driven by the contextual triggers, from mid-2014 on, five key layers of the HPEFS digital platform emerged (Figure 5.4), aligned to the layered modular architecture (Yoo *et al.*, 2010). The design choices, driven by the shift in these triggers, resulted from integration and a combination of capabilities (see examples in Table 5.1). The reconfiguring of capabilities allowed a demonstration of both evolutionary and substitutional changes in the digital platform (Xie *et al.*, 2022). They subsequently realised and improved business outcomes regarding the performance of activities, available financial products, and the experience for the platform's users**. The existence of complementarity is evident from the effects of the resulting relationship between the components in the layers and how they effectively play off one another. When acting in unison, improvement and emphasis on the capabilities' qualities explain the observed business outcomes and changes.**

Year	Layer Integrations	Complementarity
2014	**eSignature in customer Portal [ESIGN]** Service Layer (3rd party app) - **DocuSign** Device Layer / UI – **Customer Portal** Network layer - **API** Service Layer - **Core system**	eSignature from DocuSign was integrated into the customer portal. Through APIs, the capability was embedded to allow the generation of envelopes from within the core system. The customer portal was enhanced by allowing the customer to be notified first and then be prompted to eSign the documents (Westcoast UK, 2014). This increased the value of the overall HPEFS digital platform by allowing more customer tasks to be completed as part of a '*one-stop-shop*' strategy.
2014	**FICO Credit scoring [FICO]** Service Layer (3rd party app) – **FICO** Device Layer / UI – **Partner Connection** Network layer - **API** Service Layer - **Core system**	FICO credit scoring capability was integrated into the Partner Connection Tool. The integration of automated scoring provided a significant improvement to the turnaround time (less than a minute) of providing a decision. This enhanced the Partner Connection Tool as a means of financing for partners with the increased speed of credit decisions available (HPE Financial Services, 2015).
2014 to 2016	**Configurable Offers and Bundles in PCT [PCT_OFFER]** Device Layer / UI – **Partner Connection** System Layer - **Core system**	Between 2014 and 2016, a new capability was introduced into the core system and integrated with Partner Connection to allow more customisable offers and promotions. The overall HPEFS digital platform was improved by configuring and presenting a specific promotion efficiently. Where the partner could, in turn, easily select it and all processes from pricing to document generation was fully automated and integrated (HPE Financial Services, 2015).

Year	Layer Integrations	Complementarity
2014 to 2016	**IT Consumption [ITC] and Subscription [SUBS]** Device Layer / UI - **Partner Connection** System Layer - **Core system**	Between 2014 and 2016, new product offerings were introduced into Partner Connection, built with changes to the core leasing system. Integrating these new capabilities allowed '*pay for what you use*' or '*only pay for what you consume*'. The new capability in the tool gave an enhanced value to the Partner Connection as it broadened the financial products that could be offered to customers by the partners.
2016 to 2018	**Partner APIs [API]** System Layer (3rd Party App) - **FICO** System Layer (3rd Party App) - **Adobe** Network layer - **API** System Layer - **Core system**	In 2016, the first set of APIs was created to allow a partner to embed the capability into their digital platform. This allowed the improvement and integration of different capabilities, such as FICO credit scoring and eSignature (Adobe), which enhanced the capability of the partner's own platform (HPE Financial Services, 2016).
2018	**Partner Connection eSignature [PCT_ESIGN]** Device Layer / UI - **Partner Connection** System Layer (3rd Party App) - **Adobe** Network layer - **API** System Layer - **Core system**	eSignature was introduced through Adobe into Partner Connection in 2018. The entry of the customer was automatically captured and sent through API to Adobe to generate an eSign transaction. The integration through APIs allowed Partner Connection to be enhanced by expanding what the partner could offer its customers regarding the ease and speed to eSign a contract. (HPE Financial Services, 2018)
2019	**Technomics Mobile App [TECHNOMICS_APP]** Device Layer / UI - **Mobile Apps** System Layer (3rd Party App) - **FICO** Network layer - **API** System Layer - **Core system**	HPE Technomics Mobile app was introduced in 2019 as a different user interface for partners integrating through APIs. The screen real estate drove a need to change the platform to simplify the entry process, which significantly improved the experience of the partners and sales team of HPEFS (HP Enterprise, 2019). The UI design, in this case, drove the complementarity to the existing capabilities.
2019	**Automated Supplier Invoice Management [BASWARE]** System Layer (3rd Party App) - **Basware** Network layer - **API** System Layer - **Core system**	Integrating Basware into the HPEFS digital platform was offered to partners as a means to enter their invoices in an automated way. This allowed the partners to be paid quicker as the automated invoice processing enhanced the platform's value (HPE Financial Services, 2019)

Table 5.1 Complementarity platform changes

Other smaller examples also came through, such as changing the access by a person role in the firm to the user interface in Partner Connection to allow franchise businesses to drive internal efficiency (franchise financing is defined as *a large number of small value deals for many individual franchises to finance IT solutions being processed over an extended time for a single*

large franchisor). A second example was the initial integration of a customer's IT Service Management system (e.g., ServiceNow, BMC Remedy) to upload data into the Customer portal automatically. In 2019, a new core pricing engine, accessible by APIs, was initiated for all HPEFS digital platform applications. This was the first significant capability to be integrated online with Adobe or FICO but designed and developed in-house and demonstrated an alignment with the '*professional service*' API archetype (Wulf & Blohm, 2020).

Retroduction of the patterns of integration, as highlighted, present the design process as making choices within layers that create complementarity between capabilities as they interact in the platform to drive higher-level business outcomes. Confirming the '*internal potential*' of these choices and that they are responsible for the outcomes leads to forming the layer complementarity mechanism. This is reinforced as it acted in context, i.e., was contextually driven. In this case, it was that of growing the business with a broad '*low effort*' strategy coupled with new forms of financing.

5.1.3   Value hybridisation mechanism

The third generative mechanism is a further evolution of capability integration within a digital platform and extends layer complementarity as it continues to broaden the business solutions. From observation, **the integration of the digital platform layers is part of a total solution for the business, built on creating an experience where the key focus is on the end-to-end journey of the external user and the application of co-creation (Lusch & Nambisan, 2015) for service innovation**. The solutions concentrate on the complete journey of the user, their engagement throughout and the touch points where the digital platform plays a role in the experience. **Value hybridisation is created in the design choice by developing synergy within the platform's capabilities and the user's full journey (Suseno *et al.,* 2018). In effect, the organisation creates a unified solution in the digital platform driven by the user's journey and the outcomes they will value, based on Grönroos and Voima's (2013) concept of '*value-in-use*'. In turn, this would create a return (revenue and profits) for the organisation**.

From the observations and internal documents analysis, the digital design strategy evolved with the philosophy of a '*fully-connected digital experience'* with ease, speed, and transparency as the digital platform's central characteristics. The contextual triggers for value creation outcomes also progressed between late 2017 and 2019. The digital experience strategy shifted to introduce several key tools, methods, and techniques to design an improved experience and, thus, value creation outcomes. This aligns to the concept of understanding the user's '*well-being*' to aid in the design of a digital platform (Lohrenz *et al.*, 2021). They included journey

mapping, co-creation workshops, design-thinking, prototyping, experimentation, and empathy mapping. By 2019 a '*Digital DNA*' framework collated this set of tools and techniques to adopt as the standard set of design approaches for all digital solutions. In addition, it was combined with the concept of '*experience channels*' to apply to the customers or partners interaction with HPEFS. This accounted for the design of the digital platform at this point and was based on the channels of (1) high-touch engagement with sales and operations, (2) low-touch self-service through various HPEFS digital platforms and (3) integration of key capabilities into the customer's or partner's platforms.

The digital platform and the platform integration approach began to align with the changes in contextual triggers. The events in Table 5.2 illustrate the layer integrations to create a synergy between the user's journey and their interaction with the digital platform solutions from 2017 onwards.

Year	Layer Integrations	Complementarity
2017	**End-of-Term Self-Service for Customers [EOT]** Device Layer / UI – **Customer Portal** Network layer - **API** Service Layer - **Core system (Leasing)** Service Layer - **Core System (Contract Lifecycle)** Service Layer – **Core system (Asset Management)**	Synergy was created within the end-to-end process to allow self-service for the customer so their journey and completion with low effort on all tasks. Additional synergy was created in the HPEFS core systems from request initiation, pricing options, asset return management and invoicing, where fully automated internal tasks aligned with the customer's journey and improved operational efficiency (HPE Financial Services, 2017).
2018	**Omnichannel Partner [TECHNOMICS]** Service Layer (3rd party app) – **FICO** Service Layer (3rd party app) – **Adobe** Device Layer / UI – **Partner Connection** Device Layer / UI – **HPE Technomics Mobile App** Network layer - **API** Service Layer - **Core system**	An evolution of the journey for the partners and a progression from a single platform module (Partner Connection) to create a seamlessly integrated set of platform modules – Partner Connection (Desktop), HPE Technomics Mobile App, and Partner APIs (Own platform integration). This allowed the solutions to create a synergy between the overall HPEFS digital platform and the different selling methods, locations, and journeys partners needed to succeed (HPE Financial Services, 2019).

Year	Layer Integrations	Complementarity
2018	**HPE Flex Capacity and PPU (Metering) [METERING]** Device Layer / UI – **Customer Portal** Device Layer / UI – **HPE OneView** (Integrated IT infrastructure management) Network layer - **API** Service Layer (3rd party app) – **GoTransverse** (Pricing and Billing) System Layer - **Core system**	Journey for a larger enterprise customer to manage consumption for all IT infrastructure (Storage, Server, and Networking). The synergy designed between the products and solutions through the infrastructure management software to HPEFS's digital platform allowed for easy capturing and billing of usage with no effort for the customer (HPE Pointnext, 2018). The clear benefit to the customer was the '*pay for what you use*' in any of the infrastructure financed with HPEFS.

Table 5.2 Hybridisation of value platform changes

Other examples include the new offers from 2018 that gave the customer flexibility to add related services to the financial contract and, subsequently, be processed automatically. Similar to the partner-based solution, a customer omnichannel was initiated in 2018 with the longer-term strategy of integrating a customer's own IT service management (ITSM) such as ServiceNow (https://www.servicenow.com/) or BMC Remedy (https://www.bmc.com/it-solutions/itsm.html). As a final example, in 2019, a major revamp of the external portals (Customer Portal and Partner Connection) was initiated. This was driven by another evolution in the context of experience on a digital platform from the perspective of '*collaboration*' and combining Customer Portal and Partner Connection into a single fully integrated user interface and a move towards a complete '*service platform*' (Lusch & Nambisan, 2015), initially on the desktop platform, before moving to a mobile version.

The **Hybridisation of Value mechanism's** definition is based on the **process of deriving value through synergies as the causal structure. The mechanism explains the internal potential of the design choice as an action to integrate the layers of the platform. It creates a unified or total solution, where the synergy of the user's journey and tasks form the basis of the digital platform integration**, which aligns with the study's observations. It also demonstrates the potential when a digital platform possesses a '*superior architectural configuration*' and how this can be a critical component of a competitive strategy (Kazan *et al.*, 2018). As with the other integration mechanism, it helps explain the relationship between the causal action (the design choice) and the resulting outcomes.

5.1.4   Testing and validating the mechanisms

Two approaches were employed to test and validate the mechanism (Wynn & Williams, 2012). The first '*methodological principle*' for conducting and evaluating critical realist research was achieved by virtue of the research strategy itself (Section 3.3.2), i.e., to ensure a '*thick description*' of the case study focusing on the actions and outcomes of the case. Wynn and Williams (2012) outlined this principle as the **explication of events**. As outlined in Chapter 3, the study design is built on a seven-year longitudinal study with data sources to provide '*thick descriptions*' (Geertz, 1973; Stake, 2006) from the detailed reflections, observations, and data assembled during this time.

The second principle is **empirical corroboration** by assessing the explanatory power of the mechanism compared to alternatives that offer the best explanation of the observed outcomes. During the reflection process, alternative mechanisms based on being technology-enabling, driven by competitiveness, creating product and service innovation, improving efficiency, and meeting regulation and compliance were considered as a possible explanation for the *'internal potential*' for design choices. The concept of platform integration provides a more robust means to explain the contingent generative mechanisms that underpin the design choices observed in the HPEFS digital platform. This is based on the ability for the platform integration to be a more substantial basis for explaining the design outcome as it focuses on how the solution is built at the platform level. It connects the business outcomes back to how they were achieved. The proposition is that they provide a better explanation of the causal structure that generates the observed events (Henfridsson & Bygstad, 2013). While the other mechanisms exist (Huang *et al.*, 2017; Törmer, 2018; Kovacevic-Opacic & Marjanovic, 2020) and give a good perspective of the choice characteristics, they lead to different outcomes than those seen in the case.

5.1.5   Positioning within the digital platform literature

A digital platform can be defined as an '*extensible codebase*' to create '*core functionality'* that integrates '*shared*' software-based subsystems (outlined in Chapter 2). With this definition in mind, the generative mechanisms identified in the study provide an improved understanding of **how** an organisation approaches integrating the '*subsystems*' to the '*core*', impact the digital platform's realised outcomes. The study findings allow the mechanisms to form the basis of key characteristics within the design process of the digital platform. This can be achieved by considering the type of integration or the '*designed relationship*' of the subsystems and platform due to their impact on the outcomes in the process. It also confirms the role of interdependencies in platform evolution and how it is a potential driver of incremental

innovation (Hukal, 2017). This, therefore, positions the generative mechanisms identified in the study as a core part of the conceptual category of '*digital platform design*', as outlined in the literature review (Section 2.4.3) and its clear effect on change and evolution (Tiwana *et al.*, 2010).

The mechanisms identified will also extend the digital platform literature on boundary resources (Ghazawneh & Henfridsson, 2013; Gawer, 2014; De Reuver *et al.*, 2017; Wulf & Blohm, 2020). By embedding the mechanisms identified in the study, the platform owner can attain an added dimension on the level, definition, and type of integration they desire within the boundary resource design. As a result, the interaction between the digital platform owner and those developing modules, subsystems or third-party applications will be impacted.

Another core concept of the digital platform literature is that of '*coupling*' - the level of impact of a design change in one element on another (Brunswicker *et al.*, 2019). The layer complementarity and hybridisation of value mechanisms help augment the definition by providing a means to understand the impact of a design change. With the mechanism's focus on integration between the layers, any change in one can be assessed regarding its impact on the digital platform's complementarity or hybridisation (or synergy) and, therefore, the resulting outcomes.

5.2   Corrective Mechanisms

The fourth mechanism in the case emerged as a new concept of a **Corrective Mechanism**. During the analysis of the contextual triggers, a number of the open coded focused on rectifying issues or making incremental adaptations to the digital platform. These situations were assessed through the lens of Lyytinen and Newman's (2008) model of Punctuated Socio-technical Information System Change (PSIC). Within the internal document and the semi-structured interviews, the kinds of observed change typically would not surface at the empirical level and, thus, escape those studies deploying a generative mechanism lens. However, they form an essential part of the digital platform's deployment. Following Lyytinen and Newman (2008), the **Corrective Mechanism concept explains how a state of equilibrium is ensured or re-established between and amongst the technology, actors, tasks, and structural components of a socio-technical system within which the digital platform sits**.

In other words, a gap introduces instability or a form of structural misalignment between the components. Gaps include such things as where an '*actor*' cannot operate or accept the '*technology*'; an '*actor*' is not able to carry out a '*task*'; the '*technology*' is not adequate to

support the '*task*' to be performed; it is the wrong or inadequate '*technology*' for the '*task*' (Figure 5.5).
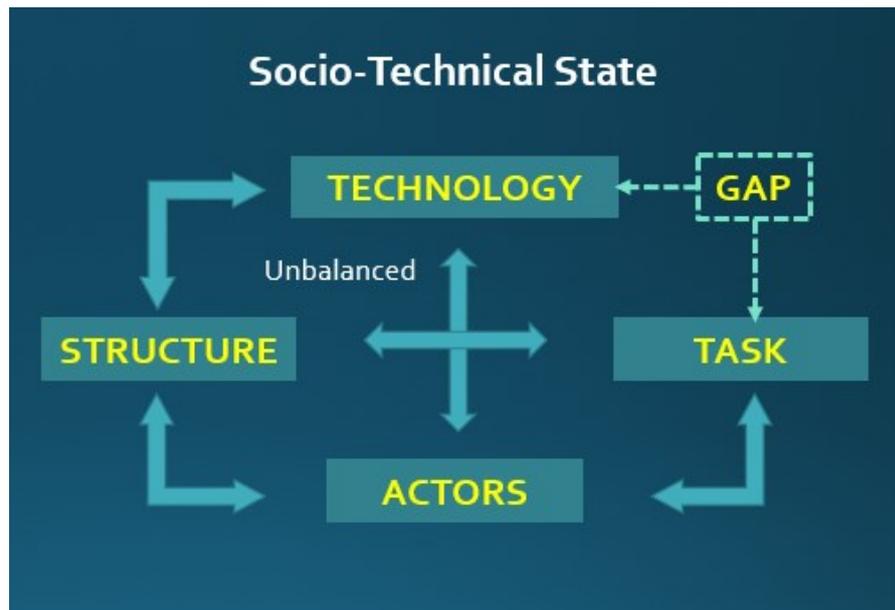
Figure 5.5 Structural misalignment (leveraged from Lyytinen & Newman, 2008:598)

Some examples from the case illustrate the misalignment or gap and the Corrective Mechanism that would restore equilibrium. Within the HPEFS process, the signing of the various documents in the regular order of practice is not all signed simultaneously. The initial implementation of eSignature had documents signed before events occurred, which required adapting the solution in Partner Connection (technology) to adjust the process by automating a split of the signing process in the documents (task) while still generating one transaction through Adobe. Within Partner Connection assigning the wrong customer (task) to a contract was an issue when searching the core system and selecting it incorrectly. The adjustment and fixing of customer matching accuracy (technology) after implementing FICO credit scoring are vital to remove this error. With the growing level of options of products in the Partner Connection Tool in each country, a problem arose with assigning the correct end-of-lease options for the customer in the contract. As a result, a set of dynamic tags (technology) were auto-insertable as a paragraph in the contract based on selection by a partner in the platform. In each case, the '*technology*' solution helps with changing the relationship with the task, actor, or structure without a significant change which Lyytinen and Newman (2008) referred to as the deep structure (as the fundamental choices in a system to how it is organised, the key activities and interaction).

The definition of the **Corrective Mechanism is a causal structure that ensures periods of platform stability. This is achieved by keeping the deep structure intact through incremental improvement or adaptation without reconfiguring this underlying deep structure. These**

causal structures explain the design choices that drive the return to '*balance of the system*' (between two or more subsystems) and towards '*equilibrium*'. Following the Lyytinen and Newman (2008) model of IS change, they will generally succeed in more significant punctuations (as a change in the deep structure). These can be represented by IS terms like '*maintenance*' or '*normal project operation*' (Lyytinen & Hirschheim, 1987; Markus & Keil, 1994).

5.3 Positioning contextual triggers in the digital platform literature

As outlined in the previous chapter (Section 4.3.1), three '*core*' or '*central categories*' (Strauss & Corbin, 1998; Matthew & Price, 2010) explain key triggers to the design choices of the digital platform from the case study. Following Henfridsson and Bygstad's (2013) paper, these triggers reflect the properties of how macro-level events impact individual actions. In effect, they represent a macro-level condition that can be said to affect or shape action at the micro-level (Hedström & Swedberg, 1996). While not the focus on the study, the following selective coding of the contextual triggers can therefore form the basis of situational mechanisms and potential future research:

(1) **Value creation outcomes** - digital platform choice is driven by the deliberate focus on improving user experience-based outcomes. Key activity gathers market intelligence and engages with users to identify experience needs in order to deliver value and incorporate future trends.

(2) **Digital design strategy** – informing and aligning the firm's digital platform's strategic direction to enable the business strategy, outcomes, and competitiveness.

(3) **Driving improved performance (incl. corrective action)** – processes to measure and analyse performance, undertake improvements, and revolve issues to meet the stated business goals of the digital platform.

As outlined (Chapter 2), the large body of research illustrates a concentration and strength in the digital platform literature of ***what*** needs to be done by the firm. In determining the contextual triggers from the case, an alignment with the literature findings on digital platforms is present (Section 2.4.3) to the triggers. We find that the '*digital design strategy*' contextual trigger, established from selective coding, is also a critical domain in the literature. There is good evidence of alignment with a number of the central papers from the review. For example, Woodard *et al.*'s (2013) conceptual model focuses on '*design moves'* as part of a '*digital business strategy'* to create digitally-enabled products or services. A digital strategy was an ever-present part of the HPEFS case that was congruent with the business strategy and the annual strategic

initiatives. While the specifics of the HPEFS digital design strategy evolved through the case, the focus remained constant throughout, i.e., on improving the impact of digital solutions on the products and services [STRAT_1]. This was evident from the full suite of outcomes over the seven years of the study. Other literature examples include Lyytinen *et al.* (2016), highlighting the importance of digitising activities. This aligns with the 2013 strategy of '*moving online*' and how task performance was replicated on the digital platform [STRAT_1]. Rolland and Mathiassen's (2018) study in a Scandinavian media organisation explored the strategic choices between '*digital options*' on their digital platform to change how users could consume content. This mirrors the HPEFS implementation of FICO credit scoring, Adobe eSignature and Basware for supplier invoice management as part of the strategic direction for Partner Connection to become a self-service tool, [STRAT_1] and [STRAT_4], between 2014 and 2019 and another channel for selling financial products [STRAT_2].

The second alignment from the contextual triggers identified is the influence of competition on the digital platform design. From the coding process (Appendix 6 - open and axial codes), it is clear how a competitive focus provided the direction to design features and capability on the digital platform to meet or exceed the competition in HPEFS [COMP_3]. Specifically, how the digital platform's architecture and configuration make it hard to imitate and become a source of the firm's differentiation. This aligns well with the literature studies such as Kazan *et al.*'s (2018) proposal that the digital platform's '*superior architectural configurations*' can drive competitive strategy.

Finally, from the study, axial coding yielded three key value creation outcome triggers focused on embedding an improved user experience - (1) Strategy [UX_STRATEGY], (2) Insights from the Users [UX_INSIGHTS] and (3) The experience design process itself [UX_DESIGN_PROCESS]. These triggers align well with Grönroos and Voima's (2013) definition of value creation and the literature's overall concept of value creation outcomes. This was best illustrated by the '*Digital DNA*' framework from 2019 that collated the set of tools and techniques as the standard set of design approaches for all digital solutions built on user journeys, experience and, therefore, value. Continuing with Grönroos and Voima's (2013) seminal paper, many triggers in the case build on '*value-in-use*' for the user and '*value-in-exchange*' between the '*provider' and 'customer*' and the '*co-creation of value*' from their interaction. This is exemplified best by Partner Connection in the value it can provide to a customer from the partner. Specifically in the range of offers, the ease of acquiring financial products (e.g., FICO credit scoring decision in less than a minute and eSigning contracts) and the ease [UX_3] and speed [UX_1] by which a partner

can offer it in a self-guiding and low-touch manner, [UX_4] and [UX_5]. This was well represented by the Online Business Process Manager [Code: OBPM_06] - "*the benefits of partner connection has given you is you've got now a global platform that you can leverage for partners that can and partners can actually go into that platform themselves. They're not reliant on HPEFS colleagues to do that work for them. So again, that goes to speed of processing transactions and the flexibility that that would give them*." This was also reinforced by Lee Harold, Corporate Financing Manager, SHI, one of HPEFS's partners, when he explained how the PCT created value: "*…we can go from quote to contract in minutes, enabling us to meet aggressive turnaround times and keep our business moving*" (HPE Financial Services, 2016).

5.4   Evolution between 2013 to 2019

While the primary focus of the study was to explain how mechanisms influence the design of the digital platform, an additional assessment of critical aspects of what evolved was taken. We find that there is an evolution in two key aspects that appear, from the HPEFS case, that can be seen to coincide with each other:

(1) How the organisation develops and increases its skill and knowledge in designing solutions for an improved experience for the users and,

(2) Deploying ever-broadening solutions as they seek to increase the value of the digital platform that provides the improved experience design from (1).

Analysis of the case provided insights into the general evolution that followed three overlapping phases approximated in Figure 5.6 that tend to mirror to the concepts of phase transitions (Sandberg *et al.,* 2020). The generative mechanisms identified in Section 5.1 also mirror the phases and evolution of the digital platform (*Note: understanding this potential relationship is called out as part of future research - Section 6.4*).

As outlined, HPEFS started with a more straightforward move to '*everything online*' in 2013, from which it deployed single feature-driven solutions. The designs were generally connected to tasks in the digital platform for the customers, partners, and internal colleagues in HPEFS and to perform them more automatically. The design input was predominantly driven by need-based surveys, focus groups, and other forms of acquiring direct feedback. These accounted for the dominant level of change from 2013, but as the diagram represents started to reduce from 2014. While still applied in 2019, the relative quantity of these changes in the digital platform dropped dramatically.

End-to-end Journey
Capability synergy
Total solution

Low effort experience strategy
Combined complements in
capability

Singular feature-based
Linking solution to tasks
Needs-based
Surveys, focus groups

2013   2014   2015   2016   2017   2018   2019
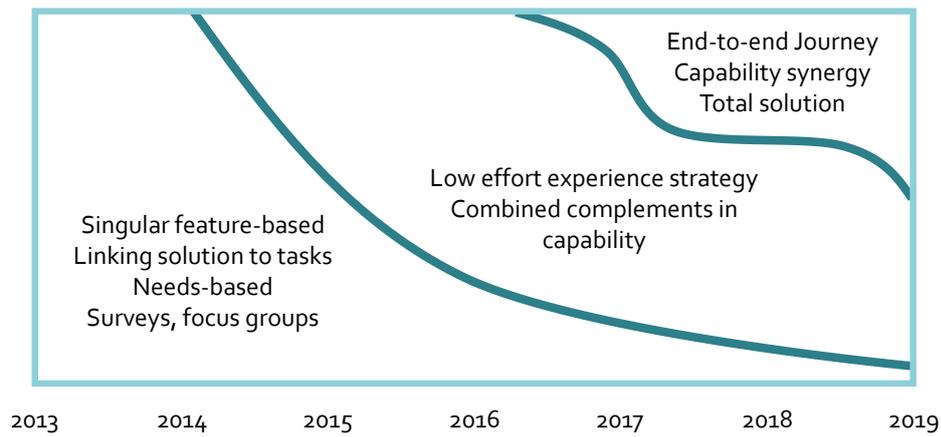
Figure 5.6 A visual approximation of evolution in HPEFS's digital platform (2013 – 2019)

In 2014 a change commenced where the main capability additions were based on an experience strategy that was primarily centred on '*low effort*' to use and adopt the HPEFS digital platform. As discussed in Section 5.1.2, the organisation adopted the '*effortless experience*' framework (Dixon *et al.*, 2013) for customers and partners. Due to this change, the solutions broadened from singular features to a combination of capabilities and how they complement each other. The broadening of the solutions can be associated with the approach to experience design (reflected in the layer complementarity mechanism). In the final phase, the most significant shift in developing expertise in experience design occurred in late 2017 but started in earnest in 2018. The organisation began to develop more advanced skills and knowledge in journey mapping, co-creation, and high-fidelity prototyping through direct training and participating in externally led workshops. Follow-on activity with the organisation, customers and partners broadened the digital platform solutions with a more significant set of business outcomes and impact. The solutions were driven by the external user's end-to-end experience being sought in these cases. The first example was the design of End-of-Term self-service for customers in the Customer Portal, with a growing number of solutions deployed from 2017 (Section 5.1.3).

Reflecting on these phases, a question emerges on what causes the evolution? One possible answer may be due to the ever-changing business strategy to stay competitive and achieve increased business goals (revenue and profit). This likely drives the organisation, causes the push for greater solutions and, therefore, more knowledge of how to create them and can explain the phases seen in the case. It may also present opportunities to understand how to accelerate a transformation (*Note: this is another future research area for consideration – Section 6.4*).

While not a focus in the study, we find a series of path dependencies as the digital platform builds on what it has previously designed and developed (David, 1985; Lim *et al.*, 2011; Bergek

& Onufrey, 2014) and towards broader solutions. On the partner side, a number of the solutions connect, and their design is heavily influenced by the initial design of the Partner Connection digital platform. We see the evolution of the Partner APIs (2016) that matches and fully aligns. From here, the concept of the Partner omnichannel design (2018) demonstrates the dependency on the desktop solution of the Partner Connection Tool (2014) that leads to the HPE Technomics Mobile application (2019). This presents a future research opportunity to understand better the impact of the path-dependency in digital platform design and evolution.

Finally, the case itself provides a unique set of insights and longevity on a digital platform and the evolution during this time. In general, most studies in this area are much shorter in duration and with much more limited access. Therefore, the mechanisms identified have a greater level of temporal input to their definition.

5.5   Conceptual framework and digital platform design model

By drawing on the findings in the case, I can position them within a proposed conceptual framework and digital platform design model (Figure 5.7 – *Research Objective 5*). As an interconnected model, it outlines the cause-and-effect relationship that explains and theorises what an organisation will experience when designing a digital platform. These insights will have implications for both theory and practice as the model presents an understanding of the causal structure's impact on the design process. The proposed framework augments the seminal work of Henfridsson and Bygstad (2013) as it complements the generative mechanisms of digital infrastructure in their study. It allowed the application of this theoretical lens to the subordinate level of the digital platform (or technology) as one of the '*necessary elements*' in a digital infrastructure.

It provides a general framework that underpins the digital platform design process as an organisation focuses on delivering critical outcomes driven by relevant contextual triggers. The model defines the main elements of the casual path by breaking it down into three key components. Reconfirming the relevance of the context-mechanism-outcome model (Pawson & Tilley, 1997), the '*flow*' of the process (reflected in the arrows) and relationships of the constructs are mainly linear in the path, i.e., from (1) context to (2) design choices whose potential is explained by one of the digital platform integration mechanisms to (3) business outcomes:

(1) **Context (Contextual Conditions and Triggers)** – drives the design direction for the creation of capability in the digital platform where the stakeholder input influences the

contextual triggers as value creation inputs. They will come in many different forms, are context-driven, and will be influenced by the goal of integrating an improved user experience within the digital platform. As observed in the case, they will evolve over time as the organisation's skills and knowledge in designing solutions to deploy ever-broadening solutions driven by a changing digital design strategy. The firm's strategic intent will drive the digital design strategy to align with the business goals. Over time the value creation inputs, and the digital design strategy will also exhibit a symbiotic relationship with new insights and evolving strategies influencing the digital platform design. As the mechanisms within the design choices act in context to trigger outcomes, understanding the role of the contextual triggers is essential due to their influence on the overall process. The framework presents the two primary contextual triggers that will determine the main capabilities to be integrated into the organisations' digital platform.
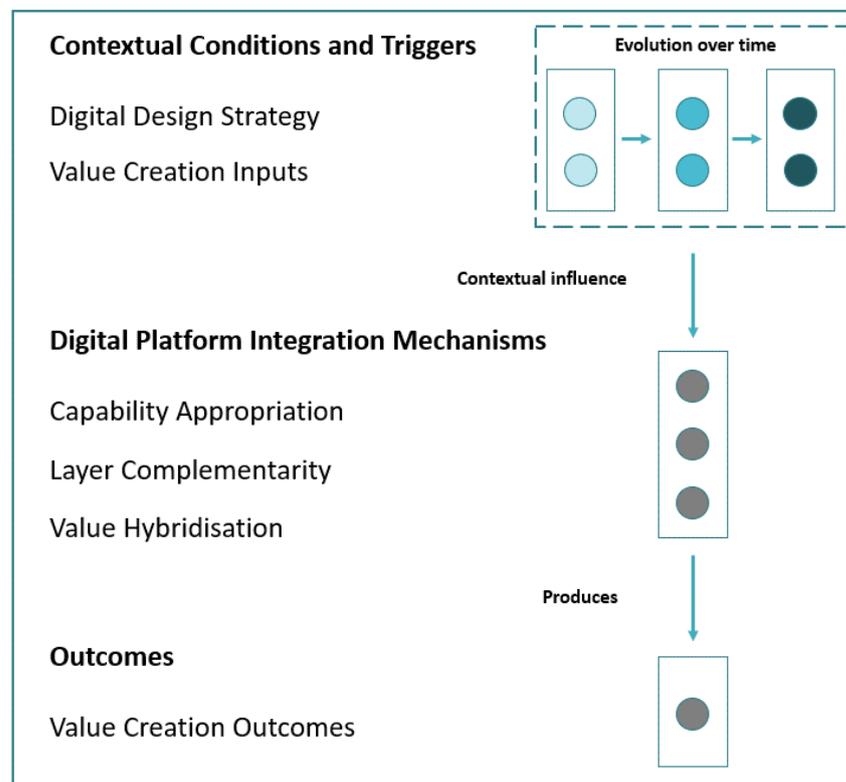
Figure 5.7 Conceptual framework and digital platform design model

(2) **Integration Mechanisms and the design process** – as the organisation embarks on the design of the digital platform, the design choices are underpinned by the platform integration mechanisms. It is possible to position the design choices within these contingent mechanisms to explain the potential and subsequent business outcomes

that would create value. The model will also help explain why an organisation may have to make additional **corrections** based on feedback and improve adoption from which they will have to make changes.

(3) **Outcomes** – once deployed, the digital platform changes are implemented, where adoption ultimately leads to the desired business outcome(s). The observed output can then be seen in value capture (revenue and profits) or value creation in terms of the experience to the customer (or partners). Understanding the platform integration mechanisms and Corrective Mechanisms makes it possible to connect the outcome to the design action that generated it.

5.6 Design principles

A proposed set of digital platform design principles that can guide a firm's efforts provides *'practical utility'* (Corley & Gioia, 2011) from the study. It must be acknowledged first however, that a level of uncertainty comes with these proposals with the application of a critical realism perspective. The creative process involved in abduction and retroduction will require future study to build on the case work and further verify and explore the potential of the following proposals. They support the generation of strategic design choices of capability between the layers and components of a digital platform and are embedded within three design principles: (1) Linkages, (2) Complements and (3) Synergies. They can guide practitioners to drive and sustain a digital transformation through its digital platform as part of an overall design process. They are a translation of the platform mechanisms as outlined in Section 5.1 of the chapter:

(1) **Linkages** - Identifying and utilising linkages between the components of a platform that add features and functionality that improve how tasks are performed, internally or externally.

(2) **Complements** - Looking for potential solutions where the functionality of one platform's components and another fully complement each other to drive better outcomes — creating a '*designed*' relationship between the platform layers from these capabilities that allows them to benefit as they play off one another mutually.

(3) **Synergies** – Actively combine components that give synergy to the user and their journey to the capabilities on the firm's digital platform. To focus on the unison of the parts to create a '*total*' solution that can deliver for all stages of the user on the journey and their engagement with the organisation through its digital platform.

5.7   Practical design considerations for a digital platform

To complement the general design principles retroducted from the case (Section 5.6), I focus on more specific forms of design considerations in this section. The eight considerations came through my observations as a complete participant in the study and coupled with reflections from the other data sources (archival records and semi-structured interviews). They represent the more frequent areas from the analysed data that can help practitioners in their digital platform design journey. They underpin the generative mechanisms and can be considered a requirement to realise the mechanism's internal potential. Where appropriate, examples from the case have also been included.

Consideration #1 - Experience design - Developing and deploying a digital platform to generate value requires the firm to focus on how best to design an experience for the user. As an essential characteristic, the direction to design and deliver the digital platform should primarily be from an outside-in approach, i.e., customer or partner perspective, as they interact with the organisation for all products and services. Critical for the organisation is to account for the business problems the customer (or partners) is experiencing or '*pain points*'. In parallel, a focus is needed to design the '*touch points*' along the customer's journey to establish a future state where a low-effort, self-directing and '*frictionless*' experience is enjoyed. It generally makes it more challenging to switch to competitor platforms and reflects the current trend of the consumerisation of IT (Gregory *et al.*, 2018) that is driving superior experience as a minimum expectation for users.

Consideration #2 - Interaction and engagement - Careful thought should be given to the types of users and user interfaces to control the way interaction occurs with the organisation's digital platforms. Solutions such as self-service platforms, mobile applications, and the integration of external systems to drive business outcomes can enable a strategic shift for the organisation and therefore need consideration. In the case study, the HPEFS partner omnichannel created the opportunity for different forms of engagement for partners with their customers, designed to maximise the benefit of the platform choices to achieve their business goals.

Consideration #3 - Data – Following an integration strategy for the platform's components should include an intent to deliver effective ways to capture, store, transform and present data. It can be viewed as central to the success once the following is considered – what is captured, why it is captured and how to transform the data into actions, insights, and decisions. Within HPEFS, it was a fundamental consideration as it drove improvement in the journey of the

customer, partner, and the activities of the internal colleagues. The Partner Connection tool illustrated the importance of this attribute as data was captured and carefully used throughout the financial transaction. Speed, low effort, ease of use, and simplicity, vital to delivering an optimal experience, were possible by the considered design of use and application of data throughout this digital platform.

Consideration #4 - Transforming the underlying process – Applying a process lens to design the digital platform's ability to impact activities and tasks, focusing on those performed internally and externally, to achieve business outcomes more efficiently. A vital component of the user journey is the tasks they perform and are therefore pivotable to the improvement that a digital platform can enable. For example, the end-of-lease changes in the customer portal allowed an end-to-end process for customers that was backed up by modifications to the internal core system and data management. This allowed for a fully automated end-to-end solution where the '*human touch*' was very low, and the effort on the customer was minimal. This replaced the phone calls, emails and manually generated quotations between customers and HPEFS colleagues with a self-serve solution where the pricing, contract generation and any other part of the tasks were automatically completed to reduce the effort for all involved significantly.

Another consideration is to automate the mundane, lower value-add activities (e.g., data entry and capture) to allow the organisation to focus on higher value-add tasks. For example, the auto-population of fields in Partner Connection from the core system and automatic selection of customers for credit decisions proved quite impactful in creating an improved customer experience.

Consideration #5 - 3rd party applications – Integrating external applications can provide immediate advantages, and the suitable means to integrate can be implemented without extensive internal development. As a result, it can give a path for an organisation to avoid the cost of a legacy system replacement or evolution due to '*tech debt*' while still delivering an impact from the digital platform (Rolland & Mathiassen, 2018). It also allows future capability development to be driven by the provider and permits access to innovation without significant investment. HPEFS examples from the case include the FICO credit scoring solution, eSignature from Adobe and DocuSign, and supplier invoice management from Basware to illustrate the impact of this type of integration.

Consideration #6 - Products and services – Designing and integrating the layers of a digital platform presents the firm with the opportunity to create and offer new technology-based

solutions to customers (and partners). Improvements in the service or service-based products are driven by integration and changes to capture data differently (e.g., direct user interface entry, APIs, telemetry solutions) and processing it automatically that previously was not necessarily efficient or cost-effective. Examples from HPEFS illustrated some of these changes, e.g., Basware for supplier invoice management, Adobe eSignature for eSigning contracts, and metering of infrastructure usage for IT consumption.

A second consideration is how to design tailored solutions to address the customer or partner's needs. Designs are based on how the user is configured or decisions they make on the platform, e.g., tiered pricing, offer-driven pricing, contracts, and branding as was delivered in Partner Connection.

Consideration #7 - APIs – Integration solutions between the layers of the digital platform have a significant role in enabling business outcomes. Providing the means to access third-party applications enables the organisation to overcome the current infrastructure's internal limitations, e.g., FICO credit scoring and Adobe eSignature in the case. Transition to future solutions becomes more accessible with the standardisation of these solutions, e.g., the Stripe payment platform planned for HPEFS. Finally, system-to-system integration is also more readily possible with these solutions, e.g., customers' use of ServiceNow to manage their IT assets can be integrated with HPEFS's Customer Portal for those leased assets. The organisation benefits from the flexibility to switch and the ability to add or change with a lower effort. As outlined by the Global Business Development Director [Code: GBDR] on Partner APIs [API], "*the benefits to the partner is it allows their sales team for work within their existing environment, it becomes an enhancement to their current system functionality and, and makes it easy for them, so they don't have to swivel chair in between two different systems, they can work within the one system, just take advantage of the additional functionality.*"

Consideration #8 - Complexity and size of development for new solutions at the subsystem level are more readily possible by adopting a digital platform integration approach. This is workable as the focus is on integrating the '*solution*' or '*software subsystem*', which can stand somewhat separate until ready, e.g., the HPEFS plans for a new pricing engine or the Portal+ platform for collaboration. Therefore, the transformation process can be more of a continuous incremental change, i.e., a form of a gradualist paradigm approach (Hayes, 2014). It can therefore have a greater chance of success than a larger, more radical form of discontinuous change, i.e., the punctuated equilibrium paradigm (Hayes, 2014).

5.8   Chapter summary

The chapter provides the significant findings from the case and a set of answers to the posed research question on how mechanisms connect the design choices observed in a digital platform. The three contingent digital platform integration mechanisms (Section 5.1) explain the causal nature of design choices in a digital platform. The outcomes from these choices are triggered by one of the mechanisms found in the study, driven, and acting based on situational, contextual triggers. The next set of findings (Section 5.2) focuses on a new concept called Corrective Mechanisms. This provides insights into the types of changes that are typically incremental and more of an adaptation of the digital platform. The mechanisms align with Lyytinen and Newman's (2008) model for IS change to restore balance or equilibrium in the socio-technical system.

Section 5.3 outlines the contextual triggers identified as part of overlaying a configurational perspective (Context-Mechanism-Outcome) to the case, which is critical for identifying the generative mechanisms. The contextual triggers align with several areas identified in the digital platform over the seven years. Positioning these findings with the literature review is also outlined in this section to connect to the digital platform literature. Section 5.4 reflects on the digital platform's evolution from 2013 to 2019 and the case itself. It explores how the solutions changed and broadened during this time in parallel with the approach to designing the platform and the experience therein. Section 5.5 presents a proposed conceptual framework and digital design model based on the findings of this study. This outlines an interconnected model to outline the cause-and-effect to help explain and theorise what an organisation will experience. The penultimate section presents several design principles built leveraged the generative mechanisms. These provide input and potential application opportunities for practitioners, thus showing and demonstrating the practical utility of the study and output.

The final section outlines more specific forms of design considerations that are the more frequent characteristics that can help practitioners in their digital platform design journey. They underpin the generative mechanisms and can be considered a requirement to realise the mechanism's internal potential. In summary, the chapter presents a series of findings to provide answers in support of the research questions. The longitudinal nature allowed an extensive range of areas to be explored, and several additional areas emerged that, while not part of the study, may form the basis of some additional future research (Section 6.4). The next chapter closes the study with key conclusions, contribution summary, reflections, and several recommendations for the next steps.

6 Conclusions

IDC predicts that the investment in digital transformation will be a compound annual growth rate (CAGR) of 16.5% between 2022 and 2024, with a worldwide value of $6.3 trillion (Carosella *et al.*, 2021). We also find that platform-based business dominates this transformation, exemplified by some of the most valued companies, e.g., '*GAFAM*' - Google (Alphabet), Amazon, Facebook (Meta), Apple, and Microsoft (Constantinides *et al.*, 2018). In 2020, as digital platform ecosystems, these companies occupied the top five brand positions in terms of value (Forbes, 2020). However, as explored in chapter two (Section 2.4.3), the literature offers limited guidance on '***how***' design choices around digital platforms can influence digital transformations and motivates the research. The literature review sought possible solutions to this dilemma of '***how to design',*** and the theoretical lens of generative mechanisms (Henfridsson & Bygstad, 2013) helped focus on context, design choices, and the digital platform design outcomes. The research question subsequently formulated then provided the basis for the study - "*For a digital transformation within financial services, how do enabling mechanisms influence the design choices of a digital platform?*". The research approach and methodology were designed to provide answers (explored in Chapter 3). I outlined the chosen critical realist philosophy, the justification for selecting an in-depth qualitative case study of HPEFS, and the application of the seminal work of Henfridsson and Bygstad (2013) on generative mechanisms. Other leverage in the thesis included the application of affordances (Bygstad *et al.*, 2016) to identify contextual triggers and layered modular architecture (Yoo *et al.*, 2010) to position the designs within the digital platform architecture. The research focused on examining a digital platform at an architectural level and investigating the '*action*' of design choice and how the outcomes observed arose.

Within Chapter 4, three ***digital platform integration mechanisms*** and the concept of ***Corrective Mechanisms*** proposed answers to the research question. The analysis and findings examined in the chapter enable a deeper understanding of the mechanisms underpinning an organisation's design choices. It shows how they can positively influence a firm's digital transformation, providing additional insights into guiding change. Chapter 5 describes the proposed digital platform integration mechanisms and their influence on design choices on a platform. The chapter further explores a conceptual framework and model that highlights the interconnection of the mechanisms with the design process and explicates a set of design principles for practitioners.

The structure of this final chapter begins with an outline of the original contributions to knowledge (Section 6.1). It positions the research's output within the fields of generative mechanisms, digital platforms and the proposed contribution made. The application to practice is presented (Section 6.2) to view the practical utility of the output. The study's limitations are explored (Section 6.3) before laying out the areas for further research (Section 6.4). Reflections and observations that may influence and form key considerations within future research and potentially help other researchers are presented in Section 6.5. This acknowledges the key aspects of the design process, research process and areas of the study that should be considered in the future. Penultimately a set of conclusions to summarise the key insights from the study (Section 6.6) are presented on the key contributions before final thoughts are presented (Section 6.7) to close out the study.

6.1   Theoretical Contribution

The following section summarises how the study contributes to two central bodies of literature: (1) Generative Mechanisms and (2) Digital Platforms. Each of the five original contributions to knowledge is followed by a brief outline of where the contribution will have its impact.

Contribution 1a – identified three digital platform integration mechanisms, as inherent properties of design choices, at the architectural level, explaining how they can lead to different impacting outcomes in a digital platform (*Research Objective 4*). The study has extended the work of Henfridsson and Bygstad (2013) by applying their model of generative mechanisms into the context of digital platform design, within a financial services organisation and over a seven-year duration. The main contribution to knowledge is the identification of three causal mechanisms within the design process of a digital platform. More specifically, the original contribution is the digital platforms integration mechanisms that have emerged to explain the '*internal potential*' possessed by the design choices (actions), in this case, within a configurational perspective of **context**, **mechanism,** and **outcome** (Henfridsson & Bygstad, 2013). The study further contributes by clarifying the critical elements of the digital transformation process as it centres on digital platforms.

Contribution 1b – the emergence of a new concept of a Corrective Mechanism. A causal mechanism that ensures platform stability periods, thus keeping the underlying deep structure intact and incremental improvement without reconfiguring it (*Research Objective 4).* This further extends the generative mechanism theory to those incremental adaptations that generally succeed in punctuations of the IS system (Lyytinen & Newman, 2008). These causal

structures explain the design choices that drive the return to '*balance of the system*' (between two or more subsystems) and towards '*equilibrium*'. The proposition from the study is to put forward these mechanisms as another set of original contributions to knowledge as they will not surface at the empirical level and will generally escape those studies deploying a generative mechanism lens. However, they form an essential part of the digital platform's deployment and illustrate their position in a digital transformation.

Contribution 2 – adding the concept of digital platform integration mechanisms to the digital platform literature provides a deeper understanding of specific design activities within a digital transformation (*Research Objective 1*). Digital platform integration mechanisms provide the means to explain how the design choice can influence the outcomes of the integration of the '*shared*' or '*add-on software subsystems*' with the core of the system in a digital platform (Meyer & Lehnerd, 2003; Tiwana, 2010). This study, therefore, provides an original contribution to the digital platform literature. It provides a novel means to compare platforms from the perspective of choices based on integration mechanisms made by an organisation related to the outcomes and, subsequently, the platform's performance. In effect, the choices are characterised by the integration mechanisms that, in turn, can be applied to other research efforts as a variable in platform innovation.

Contribution 3 – defining a digital platform design model that can explain what an organisation will follow when designing a digital platform (*Research Objective 5*). The added contribution to the knowledge is a conceptual framework and digital platform design model (Figure 5.7). As an interconnected model, it outlines the cause-and-effect relationship to explain what an organisation will experience when designing a digital platform. It can facilitate testing and validation of the design process to explain better what is observed. It can also help advance our knowledge on how to embed technologies into digital platforms that help with the digital transformation challenges organisations face.

Contribution 4 – to provide a set of digital platform design principles that can guide a firm's efforts into digital transformation (*Research Objective 5*). Building on the digital platform design model, a set of practical design principles has been established based on (1) linkages, (2) complements and (3) synergies between the layers and components of a digital platform (Section 5.7). As a proposed set of design principles, they can guide practitioners to drive and sustain a digital transformation through its digital platform as part of an overall design process.

Contribution 5 – Contribution from a seven-year longitudinal case. The final contribution to knowledge is that of the case itself. The circumstances present a unique set of insights and

longevity on a digital platform and the evolution during this time. In general, most studies in this area are much shorter in duration and with much more limited access. Therefore, the mechanisms identified have a greater level of temporal input to their definition.

6.2 Contribution to Practice

Firstly, the study's answer to the research question supports a practitioner in understanding the complexity of the process and the evolution of a digital platform. The proposed ***conceptual framework and model*** define the main elements of the design process and offer help with this complexity by breaking it down into more manageable components. It also provides a general framework that can underpin the annual strategic planning process as an organisation focuses on delivering different outcomes driven by contextual triggers.

Second, chapter five (Section 5.7) defines a set of ***design principles*** and how integration will enable value creation outcomes with a focus on driving adoption. This represents the translation from the digital platform integration mechanisms to design principles on the integration of the layers and components:

(1) **Linkages** - Identifying and utilising linkages between the components of a platform that add features and functionality to improve how tasks are performed, internally or externally.

(2) **Complements** - Looking for potential solutions where the functionality of one component of the platform and another fully complement each other to drive better outcomes. Creating a '*designed*' relationship between the platform layers from these capabilities allows them to grow the mutual benefit as they play off one another.

(3) **Synergies** – Actively combine components that give synergy to the user and their journey to the capabilities on the firm's digital platform. To focus on the unison of the parts to create a '*total*' solution that can deliver for all stages of the user on the journey and engagement with the organisation and its digital platform.

Third, an organisation that desires to transition from features to user experience on their digital platform can achieve this with the evolution of the design process they follow (e.g., moving to journey mapping, co-creation, and prototyping). Working in tandem with this move is broadening the digital platform integration solutions to support the increasing value creation outcomes that the design process strives to create.

To complement the general design principles above, more specific forms of design considerations for practitioners were identified from the empirical data from the case. They underpin the generative mechanisms and can be considered a requirement to realise the mechanism's internal potential.

(1) **Experience design** – Focus on how best to design an experience for the user in the digital platform. To employ an '*outside-in*' approach, i.e., designing from the customer or partner perspective, as they interact with the organisation for all products and services.

(2) **Interaction and engagement** – Accounting for the types of users, their roles and appropriate user interfaces to consider the design of the optimal interaction with the organisation's digital platforms. The design of how users interact on solutions such as self-service platforms, mobile applications or systems-to-system solutions are instrumental in driving business outcomes.

(3) **Data** – Effective ways to capture, store, transform and present data can be viewed as central to the success of a digital platform. Therefore, essential questions should be considered - what data should be captured, why it is captured and how to transform the data into actions, insights, and decisions for the digital platform users.

(4) **Transforming the process -** A core component of the user journey is the tasks they perform. Applying a process lens to design the digital platform's ability to impact these activities can positively impact business outcomes more efficiently.

(5) **3rd party applications** – Integrating external applications can provide advantages without extensive internal development and take more or less immediate access to the digital solution. Overcoming the challenges presented by legacy systems, which are inherently difficult to change and where large '*tech debt*' generally exists, can also be impacted using appropriate third-party solutions.

(6) **Products and services** – Designing and integrating the layers of a digital platform allow the firm to create and offer new technology-based solutions to customers (and partners). The core is establishing where and how to capture data differently (e.g., direct user interface entry, APIs, telemetry solutions) and then processing it automatically that previously was not necessarily efficient or cost-effective.

(7) **APIs** – Integration solutions, such as APIs, between the layers of the digital platform, have a significant role in enabling business outcomes. They can provide access to third-party applications and enable the organisation to overcome the current infrastructure's internal limitations (as referenced above).

(8) **The complexity and size of development** - Adopting a digital platform integration approach allows the possibility to develop complex solutions by seeing them as subsystems. This is workable as the focus is on integrating the solution as a '*software subsystem*', which can stand separately until ready.

Finally, while not explored in the case, a practical utility (Corley & Gioia, 2011) can come from illustrating the potential of generative theory constructs and the impact of platform integration mechanisms for practitioners. These insights may drive potential improvements in organisations' design processes with the emergence of additional mechanisms, thus providing future research opportunities.

6.3   Research Limitations

While the study's results will contribute to an improved understanding of digital platform integration mechanisms, there are some limitations. This section focuses on highlighting those potential limitations that could impact the quality of the study or the ability to answer the research question effectively. This is important so they may be addressed and provide a guide for future research. On reflection, two main limitations potentially impact generalisability from a single case and bias. There are other items outlined at the end of the section.

(1) **Single case and generalisability** - Being able to generalise based on a single case is a potential limitation in the HPEFS case. While the data collected is '*thick*' (Geertz, 1973; Stake, 2006), there is still a question about the ability to overlay the mechanisms onto a broader set of digital platforms and across industries. As a singular case is used in the study, the context and business conditions could lead to mechanisms specific to the circumstances. While fitting with the empirical data, it may not be transferrable in this case as there were no comparisons or data collected from other cases. Additionally, as the mechanisms are acting in context (Pawson & Tilley, 1997), which is different from case to case, this may also limit the effectiveness of the answer to the research question. However, for many reasons, an in-depth case study on a single case (Section 3.3) was the selected research strategy. First is the availability of '*rich*' insights (Weick, 2007) or '*thick descriptions*' (Geertz, 1973; Stake, 2006) from the detailed reflections due to long and '*deep access*' (Henfridsson & Bygstad, 2013; Williams & Karahanna, 2013) as a '*fully engaged*' complete participant (Bryman & Bell 2007; Creswell & Poth 2018; Yin, 2018). Secondly, as a longitudinal study, the single case allows the exhibited conditions and the '*underlying processes*' to be assessed based on how they change throughout the study

(Yin, 2018). It also allows to '*falsify*' poor propositions due to the nature of the in-depth data and can test the pre-conceptions, assumptions, and hypotheses that may be held (Flyvbjerg, 2006). Finally, it was felt that any potential '*misunderstandings*' from a single case could be overcome by strategically selecting the right case Flyvbjerg (2006), which HPEFS would be argued to fit. Strengthening generalisability could be achieved by testing and validating the integration mechanisms and contextual triggers (situational mechanisms) in other digital platform evolutions. This would allow validation of the case study's findings if applied to a broader range of financial services organisations and other contexts.

(2) **Bias** – as authenticity and accuracy were required in the study, my role as a '*complete participant*' potentially weakened the findings due to bias (Section 3.4.2.5). Firstly, researcher and observer bias (Saunders *et al.*, 2012) allows for the potential of subjective views of the situation to influence the data and observations. Secondly, interviewer, interviewee, non-response, selection, confirmation, and managerial bias were all possible issues in the semi-structured interviews (Bryman & Bell, 2007). This could have influenced the interviewees and their responses (or non-responses) and led to a poor selection of whom to interview, which could impact breadth and possibly overfocused on the management in the organisation. These types of biases would impact the quality of the output from the interviews and the credibility of the data collected. The use of archival information (internal and external documentation) and conducting semi-structured interviews were selected to counteract researcher or observation bias issues. Triangulation of multiple data sources provided '*corroborating evidence*' and, therefore, the validity of the findings (Wynn & Williams, 2012; Creswell & Poth, 2018). A broad range of participants was selected, resulting in a 60:40 split of individual contributors to management to counteract elite (or managerial) bias. However, 8 of the 19 interviewees were my direct reports, so a colleague from the university participated as an independent observer to minimise potential interviewee bias. Additionally, a different approach in the interviews to reduce confirmation bias was the use of '*disconfirming evidence*' by looking for unsuccessful changes in the digital platform transformation (Creswell & Poth, 2018). As with generalisability, removing bias by conducting a study in a broader set of organisations would prove helpful. This allows validation of the findings from the case study if or when applied to a broader range of financial services organisations and other contexts.

(3) **Sensitivity of commercial data** - a specific limitation exists in the case because of the sensitivity of the commercial data. It is possible to show the impact of the digital platform integration mechanisms through sales growth in the Partner Connection Tool (PCT) or by various customer segments adopting the customer portal. However, the commercial sensitivity meant it was difficult and presented a limitation in outlining the exact impact of the digital platform design choices. Redacted information presented in the thesis and normalising data from dollar value or count to percentage were the key methods to represent the data closely. Positively, however, the commercial data was also not central to identifying the generative mechanisms.

(4) **Impact of the decision process and those involved** – the study did not explore the decision-making process itself nor its impact. The potential question would posit whether different people and decision-making processes could lead to alternate digital design outcomes. This may modify the digital platform integration mechanism within the process or with people effectively-being in a different context and with different triggers. Future research should look more closely at decision-making for digital platform choices and the influence of the process, meetings where decisions are taken, and the leadership and stakeholders involved. As with previous limitations, conducting the study in another organisation would also prove helpful.

(5) **Boundaries of the HPEFS digital platform –** several limitations around the boundary definition exist from the case that should be considered for additional research. The digital platform integration mechanisms are based on a B2B engagement where access is not open and granted by the organisation. The platform can be seen as narrow in scope as the focus is on managing the end-to-end activities that pertain to HPEFS. As such, a Business-to-Customer (B2C) engagement, with more open access and the presence of complementors, maybe a limitation to the scope of the study's contribution.

6.4   Future Research

When considering the future research from the stage reached in the study, several situations exist wherein applying the model and mechanisms could strengthen generalisability (as outlined in the previous section). ***Testing and validating the integration mechanisms in other digital platform evolutions*** is the first opportunity:

(1) To apply and test the digital platform integration mechanisms in other cases of digital platform evolutions. To establish if the findings and the integration mechanisms for the

digital platform turn out to be the same or similar, given its different context. This will also confirm how context may drive alternative platform integration mechanisms.

(2) To investigate if additional contextual triggers exist (outside of digital design strategy, value creation outcomes, SDLC execution, improvements, and corrections) to determine if they give rise to alternate integration mechanisms. Therefore, identifying other elements that may drive the transformation of a digital platform and potentially other areas an organisation must contemplate.

(3) An option to consider is conducting a subsequent study, applying action designed research (ADR) to an organisation's digital platform (Sein *et al.*, 2011). The objective would be to transform an organisation through its digital platform and test the HPEFS study conceptual framework and model through direct application. To then reflect, learn, and refine the integration mechanisms definition.

The second research opportunity would involve ***augmenting (or extending) the digital platform integration mechanism*** of the HPEFS study. This can increase the potential contributions to the broader area of digital transformation by focusing efforts on some of the following:

(1) To explore the success and failure of an organisation's digital transformation with the lens of the platform integration mechanisms, i.e., to grow or expand the definition of the mechanism to better outline what will determine success and failure. Studying digital transformation success and comparing it to failures would support organisations as they struggle to digitally transform (De la Boutetière *et al.*, 2018) due to the key insights expected from such as study.

(2) To identify situational mechanisms from the contextual triggers outlined in the study (from axial coding) to augment therefore the action formation mechanisms identified. This can also be further complemented by identifying the transformation mechanisms in the case.

(3) To establish how the progression in the digital platform integration may influence the evolution of gathering input from external stakeholders and impact the growth in the size and breadth of the solutions (as observed in the case).

(4) Investigate the impact of ever-changing business strategy to stay competitive and achieve increased business goals (revenue and profit). To understand how it can cause the push for more impactful digital solutions and, therefore, more knowledge of how to create them. An opportunity also exists to understand aspects of the growth and rate of acquiring knowledge to accelerate the transformational process.

(5) To determine the impact on the design choices and the process of platform integration mechanisms from the existence of path dependencies. There may be modifications in the integration due to the update on the previously installed capability in the digital platform. The example of the Partner APIs and HPE Technomics mobile app in the case illustrated this dependency but was not an area that was explored.

(6) To determine if any other influences on the evolution of the digital platform may have a bearing on the identified integration mechanisms that may not have surfaced during the study.

(7) To investigate how the integration mechanisms of the digital platform impact (positively and negatively) throughout the life of an organisation's transformation. Applying the normalisation process theory (NPT) elements – coherence, cognitive participation, collective action, and reflexive monitoring (Carroll & Conboy, 2019; Carroll, 2020; Carroll *et al.*, 2021) could provide valuable insights into this question.

(8) To assess the impact of digital platform integration of ever-changing and contemporary technologies (e.g., augmented, and virtual reality, cognitive intelligence, machine learning and artificial intelligence). As new technologies come along, there may be a change in integrating them into an organisation's digital platform, which could be significant given the rate of technology change.

(9) In the future, advanced analytics in research can also provide opportunities as broader types of data can be more readily available from digital platforms and the organisations under scrutiny.

To look more closely at the ***decision-making process*** for digital platform choices. Specifically, to understand the influence on the design choices from the processes followed for decision making, meetings where decisions are taken, and the leadership or stakeholders involved.

To explore and identify ***other approaches (methodological research) to establishing a generative mechanism*** in a case study with similar characteristics to the longitudinal HPEFS case. To probe for alternative approaches for identifying mechanisms and if other proven techniques could give rise to potentially different outcomes than was seen in the case.

To establish a ***research agenda*** around the common theme of platform integration between the architectural layers of a digital platform. Within this research agenda, determine other explanations of how the platform's layers integrate and if some different explanations can more accurately explain the outcomes seen in a digital platform.

Finally, exploring and ***building towards a new IS design theory*** for digital platforms based on the underlying theory of digital platform integration mechanisms and its guidance to practitioners (Markus *et al.*, 2002).

6.5 Reflections and Observations

The section provides reflections from the study that may influence and form key considerations within future research and potentially help other researchers. Initially, the observations (Section 6.5.1) focus on the digital platform design process, its flows, and how it evolved throughout the study. From here, aspects of the study give some insights from the research process itself in Section 6.5.2 (acting as a '*complete participant*', longitudinal study, and the iterative and non-linear nature of the process). The final part of the section (Section 6.5.3) outlines those areas that, while not studied directly, are a part of the design process and would be considerations for future research.

6.5.1 Reflections on Digital Platforms

Reflection 1 – An important consideration in digital platform research is to consider the co-existence of a complex, iterative and very dynamic set of interdependencies and relationships that occur within a natural sequence. At a high level of abstraction, a central set of steps should be considered linear in flow where each preceding step is a critical input to the next step to provide a framework to position the findings in the study. The '*flow*' of the design process, from the output of the study and the empirical data, is, in the main, linear. The researcher, when investigating digital platforms, should therefore consider how the design process flows and the steps that are involved - from contextual triggers to business outcomes while focusing on what is occurring below the surface:

(1) **Contextual trigger** – drives the design direction where the business strategy and stakeholder input influences the contextual triggers, coming in many different forms.

(2) **The design process** that follows connects

    a. The desired business outcomes influence how the layers in a digital platform are both selected and integrated.

    b. The design choices that drive development leads to (3).

(3) **Deployment of the digital platform designs** that,

(4) Translates into a level of **use and adoption**. The organisation may then have to make some additional **corrections** based on feedback and adoption metrics from which they will have to make changes.

(5) Ultimately leading to **business outcome(s)** and, therefore, a **value capture in terms of revenue and profits** or **value creation in the user experience to the customer** (or selling partners).

Reflection 2 – As organisations work on designing their digital platform, there is a parallel evolution in (1) becoming more sophisticated and knowledgeable of how to design and (2) broadening their solutions as they seek to increase the value of the digital platform. As an organisation goes through an ongoing digital transformation, approaches to gathering input from external stakeholders and the growing breadth of the solutions for a digital platform will generally evolve. Through the seven-year transformation of HPEFS, there was a general evolution that followed three overlapping phases (Section 5.4), i.e.

(1) Starting with the more straightforward move to '*online*' in 2013, in HPEFS, to deploy single feature-driven solutions. The designs were predominantly driven by need-based surveys, focus groups, and other forms of acquiring direct feedback.

(2) Evolution from 2014/2015 to add features was based on an experience strategy centred on '*low effort*' to use and adopt the HPEFS digital platform. Solutions started to broaden from singular to a combination of features.

(3) Developing expertise in experience design and becoming more sophisticated in areas such as journey mapping, co-creation, and high-fidelity prototyping led to broadening solutions with a more significant impact. The solutions were driven by the end-to-end experience being sought in these cases. The first example was the design of FICO credit scoring in 2015, with a growing number of solutions deployed from 2017 onwards.

This highlights a potential area of future research - establishing how the digital platform design may influence this evolution. It is also likely that the design approaches will continue to develop as digital platforms and technology evolve.

Reflection 3 – there is an influence on the evolution of the digital platform of path dependencies to build on the previously designed and developed. While not a focus in the study, there is a path dependency as the digital platform builds on what it has previously designed and developed (David, 1985; Lim *et al.*, 2011; Bergek & Onufrey, 2014) and towards broader solutions. The example of the Partner omnichannel design (2018) demonstrates the dependency on the desktop solution of the Partner Connection tool (2014) to the evolution of the Partner APIs (2016) and then to the HPE Technomics Mobile application (2019). All of which connect to the initial design of the platform encapsulated in the Partner Connection tool.

Another future research opportunity involves exploring the impact of the path-dependency nature of digital platform evolution.

Reflection 4 - FinTech is more than applying technology. There is a temptation to describe technology embedded into a digital platform within a financial services context as FinTech, which was a perception at the beginning of the research. Aligned to Deloitte (2015), a better definition would be *'embedding technology into financial services that fundamentally changes an organisation's business model and delivery of the activities'*. Examples such as Stripe (payments), Rocket Mortgage (online mortgage, loans), Lemonade (insurance), Wealthfront (investment), or Revolut (send, save, and spend money) all fundamentally impact the business models in the areas they operate where technology is a core element of the disruption. While the digital designs within HPEFS changed aspects of the business model, the focus of the study was on the digital platform but not necessarily on the business model itself. So, it cannot be fully classed as FinTech research.

6.5.2   Reflection on the Research Process

Reflection 5 - The application of Generative Mechanism in research provides an excellent approach to sourcing the causal structure of action-to-outcome within an event. However, it can be perceived as complex to establish due to the creative retroduction process required (as an unobserved and inferred phenomenon in the design process). Within the study, there are several observations about the adoption of Generative Mechanisms as a theoretical lens:

(1) The findings from the study show that explanations built on mechanisms can be helpful in theory-building within the IS domain. The study builds on previous studies by identifying mechanisms such as those on digital infrastructure (Henfridsson & Bygstad, 2013), open government (Jetzek *et al.*, 2013), using affordances to identify generative mechanisms (Bygstad *et al.*, 2016), and the mechanism supporting the scaling of a Chinese digital credit business (Huang *et al.*, 2017) – which are some of the more highly cited papers.

(2) Explaining change by inferring generative mechanisms provides an excellent approach to sourcing the causal structure of action-to-outcome within an event. This "*internal potential*" (Pawson & Tilley,1997:57) of an '*action*' is advantageous because it acts as the inference source, enabling retroduction that explains the causal structure and the observed outcome. Therefore, reflecting on '*what enables*' an object, system, substance, or action to bring about change is key to identifying the mechanism (Sayer, 1992).

(3) On the opposite side, the study also demonstrated that establishing the presence of the '*real*' structure (a mechanism) within a critical realist view (Saunders *et al.*, 2019) can be difficult as it is unobservable. This presents a challenge for a researcher to be confident in identifying the correct mechanism that helps explain the observed outcome. Therefore, generative mechanisms can be potentially problematic as the validation is not straightforward, i.e., retroduction is a creative process that relies on inference, but how does the researcher know that the mechanism is valid? As an aid, Wynn and Williams (2012) outlined the approach of empirical corroboration to provide a means to test and validate mechanisms. It involves assessing the explanatory power of the mechanism (Section 5.1) in conjunction with the explication of events.

(4) While adopted early in the process, the critical realist philosophy suited my approach, as proved in the study. It provides the advantage of basing the study on gathering data on the events experienced to ensure the full facts are attained. They act as the constant throughout and allow any doubts to return there to allow a retest of the inferences made to identify the underlying causal generative mechanisms through the '*retroductive'* process (Saunders *et al.*, 2019:147).

Reflection 6a – Access to a complete participant in a longitudinal study is strengthened by using complementary sources (archival data and interviews) to accurately account for all the relevant information. The combination provides a robust set of insights to the researcher. In this study, the impact of access to seven years of transformation as a '*complete participant*' provides a different level of insight but requires archival information and other sources to succeed fully. While I was acting as the '*complete participant'* in the study, it was not until early 2018 that I began adopting a researcher's approach. To ensure the data was comprehensive, assembling complementary sources (archival data and interviews) was key to completing the study. Therefore, the advantages of being a '*complete participant*' could have been potentially negated for this extended study as accurately remembering all the relevant information would be difficult. The added advantage from multiple sources came through as it also promotes strong triangulation for validation (Eisenhardt, 1989; Rousseau *et al.*, 2008; Yin, 2013) which was vital to managing bias, as discussed earlier.

Reflection 6b -   Full access to a complete participant in a longitudinal study provides a key advantage for generalisability due to intense observation. It gives many discoveries, a deeper set of insights into the phenomenon, and an understanding of its change behaviour over a more extended time. Combining a longitudinal study with the depth of accessible information

as a '*complete participant*' supports Flyvbjerg's (2006) approach to generalisability as outlined in Chapter three (Section 3.3.2). It would be challenging to utilise a single case to establish findings noted in HPEFS without this access and '*intense observation*' within the longitudinal data. Reflecting on the case, a lower quantity of data and reduced quality would affect the analysis and conclusions and diminish the study's impact.

It also allows for a deeper view of the phenomenon under scrutiny in seeing how it behaves over a more extended period. Thus, it gives a potentially better set of insights into what occurs. Moreover, it allows for an improved interrogation of the actual output. In this case, the evolution over the seven years allowed the three mechanisms to emerge. Whereas, over a single shorter period, it would have been more challenging to ascertain the existence of the three mechanisms.

Reflection 7 – There is an iterative and non-linear nature to the research process, which means the research will unfold until no new output, or saturation, in terms of the findings from the analysis. Throughout the process, there are times where reflection and '*thought trails*' about the data drove iterations based on the following:

(1) Ongoing assessment of the literature's quality – reliability, validity, adequacy, and completeness (Okoli & Schabram, 2010). At times, this drove an update to ensure the quality of the literature, i.e., a sufficient level of high-quality peer-reviewed literature, emerging sources found from reading, and ensuring the latest thinking is integrated. The three rounds of reading the literature (Section 2.3) provided a need for ongoing reflection on the changes in the field.

(2) The data analysis process drove several refresh cycles of understanding (Figure 3.4 and 3.5) by revising earlier thoughts and findings as each iteration was completed.

6.5.3 Reflection on some broader considerations

Reflection 8 – With the generally narrow-focused nature of research, it is important to realise and consider other aspects that could have a bearing on the study or in the broader context of where the phenomenon sits. In this specific case, it is the people involved in the process, the decision-making process, and the platform's role in the broader transformation and normalisation. As seen in the case, the digital platform is an enabler for the outcomes and a central component. While not explored in this study, three other areas could be considered when discussing digital transformation for digital platform design. First, the participating stakeholders in the design process are central to making the appropriate choices on the components worthy of integration. Second, the decision-making process would be another key

focus for future research (e.g., satisficing, bounded rationality, heuristics, and intuition). Third, the platform's role is one of the essential elements of the broader normalising of a digital transformation, i.e., embedding and sustaining a digital transformation (Carroll & Conboy, 2019; Carroll, 2020; Carroll *et al.*, 2021). This also represents a potential area of future research - the integration mechanisms of the digital platform impact across the four elements of the normalisation process theory (NPT) i.e.

(1) **Coherence**: sensemaking individually or collectively from the presentation of 'new' capability to the HPEFS organisation, i.e., sensemaking for the ongoing use of technology

(2) **Cognitive Participation**: People's relational work builds and sustains a community of practice around a digital transformation. This includes new methods within the design process, such as co-creation, prototyping, and journey mapping.

(3) **Collective Action**: the operational work to enact the digital transformation.

(4) **Reflexive Monitoring**: the appraisal of people's work to assess and understand how a digital transformation affects them and others, leading to reconfiguration.

6.6   Final conclusions

The following section provides some conclusions about the research pertaining to the key contribution to knowledge. The primary focus of this section sums up the '*science*' behind digital platform designs through the lens of Generative mechanisms from Henfridsson and Bygstad's (2013) seminal paper.

Conclusion 1 – Digital platform integration mechanisms can explain the inherent properties of design choices that, in turn, influence the digital design and the subsequent value creation outcomes. The study has proven that causal structures exist that can act in context on design choices an organisation may make on its digital platform (Pawson & Tilley, 1997). These causal mechanisms, when actualised, will explain the observable outcomes or events to demonstrate their alignment to the seminal work of Henfridsson and Bygstad (2013). Three digital platform integration mechanisms have emerged that fit into their action-formation mechanism definition. They explain the '*internal potential*' possessed by the design choice (action), in this case, within a configurational perspective of **context**, **mechanism,** and **outcome** (Henfridsson & Bygstad, 2013). It can be positioned within a proposed conceptual framework and digital platform design model to explain what an organisation will follow when designing a digital platform (Figure 5.7). Finally, the importance of the findings is to help advance our knowledge

on how to embed technologies into digital platforms that help with the challenges organisations face to transform digitally.

Conclusion 2 – when incremental adaptions of the digital platform occur, a class of causal mechanisms - Corrective Mechanisms - explains how a state of equilibrium (or balance) is ensured or re-established between and amongst a socio-technical system. As a causal structure, it drives the return to balance of the system (between two or more subsystems) that leads to the observable event of equilibrium. Within the study, the changes were those incremental adaptations that generally succeed in punctuations of the IS system (Lyytinen & Newman, 2008). They can be represented by IS terms like '*maintenance*' or '*normal project operation*' (Lyytinen & Hirschheim, 1988; Markus & Keil, 1994), which illustrates the internal potential of the design choices (Figure 5.5). The events produced due to these Corrective Mechanisms will not surface at the empirical level and will generally escape those studies deploying a generative mechanism lens. However, they form an essential part of the digital platform's deployment and are essential to highlight and illustrate their position in a digital transformation.

6.7   Final thoughts

Over the seven years from 2013 to 2019, the HPEFS study highlighted how integrating architectural layers enabled the digital platform designs and business outcomes observed through a generative mechanism lens. As a complete participant for the duration of the study, I reflected on what would help an organisation endure. The digital platform can significantly impact when correctly designed, developed, and deployed. However, stepping back a little further from the case, I contend that the following quote ultimately provides the final word and possible backdrop to the success of a digital transformation :

*"It is not the strongest of the species that survives, nor the most intelligent that survives. It is the one that is the most **adaptable to change**."*

Charles Darwin (1809 – 1822)

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APPENDICES

Appendix 1: Literature Review Methodology – 'Search and Acquisition'

Appendix 1.1 A hermeneutic framework for the literature review process

The process is made up of two major hermeneutic circles that are mutually intertwined (Figure A1.1). The '*search and acquisition*' circle is focused on the steps to search the literature and to attain more information about the domain of interest and the '*problem*' established in the study. Success is the identification of more relevant sources of information and through reading to develop understanding.
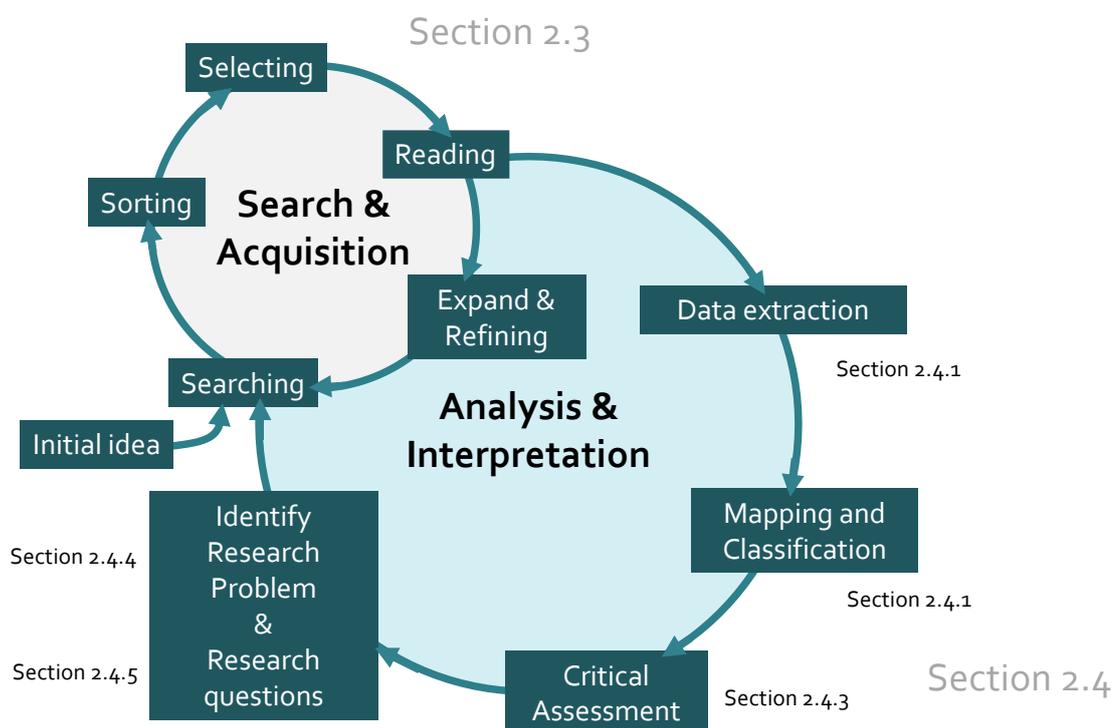
Figure A1.1 A hermeneutic framework for the literature review process
(adapted from Boell & Cecez-Kecmanovic, 2014)

The steps for the '*search and acquisition*' circle are outlined in Table A1.1:

Step	Description
Searching	• Searching for relevant articles through the use of search operators within academic sources and when necessary to go beyond the database search. • Focus on search techniques to quickly drill down into highly relevant material (precision).

Step	Description
Sorting	• Applying different methods to sorting the articles found in the search (e.g., dates, citations, and relevance).
Selecting	• Defining and applying criteria to decide based on relevance what to carry out orientation-based reading on.
Reading (Orientational)	• Developing an initial understanding through '*orientational*' reading to position the study. • Reviewing the title and initial read (i.e., abstract, introduction and conclusion) of the paper for preliminary, but brief, assessment to gain an overall impression of the content (Wallace & Wray, 2016). • Applying selection criteria for subsequent deeper '*analytical*' reading (part of the search and acquisition circle).
Expand & Refining	• Based on reading & reflections from the '*analysis and interpretation*' activity to decide, if necessary, to ○ Expand the search approach i.e., different journals or sources. ○ Refine the search '*criteria*' to focus on specific areas of interest. • Identify improvements in the search strategies to achieve greater precision in subsequent searches.

Table A1.1 Search and Acquisition (adapted from Boell & Cecez-Kecmanovic, 2014)

The '*analysis and interpretation*' circle is a continuation from '*search and acquisition*' where the focus is to go deeper into the literature. Table A1.2 provides a summary of the activities involved. The details of the steps from '*mapping and classification*' to research question formulation are covered in the main text (Section 2.3)

Step	Description
Reading (Analytical)	• In-depth, '*analytical*' reading to help in mapping and classifying. • To interpret and become immersed to achieve understanding.
Data extraction	• Is an outcome of '*analytical*' reading. • Making extensive notes to '*deconstruct*' the article into key elements e.g., ○ Understanding of the paper. ○ The papers' purpose or focus. ○ Research questions being addressed. ○ Findings and proposals. ○ Key concepts and theories adopted. ○ Methodologies and approach.

Step	Description
Mapping & Classification	• To systematically organise the data and present it in a '*succinct form*' i.e., representing graphically or in tables to enable critical assessment. • Mapping and classifying relevant ideas, findings, links, and contributions within the literature. • Goal to synthesise into logical groupings of patterns to reflect the key concepts. • A creative process that may lead to new questions and drive to identify new relevant material.
Critical Assessment	• Focus on analysis and evaluation. • Enable the identification of weaknesses and areas of limited research. • To provide the opportunity to problematise current knowledge by challenging assumptions.
Identify Research Problem	• Develop an '*argument for a research gap*' based on the critical assessment. • Demonstrate the gap or '*problematic assumptions*' and their importance as something to be solved. • '*Formulation*' or '*framing*' into a research problem. • The revision of the research problem may trigger a new round of search and acquisition.
Identify Research Question	• Transforming the research problem into a specific research question. • Where answering the question in the study will help '*solve*' the problem. • The research question(s) is what is empirically tested.

Table A1.2 Analysis and Interpretation (adapted from Boell & Cecez-Kecmanovic, 2014)

Appendix 1.2 Searching

Sources (incl. Expand and Refining) - Selecting a bibliographic database was the initial decision before starting the searching process. From reviews of the various available sources, it came down to one of the main indexing databases, Web of Science™ or Scopus®. I selected Scopus® as it is seen as the "*largest abstract and citation database of peer-reviewed literature*" (Elsevier, 2022). It has content from 25,000 active journals and 7,000 publishers with detailed citation data and comprehensive export functionality for further analysis. As reproducibility and repeatability were important, I also found the creation of the search strings more intuitive, easier to set up and rerun than Web of Science™.

I then focused on the leading journals for IS to provide the foundation of the literature review (Webster & Watson, 2002). The main source considered was the '*AIS Basket of Eight*' (AIS, 2022)

– Table A1.3. The Academic Journal Guide (AJG) 2021 rating (formerly called the Association of Business Schools (ABS) rating) illustrates why these are some of the leading journals. A rating of **4*** recognises those as '*journals of distinction*' and '*exemplars of excellence*'. The next rating of '**4**' reflects journals whose publishing is viewed as the "*most original and best-executed research*" (Chartered Association of Business Schools, 2021:12). These high-quality ratings help to justify these journals as the main selection for the literature review.

Journal	AJG 2021 Rating	Journal Citation Reports ™ Rank
MIS Quarterly	4*	1
Information Systems Research	4*	5
Journal of the Association for Information Systems	4*	19
Journal of Information Technology	4	2
Journal of Strategic Information Systems	4	10
Journal of Management Information Systems	4	15
Information Systems Journal	4	16
European Journal of Information Systems	4	17

Table A1.3 AIS Basket of Eight (AIS, 2022)

While the '*AIS Basket of Eight*' (AIS, 2022) provides the main source of the literature reviewed, I decided to broaden the journal coverage. I expanded, in a second iterative round of the process, by searching other highly ranked IS journals (Table A1.4). This helped the study to deliver higher quality research by taking a more concept-centric than publication-centric approach (Webster & Watson, 2002). While not as high in terms of the rating of the '*AIS Basket of Eight*', these journals publish '*well-executed*' research and are well regarded to be given the '**3**' rating to justify their inclusion (Chartered Association of Business Schools, 2021).

Journal	AJG 2021 Rating	Journal Citation Reports ™ Rank
Information and Management	3	12
Decision Support Systems	3	13
Information organization	3	21
Information Systems Frontiers	3	26
Information Technology and People	3	35

Table A1.4 Additional literature to augment the AIS Basket of Eight

Another expansion of the sources in this second round was to include the proceedings from AIS conferences (https://aisnet.org/page/Conferences - Table A1.5). These provided an additional valuable source of literature as they are seen as the primary conferences for IS academics and research-oriented practitioners.

Conference	Conference details
International Conference on Information Systems (ICIS)	https://aisnet.org/page/ICISPage
European Conference on Information Systems (ECIS)	https://aisnet.org/page/ECISPage
The Americas Conference on Information Systems (AMCIS)	https://aisnet.org/page/AMCISPage
Pacific Asia Conference on Information Systems (PACIS)	https://aisnet.org/page/PACISPage

Table A1.5 AIS Conferences

The third iterative round of literature came about from the reading step throughout and attending various online webinars, research seminars within the college, conferences, and many other interactions. Once something was identified as of potential interest, they were captured in a third group, from where I followed the same process i.e., if promising, to follow through with analysis and interpretation.

I used an available ranking compiled by the Education University of Hong Kong (2022) for the relatively small number of academically published books included. While no internationally accepted system for the ranking of academic publishers of books they present an amalgamation of three ranking lists of (1) Australian Political Studies Association (APSA), (2) Socio-Economic and Natural Sciences of the Environment (SENSE) and (3) Centre for Resource Studies for Human Development (CERES) of the University of Utrecht. The publishers are ranked as *A**, *A*, *B* or *C* where they assign the highest from the three lists for a given academic publisher. Examples of the *A** rankings include Cambridge University Press, Chicago University Press, Columbia University Press, Oxford University Press to name but a few. Throughout, the sources were selected from *A**, *A* or *B*.

Finally, during the study, some literature used is deemed as '*1ˢᵗ Tier*' of grey literature (Adams *et al.*, 2016). While not peer-reviewed, tier-one is generally where there is greater editorial control and confidence to which the expertise of the author(s) can be established. Examples from industry sources such as the International Data Corporation (IDC), Forbes, Gartner and

McKinsey provided additional perspective and market insights to digital platforms and digital transformation for the study. The other grey literature was published material from HPEFS and their competitors, all of which was available in the public domain. Other internal material to HPEFS was referenced and if presented was redacted to preserve commercial sensitivity.

Searching – before going with a range of search terms, I decided to include a search on those '*scholars*' that are seen as '*specialists*' in platform research and highly regarded in the field. This in effect was recognising the '*conversation*' within which I would be contributing through the study (Huff, 2009). The search of publications by author, included in the literature review, are outlined in Table A1.6, across all three rounds. They appeared as authors or co-authors a total of *85* times in round one, *19* in round two and finally *28* in round three.

Author	Publications in AIS Basket of 8	2nd Round	3rd Round
Ola Henfridsson	17	4	2
Kalle Lyytinen	8	1	4
Eric Monteiro	5	1	0
Amrit Tiwana	20	2	0
Annabelle Gawer	0	0	8
Michael Cusumano	0	0	4
Peter Evans	0	0	2
Marshall Van Alstyne	3	3	4
M. C. Boudreau	9	1	0
Youngjin Yoo	19	6	0
Geoffrey Parker	4	1	4

Table A1.6 Key Authors on Platforms or Digital Platforms

Next, a broad range of terms was selected to reflect the diversity used in the titles, abstracts, and keywords of the articles. The search terms within the '*AIS Basket of Eight*' are captured in Table A1.7. It became clear that other terms were necessary to capture the widest range of literature and at this stage to focus on inclusion than exclusion (Tranfield *et al.*, 2003; Denyer & Tranfield, 2009; Okoli & Schabram, 2010). This search gave rise to a total of *519* articles for sorting.

Key Search Terms	1st	Qty
"Platform Design"	✓	5
"Platform"	✓	302
"Ecosystem"	✓	57
"Transformation" AND "Digital" AND "Platform"	✓	9
"User" AND "Acceptance" AND "Platform"	✓	4
"Transformation" AND "Acceptance" and "Platform"	✓	0
"Acceptance" and "Platform"	✓	4
"Transformation" AND "Ecosystem"	✓	4
"Platform" AND "Emergent" or "progression" OR "Innovation" OR "Unfold" OR "Gradual development"	✓	47
"Platform" AND "Reuse" OR "Redesign" OR "Reusable"	✓	4
"Intraplatform" OR "Intra-platform"	✓	1
"Intraplatform" OR "Intra-platform" AND "Design"	✓	0
"Architecture" AND "Mechanism" OR "Generative"	✓	17

Table A1.7 Key Search terms and article quantity from Round 1 (within the AIS Basket of Eight)

Within round one, I also included any review articles for "*Platform Design*". This was not limited to the '*AIS Basket of Eight*' and yielded an additional **57** documents for consideration. The round one total of **604** was then sorted to determine those articles for '*orientational*' reading.

Leveraging the output from the first round, I narrowed down the search terms for the next group of '**3**' rated journals to four. This threw up a total of **307** articles (Table A1.8).

Key Search Term	2nd	Qty
"Platform Design"	✓	36
"Digital Platform"	✓	170
"Platform" OR "Ecosystem" OR "Infrastructure" AND any of the key authors	✓	20
"Digital Transformation"	✓	81

Table A1.8 Key search terms and article quantity from Round 2

The third iterative round of literature, as mentioned, came about from the reading step in rounds one and two, from attending various online webinars, research seminars within the college, conferences, and many other interactions. References of potential interest were

captured and grouped. While a much more diverse group, I was selective based on the journal or publications rating. The final count of this group was *72* (see Table A1.9 by journal and publication rating).

Journal/publication rating	Qty
4* rating AJG	17
4 rating AJG	10
3 Rating AJG	19
2 Rating AJG	12
A Rating Publications	4
B Rating Publication	2
Grey Literature	5
Conference Proceedings	3

Table A1.9 Journal/publication references from round 3

In summary, the searching process yielded a total of *979* articles publications or books for sorting (Table A1.10). As some were presented more than one time in searches, I had to filter out to arrive at the unique quantity of *836*. The next step of sorting was to determine which references would be considered for '*orientational*' reading.

Round	Qty	Unique references
Round 1	604	468
Round 2	307	296
Round 3	72	72
TOTAL	983	836

Table A1.10 Total Journal/publication references from the 'searching' process

Appendix 1.3 Sorting and Selecting

With such a large number of articles, I had to carefully consider how to filter out those that may not be relevant before reading. To achieve this, I devised a '*practical screen*' for inclusion and exclusion, an '*initial weeding out*' (Tranfield *et al.*, 2003; Denyer & Tranfield, 2009; Okoli & Schabram, 2010). Table A1.11 outlines the 3-step sorting and selecting approach, completed to down-select the articles presented in the searching step:

Step	Filter	Focus of filter
1	**INCLUDE** if either • Key Author (Table A1.6) **OR** • Highly cited article (> 20 citations) **OR** • Was returned more than 2 times in the searches.	Identify high relevance due to the Author, has potential due to its high citation or uses a broad range of terms in the title, abstract or in keywords.
2	**INCLUDE** • Title Review of the *NOs* from step 1 to decide if relevant. **EXCLUDE** if • Article title from Key Author deemed not relevant. • Title review from highly cited article deemed not relevant.	Judgement review of all the reference **TITLEs** to determine what could be added or removed.
3	**EXCLUDE** if • Rating not from AJG (2, 3, 4 or 4*) • Not from AIS Conferences	Preliminary quality screen based on academic rating (Okoli & Schabram, 2010).

Table A1.11 Total Journal/publication references from the 'searching' process

A detailed protocol document was created to outline the specific steps from running the queries in Scopus®, exporting the full data set into excel, to sorting and selecting. It was key to being able to repeat through each round. Table A1.12 outlines the summary of the number of references included in the reading step that subsequently followed.

Round	Initial search	Unique	Exclude	Include
Round 1	604	468	366	102
Round 2	307	296	260	36
Round 3	72	72	45	27
TOTAL	**983**	**836**	**671**	**165**

Table A1.12 Summary of the 'sorting' and 'selecting' steps

Appendix 1.4 Reading

This represented the '*orientational*' reading step of the **INCLUDE** references (Table A1.12). As mentioned, this was to position the literature within platforms and more specifically digital platforms. The key part of this step was to provide the highly relevant papers and literature for subsequent '*analytical*' reading. After reading the abstract, introduction and conclusion, I summarised the initial understanding of the paper, based on extracting data from three aspects,

(1) to (3), see next. An initial categorising (4) and questions (5) that could be answered in subsequent '*analytical*' reading, completed this step:

(1) **The key focus of the paper** - summarising the domain and main output or article goal.

(2) **Context** - details of the type of study, timeframes, organisations involved or general situation.

(3) The **real-world problem** the research was tackling (if called out).

(4) **Initial categorising** – proposed, initial category to assign the paper that captures the essence from a digital platform perspective (Categories - Business Value; Design selection; Design Strategy; Competition).

(5) **Key questions to ask about the article** (on '*analytical*' reading) – questions and clarifications that would potentially be useful on further reading.

The selection process was based on an initial assessment to determine relevance. In an overall sense, relevance was based on making choices around digital platforms (such as embedding new technologies) and how this could influence a digital transformation. The criteria for assessing relevance from the literature was by judging the levels on how they:

(1) Offered the reader guidance from the perspective of a digital platform or digital transformation to achieve an outcome.

(2) Explained choices or relationships on/within a digital platform and their subsequent impact internal to the organisation or external or outcomes (why).

The relevance assessment gave rise to rating levels and criteria are summarised in Table A1.13.

Rating Level	Criteria
HIGHLY RELEVANT	• Provides clear insights in multiple ways to leverage or explain. • Very good examples of connecting to the how and why for digital platform design. • Applicability is high at the architectural level.
MEDIUM RELEVANCE	• Provides some good insights • Applicability is present at a general level.
LIMITED RELEVANCE	• Provides limited insights. • Applicability is possible but low.
NO RELEVANCE	• Provides no insights as focus or findings are not relevant to digital platform design. • Uncertainty as to its application to digital platform design.

Table A1.13 Relevance Ratings

The level was assessed against the following characteristics or factors of the papers, considered within the lens of a digital platform, infrastructure, or ecosystem:

(5) **Examining and investigating a particular aspect within a digital platform, infrastructure, or ecosystem** – looking at and understanding its impact, its influence, key drivers or required conditions. Presenting insights on specific elements, components, or attributes of a digital platform, infrastructure or ecosystem. Defining the digital platform, organisational structure, or development processes to achieve a specific outcome.

(6) **Proposing design principles** based on a research endeavour.

(7) **Establishing a new or augmented theoretical model / conceptualisation / emergence of key concepts / framework** – from analysis and proposals about design in a digital platform, infrastructure or ecosystem.

(8) **Demonstrating a relevant 'A' that causes 'B'**. Where '*B*' was areas, such as achieving value-based outcomes, how specifics in a digital strategy influence design, interactions from stakeholders in a digital platform (customers, developers, other companies) etc.

Appendix 1.5 Analytical Reading and Data extraction

The outcomes from in-depth, '*analytical*' reading help to map and classify the literature. It is the combination of these key actions with a critical assessment that drive towards understanding. The goal is to interpret and become immersed in the material to achieve understanding. Data extraction is an outcome of '*analytical*' reading by making extensive notes based on '*deconstructing*' the article into key components (Boell & Cecez-Kecmanovic, 2014). It builds on the '*orientational*' reading output and extends the key information taken from the references (Table A1.14). The recurring objective was to expand understanding of the field and the approaches taken in each study, their motivation, theories, findings, and contributions. This gave rise to a more in-depth set of data collected from the literature and in some cases, papers were revisited based on a reference being made in another.

Components	Description
Key focus of the paper	• Capturing the core focus of the paper i.e., summarising the domain and main output or article goal. • Revisited in '*analytical*' reading and revised, if necessary, from the initial '*orientational*' review.
Context	• Details of the type of study, timeframes, organisations involved or general situation. • Revisited in '*analytical*' reading and revised, if necessary, from the initial '*orientational*' review.
Real-world problem	• Real-world problems, challenges or questions that are addressed by the study. • Where little '*attention'* has been paid, areas that are poorly understood or limited knowledge that support the motivation for the study. • Revisited in '*analytical*' reading and revised, if necessary, from the initial '*orientational*' review.

Theory / theoretical lens / concepts	• Theoretical concepts applied in the paper to
	   o Explain how it influences or impacts a given platform-based situation.
	   o As a lens for a study to assess its impact.
	   o That proposed new conceptual or theoretical models.
	   o Explain relationships.

Proposals / statements	• The proposal from the paper e.g.
	   o How the theories are applied.
	   o Frameworks or models to help in explanation
	• Details of the examinations based on specific theoretical lenses.
	• Revisited in '*analytical*' reading and revised, if necessary, from the initial '*orientational*' review.

Key findings	• Revisited in '*analytical*' reading and revised, if necessary, from the initial '*orientational*' review.
Contribution	• The contribution the author(s) call out that they are making with the paper.
Research questions	• Stated research question from paper (if called out).
Relevance to HPEFS	• What can be seen as relevant from the case – reflecting on potential events that may connect.
Relevance	• Revised based on the criteria, set as either High, Medium, Limited or No relevance.

Table A1.14 Key data extraction from 'analytical' reading.

The output from the '*analytical*' reading step provided the raw material for the mapping process. The selection of data allowed the presentation of the topography and key aspects of the

literature. The aim was to "*synthesize the relevant literature into a compact classification that describes major views/approaches, contributions, authors and sources, etc.*" (Boell & Cecez-Kecmanovic, 2014:266). Section 2.4 provides a comprehensive outline of the steps and key output from the literature review from mapping and classification to the formulation of the research question.

Appendix 2 Concept Matrix Reference categorisation

<table>
<tr><td colspan="2" align="center">VALUE Creation</td></tr>
<tr><td colspan="2" align="center">What drives value that will influence design choice.</td></tr>
<tr><td align="center">Reference</td><td align="center">Reference focus</td></tr>
<tr><td>Abraham <i>et al</i>. (2013)</td><td>Explaining Technology Acceptance (Value creation from higher acceptance).</td></tr>
<tr><td>Adomavicius <i>et al</i>. (2008)</td><td>Decision process - Investment decisioning (business value) and Technology Forecasting.</td></tr>
<tr><td>Anand <i>et al</i>. (2016)</td><td>Key Success factors (KSFs) for Digital Data Stream Investments (as criteria for value).</td></tr>
<tr><td>Baird <i>et al</i>. (2016)</td><td>Willingness to Pay (WTP) between Premium Extensions or Free Extensions.</td></tr>
<tr><td>Bakos & Katsamakas (2008)</td><td>Value within a 2-Sided Network & specifically Internet platforms (where have Buyers and Sellers).</td></tr>
<tr><td>Burton-Jones & Grange (2013)</td><td>Effective use of IT - Value driven from the 'effective' use.</td></tr>
<tr><td>Ceccagnoli <i>et al</i>. (2012)</td><td>Optimal structure to execute e2e (external 3rd party software providers).</td></tr>
<tr><td>Chatterjee <i>et al</i>. (2002)</td><td>Key hi-level management tasks (to drive "web assimilation" to achieve operational and strategic benefit).</td></tr>
<tr><td>Claussen <i>et al</i>. (2013)</td><td>Design 'policy' to drive higher user engagement (incentive driven to give access to more users if better engagement).</td></tr>
<tr><td>Doll <i>et al</i>. (2004)</td><td>Measuring User Satisfaction - creating and testing of End User Computing Satisfaction (EUCS) instrument.</td></tr>
<tr><td>Fichman (2004)</td><td>(1) Option valuation technique for emerging information Technology (IT) - when to take the lead to innovate
(2) 12 factors to help define value and strategy for the IT activity.</td></tr>
<tr><td>Ghazawneh & Mansour (2015)</td><td>Creation of a synthesis of value creation perspectives and digital platforms to understand value creation in a digital application marketplace.</td></tr>
<tr><td>Hackney <i>et al</i>. (2004)</td><td>A Strategic decision framework for (1) Evolutionary change, (2) Value creation and (3) Management of change
and 3 key steps to sustain (a) Value generation and (b) Facilitate business services innovation.</td></tr>
<tr><td>Jiang <i>et al</i>. (2018)</td><td>HERDING - proxy or type of explanation of platform adoption - outline of what can increase and decrease adoption based on following predecessor(s).</td></tr>
<tr><td>Jung <i>et al</i>. (2019)</td><td>Providing a model and answers to the policy decision(s) to drive an industry with a 2-sided market.</td></tr>
<tr><td>Kallinikos <i>et al</i>. (2013)</td><td>Impact of changing functional relationships between artifacts and impact on appearance and form of the artifacts - impacting on the value and utility of the artifact.</td></tr>
<tr><td>Kari <i>et al</i> (2020)</td><td>Understanding the characteristics that drive the relationship between the situation context (within an Exergame - Wii)
=> and Use Continuance (post-experience, continued use - based on drives +ve or -ve experience (incidents) which equals value.</td></tr>
</table>

VALUE Creation	
What drives value that will influence design choice.	
Reference	**Reference focus**
Khan *et al*. (2013)	To realise value from investments in the IT infrastructure and exercise the 'option' at the right time - through a time option valuation model to analyse the situation (based on a discounted cashflow model and growth option modelling).
Kim *et al*. (2018)	Exploration of the process of value co-creation in an ecosystem when there isn't a focal (or main platform provider).
Kyomuhangi-Manyindo *et al*. (2021)	Key focus on Users, their tasks, and the environment and how these factors impact on usability.
Lusch & Nambisan (2015)	Building from 6 x service innovation themes a tripartite framework for service innovation: (1) Service ecosystems - actor-2-actor structure (2) Services platforms - for service exchange (3) Value cocreation - customer need for a solution
Ozdemir *et al*. (2011)	Value that is enabled / reduced by the adoption of platform as part of the overall 'business activity'. A platform that brings a Services Provider (e.g., health care) and consumer (e.g., patient) - the value to both participants is key consideration to adoption IF it is reduced by adoption of any of the participants. Using incentives to reduce impact and to encourage adoption.
Saarikko (2015)	By applying servitisation as a theoretical framework to demonstrate the influence of Value propositions to the evolution of a digital platform.
Song *et al*. (2018)	Understanding of the cross-network effects (CNEs) within a platform (Apps-Users) Using value creation / capture process as a form of measurement (Use Value and Exchange Value) Show that CNEs are not necessarily asymmetric, the effect is temporal i.e., long term and short effects are different.
Suseno *et al*. (2018)	How value is created (as describe by newly merged value categories) resulting from value creating practices that are driven by interactions between stakeholders within a digital innovation framework. Stakeholder interaction and value creating practices that merge (hybridisation - table 3, p.343) to create value.
Taudes (1998)	IT investment decisions & software growth options the application of real options methods to provide a dynamic way to value is extendibility in a changing environment (flexible implementation of its options over the base configuration and the option but not the obligation to invest - flexible way to show it $$ wise).
Taudes *et al*. (2000)	Application of option pricing models (modified net present value (NPV) equation) as a decision-making tool to value implementation opportunities" practical advantages of using pricing options models to decide to (1) Continue with SAP R/2 or (2) Switch to SAP R/3.
Yoo (2010)	Research opportunities (6 off) around experiential computing digitally mediated (bring about) embodied experiences => in everyday activities => through everyday artifacts => that have embedded computing capabilities.

Competitive moves	
Reacting to competition or competitive moves	
Reference	**Reference focus**
Anderson *et al*. (2014)	Making a strategic decision between performance and content for 'winning' strategy.
Foerderer *et al*. (2019)	To show that a platform owner will be distinguishable from its competitor by its (1) ABILITY to use knowledge transfer resources and (2) Effectiveness in integrating knowledge across the ecosystem participants (across knowledge boundaries).
Gnyawali *et al*. (2010)	A competitive move can be achieved through value co-creation with partners, forming strategic alliances & having more complex solutions.
Halckenhäußer *et al*. (2021)	Testing of 4 hypotheses to investigate when complementors face competition with platform owners.
Jimenez & Arenas (2021)	Explore and determine a set of mechanisms to show how firms balance between competition and cooperation on a digital platform.
Kazan *et al*. (2018)	3 x Competitive Strategies in network economies creates from a set of architectural digital platform profiles (6 off).
Woodard *et al*. (2013)	Conceptual model to explain how creating a 'stock' of platform designs (Design capital) that is owned by the firm can act as a foundation for a set of '*Design Moves*'.

Digital design strategy & options	
How to get to the future vision of the organisation	
Reference	**Reference focus**
Asadullah *et al*. (2018)	The identification of 3 x categories of digital platform evolution mechanisms: (1) Platform Design, (2) Platform Operations & Capabilities and (3) Platform ecosystem and governance.
Barrett *et al*. (2015)	Review of 4 x papers on application of Service Innovation as a design strategy.
Chanias (2017)	Case study of a large financial services firm - proposal that shaping of a Digital Transformation strategy is an emerging activity from bottoms-up activities. In turn this is then formalised based on having (1) a shared target, (2) clear governance and (3) more deliberate strategy decisions.

Digital design strategy & options

How to get to the future vision of the organisation

Reference	Reference focus
Claussen *et al.* (2013)	Design 'policy' to drive higher user engagement (incentive driven to give access to more users if better engagement).
El Sawy *et al.* (2010)	Strategic Dimension of how Information Technology (IT) can build a Strategic advantage in a turbulent environment. Digital Ecodynamics as a new phenomenon [Ecosystem dynamics] - made up of (1) environmental turbulence, (2) dynamic capabilities, and (3) IT systems.
Fang *et al.* (2018)	Focus on (1) Digital Innovation (as strategic direction of what to do to realise value) & (2) Digital Entrepreneurship to drive digital ventures to take advantage of the digital innovation(s).
Fichman (2004)	(1) 12 FACTORS to help define value and strategy for the IT activity and (2) Option Valuation technique for emerging Information Technology (IT) to identify when to make the strategic decision to take the lead to innovate.
Fichman *et al.* (2014)	Digital Innovation (as strategic direction of what to do to realise value). Outline of a 4 x Step process to innovate (also part of the SDLC process): (1) Discovery (2) Development (3) Diffusion (4) Impact
Gomber *et al.* (2018)	Development of a FINTECH Innovation Mapping technique to assess if changes are transformational in a Business Model, to the Customer Experience and Service.
Gregory *et al.* (2015)	Investigation into strategic options to manage conflicts (6 x situations) in IT transformation. Adoption of ambidexterity resolution strategies (short- & Long-term goals; local vs global needs; blending IT and Business needs) as key decisions and trade-offs made.
Gregory *et al.* (2018)	Key strategic input of IT consumerisation (or everyday IT) challenges and its impact on IT Governance.
Gupta & Bose (2022)	2 x longitudinal studies (digital start-ups in a Crowdfunding domain). Present a framework of how Digital Business Transformation (DBT) takes place in these types of entrepreneurial firms. This was shown to be achieved by the information exchange with the environment.
Hackney *et al.* (2004)	A Strategic decision framework for (1) Evolutionary change, (2) Value creation and (3) Management of change and 3 key steps to sustain (a) value generation and (b) facilitate business services innovation.
Henfridsson & Bygstad (2013)	3 x Generative Mechanisms - Innovation, Scaling & Adoption - core content of each mechanism gives a design strategy requirement - direction for the strategic choice for evolution within a firm's infrastructure.

Digital design strategy & options

How to get to the future vision of the organisation

Reference	Reference focus
Henfridsson & Lind (2014)	Information system strategising focus through activity-based production of strategy content. Driven or built on local technology -mediated practices.
Henfridsson & Lindgren (2010)	Study of User Involvement practices (getting the User involved in the development of the product) and how they need to be 'adapted' with the development cycle for things such as context, being part of a temporary system relationship etc.
Hogberg *et al.* (2021)	2 x case studies to understand how new technologies, new market actors, or new customer behaviours can digitally disrupt. Outlines 3 x strategic responses: (1) Expanding the ecosystem, (2) Increase the strength of the links of the digital and business strategies and (3) improving the relationships with the users.
Holmqvist & Pessi (2006)	Case study at Volvo to demonstrate that agility in IT initiatives can be achieved through (1) Scenario development and (2) keep projects sized to nurture learning.
Huang *et al.* (2017)	3 x approaches to platform development - based on identified generative mechanisms): (1) Data-driven Operations, (2) Instant Releases and (3) Swift transformations to aid in Rapid Scaling of a business.
Jha *et al.* (2016)	Study of the evolution of an IT Ecosystem and identified: (a) 5 phases of evolution of the ecosystem and (b) Definition of the critical elements of the ecosystem that includes three key features of lasting ICT-based solutions.
Kathuria *et al.* (2018)	Model to help understanding the strategic appropriation path to explain the linkage from (1) Technology (Cloud Computing in the study) to (2) Integration of the capabilities (Cloud integration), (3) the changed Business Portfolio Capability to (4) the resulting business flexibility and finally the impact to (5) Firm performance.
Kovacevic-Opacic & Marjanovic (2020)	Applying co-evolution and punctuated equilibrium to understand the ongoing process of digital platform strategy.
Legenvre *et al.* (2022)	Highlighted 4 x strategic maneuverers to take advantage of open technologies to drive competitive advantage. Outlined a 5-level strategic roadmap to realise the desired advantage.
Lindgren *et al.* (2008)	Using IT systems, that are dynamic, to enable boundary spanning i.e., making sense of peripheral information that is perceived relevant to expand the knowledge at the "centre" - to help manage the distribution and specialisation of work and context driven.
Lowry *et al.* (2017)	Focus on Privacy / Security Research in Information Systems (IS). Key IS artifacts of Ethics, Information, Legal, Organisational, Person, Process, Protection, Social, Technology, threat, and vulnerability.

Digital design strategy & options	
How to get to the future vision of the organisation	
Reference	**Reference focus**
Markus & Loebbecke (2013)	Strategic decisions: (1) Business Community (overlapping ecosystems of competing orchestrators in defined areas of business activity) (2) Standardised (to the user specifically = customised) vs. Commoditised (used by all) of the digital business processes. (3) Customisable digital platform (shared by many companies) vs. Business community platforms (tailored for use by all members of business community).
Metzler & Muntermann (2021)	The impact of digital transformation on an organisations' business model. New insights presented by looking at changes that occur in the business model, challenges of these changes and responses of the organisation to the challenges.
Rolland *et al*. (2018)	Making the strategic choices between Digital Options (new technical and informational features that will increase the platform's value proposition) and Digital Debt (maintainability and evolvability of the platform - handling future changes and needs) - focus on the INTERACTIONS between each.
Sawy *et al*. (2016)	Identifying the foundational building blocks for Digital Leadership: (1) Business Strategy (2) Business Models (3) Enterprise platforms (4) People Mindsets & Skill sets (5) The IT function (6) The workplace With digitalisation moves in 3 areas, built on the foundation building blocks to achieve the leadership: (1) Products (2) Marketing (3) Enterprise Platform
Sebastian *et al*. (2017)	Achieving digital transformation through 2 x Digital strategies that defines a SMACIT-inspired value proposition: (1) Customer engagement to achieve superior experience. (2) Digitised solutions where the value proposition is built on products, service and data. To execute on the strategy requires 2 x technology enabled assets: (a) An operational backbone - to enable operational excellence and efficiency. (b) Digital services platform - to enable business agility and rapid innovation of new solutions.
Siegel & Gabryelczyk (2021)	Presenting a framework for Digital Transformation (DT) in public administration setting - four key streams of (1) Shaping and communicating the DT offerings, (2) Designing offers and stakeholder engagement, (3) Deployment and promotion and (4) Improvement and innovation of the DT offers.

Digital design strategy & options	
How to get to the future vision of the organisation	
Reference	**Reference focus**
Soto Setzke *et al*. (2021)	Identifying configurations of digital transformation strategies from 17 x case studies. Focus on Digital services innovation (DSI) and what leads to success.
Törmer (2018)	Identifying 3 x generative mechanisms of the digitalisation within the LEGO group - (1) Modular Upgradability, (2) Economics of Substitution and (3) Reproduction.
Woodard *et al*. (2013)	Conceptual model to explain how creating a 'stock' of platform designs (Design capital) that is owned by the firm can act as a foundation for a set of 'Design Moves'.
Yaraghi *et al*. (2015)	Strategies to drive the adoption and usage of digital platforms for the exchange of health information in a B2B environment (Medical practice to medical practice). Requires co-creation, multi-sided platform, self-service technologies to provides value to user. The results are influenced by the typography of the stakeholders, the isomorphic effects of 'larger' stakeholders that influence the actions of 'smaller' ones.
Ye & Kankanhalli (2018)	Strategic decision to the approach to development within the Software Development Lifecycle - User driven innovation through lead users on a platform and providing the technology (Toolkits) and policies/rules to enable it.
Yoo *et al*. (2005)	The strategic role standards in promoting, enabling, and constraining innovation through the theoretical lens of ANT - Actor Network Theory.
Yoo *et al*. (2010)	Proposal of a Layered modular architecture as a hybrid (on a continuum) of (1) the Modular Architecture of a physical product and (2) the layered architecture of digital technology with loosely couple components and varying degree of technology embedded. Demonstrate that the digital product platform is a source of digital innovation.

Design selection	
(a) Making functionality based 'strategic' decisions. (b) Design principles (lower level) to guide decisions	
Reference	**Reference focus**
Blaschke & Brosius (2018)	Present 4 x models of balancing Control and Generativity: (1) Contextual, (2) Structural, (3) Temporal and (4) Dominal Balance.
Constantiou *et al*. (2017)	Focus on user type & economic sharing between Platform owner and users.

Design selection

(a) Making functionality based 'strategic' decisions.
(b) Design principles (lower level) to guide decisions

Reference	Reference focus
Du *et al*. (2014)	Making the optimal business decision in the platform (tiering of digital content and outline the results of the authors assessment to revenue and traffic in the digital platform.
Eaton *et al*. (2015)	Maintaining Platform overall ownership and control while integrating external innovative capabilities through the Distributed tuning of Boundary resources e.g., APIs
Engert *et al*. (2022)	Identified 3 x synergistic complementor strategies to drive impactful products on digital platforms.
Faber & de Reuver (2020)	Study to close the gap on the extensibility of digital platforms. Focused on Openness, Control, Security, and privacy and how extensibility and generativity of a digital platform affect consumer decisions.
Fischer *et al*. (2020)	Focus on how 5 x companies utilised Business Process Management (BPM) to drive their digital transformation. 17 x recommendations identified and 3 x strategy archetypes: (1) Communication & Learning, (2) Unification & Optimisation and (3) Automation and Certification used in conjunction with 6 x meta objectives (Governance & Compliance, Management Support, Interaction Model, Education, Tool Support, Conventions & Guidelines).
Flotgen *et al*. (2020)	Through a model for the ecosystem of emerging Financial Regulation in order to extend the concepts of Boundary Resources to show that reporting digital platforms will need to be co-created with the framework due to the control of the sensitive data it will manage.
Gal *et al*. (2008)	Boundary Objects impact on being a mechanism to facilitate communication and shared understanding within the 'infrastructure' i.e., not just a 'translation' device.
Ghazawneh & Henfridsson (2013)	Design of the boundary resources on a digital platform through the drivers of (1) Securing and (2) Resourcing. Understanding of the impact (relationship) on the connected 3rd party applications development.
Giessmann & Legner (2016)	Design principles for a viable Platform as a service (PaaS) business model - focus on value co-creation with partners by developing complementarity components and application.
Hukal (2017)	Looking a Modularity on a digital platform and the levels of Coarse and Granularity. The study revisits the role of interdependencies in platform evolution and the potential drivers of incremental innovation.

Design selection

(a) Making functionality based 'strategic' decisions.
(b) Design principles (lower level) to guide decisions

Reference	Reference focus
Hukal *et al*. (2022)	Identified 3 x synergistic complementor strategies to drive impactful products on digital platforms: (1) Content discoverability - ease for users to become aware of the complementors product, (2) Selective modularisation - investing in technical features and (3) Asset fortification - leveraging unique capabilities to ensure clear differentiation from competitive offerings.
Iyer & Henderson (2012)	Benefits and risk mitigation from the use of Cloud solutions (as a business and technical choice) that include gaining competitive advantage.
Levkovskyi *et al*. (2021)	Study focused on the gap of the operational level aspects of a digital transformation. Specific areas illustrated that business process transformation and key performance indicators are an important component to mastery of digital competencies
Lohrenz *et al*. (2021)	Using Self Determination Theory (SDT) to understand a user's 'well-being' on a digital platform to aid in its design. 13 x mechanisms identified to build a successful Digital platform that would help in the promotion of three of the fundamental constructs of SDT: (a) Autonomy, (b) Competence, (c) Relatedness.
Lusch & Nambisan (2015)	Identification of 6 x Service Innovation themes and a Tripartite framework based on (1) Service ecosystem based on an Actor-2-Actor structure, (2) Services platforms for service exchange and (3) Value cocreation based on the customers need for a solution
Lyytinen *et al*. (2016)	The identified properties (5 off) of a digital infrastructure to support emerging innovation networks (4 off). Demonstrates how digitisation of the activity helps to promote and sustain digital product innovation.
Robey *et al*. (2002)	Study of the implementation challenges and implications for a deployment of a new platform (ERP system in 13 firms). Findings that the ability to manage configurability knowledge realised higher assimilation. Identified two types of approaches that firms adopt: (1) piecemeal - focused on technology first vs. (2) concerted - focused on both technology and business processes.
Sandberg *et al*. (2020)	Use of Complex Adaptive Theory (CAS) to investigate the transformation of an analogue automation product platform and the ecosystem-centred organising logic. How the product platform digitisation leads to phase transitions and the mediating role of 3 x mechanisms: (1) Interaction rules, (2) Design Control and (3) Stimuli-response variety.
Soh & Grover (2022)	Assessment of the level of 'distributed sensemaking' on the innovations and content of the Platform Boundary Resources (PBRs) when released. The level of app complexity and relatedness to prior PBRs are important in the context of technological uncertainty that may exist.

Design selection

(a) Making functionality based 'strategic' decisions.
(b) Design principles (lower level) to guide decisions

Reference	Reference focus
Staub *et al.* (2021)	Focus on the acquisition of complementors and recommendation for larger companies for (1) Acquiring complementors, (2) Aligning acquisition to the firm's platform development, (2) Integrating the complementor and (4) ensuring coherency in the platform especially after diverse acquisitions.
Tan *et al.* (2019)	Presented 3 x key themes for IT-driven operational agility on platforms: (1) Resource or Task Interdependency (Pooled; Sequential; Reciprocal) (2) Agility (supported by the IT systems) and (3) Platform (2-sided / Multisided).
Tiwana *et al.* (2010)	Study to provide an understanding of the influence and effect of the platform design and architecture (what) and governance (as how development is done decisions). Adopted the 'measure' of evolutionary dynamics (properties and criterion for change - to illustrate how they change).
Um *et al.* (2015)	Identify 5 x types of Complementor engagements and the role of Platform Boundary resources (PBRs) to stimulated and control the engagements.
Wulf & Blohm (2020)	A unified view on API design choices and strategic choices. Selecting the API Archetype in the platform to drive performance impact i.e., type of access (Professional Services, Mediation Services or Open Asset Services) and a targeted economy of scope (Production or Innovation) leads to better return-of-investment (ROI) or adoption. Finding that a solid technical solution along will not suffice => the API must align with the overall business objectives and the demands of third-party developers and end customers.
Xie *et al.* (2022)	Understanding how Small and medium sized enterprises (SME's) reconfigure their capabilities. A conceptual framework allows an explanation of how digital platforms affect the SME's business model innovation with (1) Evolutionary capability reconfiguration and (2) substitutional capability reconfiguration.
Yang & Yuan (2012)	Study of an Integration information platform to present information following a Situation-Awareness (SA) oriented design to allow (1) Perception, (2) Comprehension what's going on and (3) Projection of what will happen to allow action to be taken The study proposed a Service-centre architecture by employing (design principles) of : (a) Participatory Design (PD), (b) Software prototyping (Throwaway & evolutionary), (c) Component Based development and (d) Visualisation of the information.

Architectural design

Design at the architectural level of a platform

Reference	Reference focus
Brunswicker *et al*. (2019)	Coupling between elements of the architecture. Type of '*coupling*' as a key consideration on the Architectural design and its impact on platform performance.
Chaturvedu *et al*. (2011)	Exploration and view of the core architectural structure (technical requirements) of the '*program*' of a Virtual World.
Grover & Lyytinen (2021)	Special Issue Editorial - focus on platform competition and the impact to a layered modular architecture to create value from data, complementarities, and transactions.
Jha *et al*. (2016)	Study of the evolution of an IT Ecosystem and identified: (1) 5 phases of evolution of the ecosystem and (2) Definition of the critical elements of the ecosystem that includes three key features of lasting ICT-based solutions.
Kallinikos *et al*. (2013)	Understanding the impact of changing functional relationships between artifacts on (1) Appearance and form of the artifact and (2) Value and Utility of the artifact. Outlined the influenced of the context.
Karhu *et al*. (2018)	Platform openness & forking - picking the right strategy to promote innovation and value generation in a platform. Achieved by making it more open to complementors but not wide enough to make it more conducive to forking.
Kari *et al* (2020)	Understanding the characteristics that drive the relationship between the Situation Context (within an EXERGAME - Wii) and Use Continuance (post-experience, continued Use). To understand what drives +ve or -ve experience (Incidents) which in turn equals value.
Kazan *et al*. (2018)	Creating a set of Architectural Digital platform profiles (6 off) that lead to 3 x Competitive Strategies in Network Economies. The Taxonomy for each Profiles is based on (1) Value Creation Architecture - whether is it Integrative or Integratable and (2) Value Delivery Architecture design - if the architecture has Direct, Indirect or Open Access.
Lindgren *et al*. (2004)	3 x Design principles for a Competence Mgmt System: (1) Transparency, (2) Real-time capture and (3) Interest Integration.
Rai *et al*. (2006)	Achieving an Integrated IT infrastructure to shape and give rise to 'higher-order process capabilities' (or higher levels of process integration from physical, financial and information flows) to generate performance gains. Standards for the integration of data, applications, and processes to be negotiated and implemented in order for real-time connectivity between distributed applications to be achieved
Song *et al*. (2017)	Analysis of the effects of APIs on Innovation and Imitation and how they are influenced by market conditions and complexity of the platform.

Architectural design

Design at the architectural level of a platform

Reference	Reference focus
Tiwana (2015)	Digital Platforms Extensions modularisation - maintaining Input control over revisions as Platform Owner. This influences the degree of the architecture being Loosely coupled (with a standard interface and not embedded). This is found to induce evolution to improve performance as extensions compete with each other.
Tiwana (2018)	Making key business choice on the digital platform on APIs and APPS in terms of coupling. Choice is: (1) Monolithicity or Tight Coupling internally in the App (Internal Architecture) or (2) Modularity or Loose Coupling to connect to the platform (External Architecture). The boundary of the app (defines the scope of what the APP performs for the user) and delineates between External in Internal architectures.
Van De Wetering & Dijkman (2021)	Focus on how Enterprise Architecture (EA) driven capabilities can enhance a firms digital platform capabilities (DPC). From 414 respondents the enhancement to the digital platform driven by architectural level changes is explored.
Yoo *et al*. (2010)	Proposal of a Layered modular architecture as a hybrid (on a continuum) of (1) the Modular Architecture of a physical product and (2) the layered architecture of digital technology with loosely couple components and varying degree of technology embedded. Demonstrate that the digital product platform is a source of digital innovation.

IT Governance & Execution of the Software Development Lifecycle

The development process, i.e., getting it done

Reference	Reference focus
Berente *et al*. (2019)	Deployment & Implementation steps as a response to 'technology' based transformation or Innovation
Carlo *et al*. (2014)	Adoption timing impact in a Disruptive IT Innovation process
Ceccagnoli *et al*. (2012)	Optimal structure to execute e2e (external 3rd party software providers)
Chatterjee *et al*. (2002)	Key hi-level management tasks (to drive "web assimilation" to achieve operational and strategic benefit)
Chen *et al*. (2022)	Addressing the gap of a coherent approach to governance and design of digital platforms by categorising the mechanisms of incentives and controls.

IT Governance & Execution of the Software Development Lifecycle

The development process, i.e., getting it done

Reference	Reference focus
Fichman *et al*. (2014)	Digital Innovation (as strategic direction of what to do to realise value). Outline of a 4 x Step process to innovate (also part of the SDLC process): (1) Discovery (2) Development (3) Diffusion (4) Impact
Gregory *et al*. (2018)	Key strategic input of IT consumerisation (or everyday IT) challenges and its impact on IT Governance.
Kathuria *et al*. (2018)	Key criterial for evaluating Enterprise Packaged software. Most significant: (1) Functionality, (2) Reliability, (3) Cost, (4) Ease of Use and (5) Ease of Customisation. Less significant: (6) Ease of Implementation and (7) Vendor reputations. *[Note: 2006 paper]*
Mulyana *et al*. (2021)	Findings that 'traditional' IT Governance (ITG) mechanisms are no longer valid. Identify 28 x ITG mechanisms that influence digital transformation.
Pacheco *et al* (2020)	Demonstrating that there is a necessity to transform a firm's IT Governance (ITG) to assist in key business transformation and innovations. Leverages 6 x ITG archetypes to illustrate their influence on success factors as it relates to a predictable return from the development process.
Parker *et al*. (2017)	Study to "INVERT the FIRM" as an approach to facilitate external based development. As a way to access knowledge, skills, and innovation from external development. Also allows for spillover from one 'developer' to another - accumulate the potential impact.
Tan *et al*. (2020)	Model the effect of digital platform versioning on outcomes to demonstrate that release cycle time, in the SDLC, impacts on the number of applications and users on the platform.
Tiwana (2010)	Interaction between Control mechanisms in the development process: (1) Formal control - explicitly defined and prescribed to drive control of the outcomes and approach to development, (2) Informal Control mechanisms - declaration of shared values and beliefs. Demonstrates that the informal approach strengthens the approach to development but can weaken the realised outcomes.
Wang & Burton-Jones (2020)	Study to understand how the process of Governing Digital Transformations unfold. Identifies 2 x Stages and 7 x Modalities - to explain the process of governing.
Ye & Kankanhalli (2018)	Strategic decision to the approach to development within the Software Development Lifecycle (SDLC) - User driven innovation through lead users on a platform and providing the technology (Toolkits) and policies/rules to enable it.

Socio-technical effectiveness

People and structure focus within the Socio-Technical System

Reference	Reference focus
Anderson *et al*. (2018)	Studying team effectiveness - Integration & coordination strategies when using Distributed Product Development projects of a digital platform
Andersson *et al*. (2008)	Study of knowledge management - understanding of the development of Architectural Knowledge within IT innovation.
Gust *et al*. (2017)	Steps (from the 4 x lessons in the study) to develop a state-of-the-art data analytics capability.
Karimi & Walter (2015)	How dynamic capabilities are created in an organisation to support the building of a digital platform as part of a response to digital disruption Created by (1) Changing, (2) Extending or (3) Adapting the elements in the RPV Framework (Resources, Processes and Values).
Lyytinen *et al*. (2016)	Study of 4 x types of emerging Innovation Networks Process is digitised with focus on Knowledge creation and sharing (driven by application of Operant (control of resources and knowledge) and Operand (e.g., tools used) resources) How digitisation helps to promote and sustain digital product innovation.
Parker *et al*. (2017)	Study to "INVERT the FIRM" as an approach to facilitate external based development. As a way to access knowledge, skills, and innovation from external development. Also allows for spillover from one 'developer' to another - accumulate the potential impact.
Tiwana (2010)	How the use of an Informal control mechanism (declaration of shared values and beliefs) to promote collaboration in development. Demonstrates that it strengthens the approach to development but can weaken the realised outcomes.
Tiwana & Kim (2016)	Outline of 2 x exploratory mechanisms when 'sourcing' IT capability from multiple places (or sources) at the same time (concurrent). The mechanisms give rise to improved performance of IT output: (1) UNIDIRECTIONAL MECHANISM (when there is alignment of the IT vendor practices to the 'clients'). (2) BI-DIRECTIONAL MECHANISM (degree of knowledge sharing due to the interaction between client and vendor).
Yoo *et al*. (2005)	The role standards in promoting, enabling, and constraining innovation through the theoretical lens of ANT - Actor Network Theory.

Digitisation	
Automation & digital embodiment	
Reference	**Reference focus**
Nissan (2000)	Comparing the 'output' from a computer-generated answer and determining (with a modified TURING test - comparative test)
Yoo (2010)	Research Opportunities (6 off) around Experiential computing - digitally mediated (bring about) embodied experiences, in everyday activities, through everyday artifacts, that have embedded computing capabilities.

Appendix 3 GLOSSARY

Acronym	Full Form
AIR	Audit Issue and Recommendation (Internal Audit document)
AMS	Americas Sales team
AP	Accounts Payable
APA	Advanced Pricing Agreement (Financial product)
API	Application Programming Interface
APJ	Asia-Pacific Region
ARS	Asset Recovery Services (also Asset Upcycling)
B2B	Business-to-Business
B2C	Business-to-Customer
BLA	Business Lease Agreement
BP	Business Process
BPL	Business Process Leadership
BPM	Business Process Manager
BPMgmt	Business Process Management
BRD	Business Requirement Document (SDLC Document)
CAF	Channel Assistance Fee
CAGR	Compound Annual Growth Rate (%)
CBA	Cost Benefit Analysis
CD	Customer Delivery (Operations team for HPEFS)
CDL	Customer Delivery Leadership
CDLT	Customer Delivery Leadership Team
CDM	Customer Delivery Manager
CE	Customer Experience
CEB	CEB Inc (formerly Corporate Executive Board)
CHG	CHG Meridian (independent financial services company)
CLI	Customer Loyalty Index (Survey)
COA	Certificate of Acceptance
COP	Community of Practice
CP	Customer Portal
CPE	Customer Portal Experience
CPQ	Configure, Price, Quote
CT	Customer Technology
CX	Customer Experience
DBT	Digital Business Transformation
DFS	Dell Financial Service (captive financial services division)
DLL	De Lage Landen (independent financial services company)
DQQ	Detailed Quick Quote

Acronym	Full Form
DTLT	Digital Transformation Leadership Team
DTSC	Digital Transformation Steering Committee
EA	Enterprise Architecture
ECDLT	Extended Customer Delivery Leadership Team
ECE	Effortless Customer Experience
EMEA	Europe, Middle East & Africa
EODB	Ease of Doing Business (Survey measure)
EOT	End-of-Term (Choices at the end of the lease)
eSIGN	eSignature (Adode & DocuSign)
FB	Flexible Billing (Financial Product
FDD	Functional Design Document (SDLC Document)
FICO	Fair, Isaac and Company (Credit Scoring)
GBPOS	Global Business Process and Online Strategy
GLT	Global Leadership Team
GMC	Global Marketing Council
GPC	Global Partner Conference
GPG	Global Process Guide (for Business processes)
GPO	Global Put On (Core system)
GTM	Go-to-market
HP	Hewlett Packard
HPE	Hewlett Packard Enterprise
HPEFS	Hewlett Packard Enterprise Financial Services
IDC	International Data Corporation (Market intelligence provider)
IGF	IBM Global Finance (captive financial service division)
IPO	Initial Public Offering
IPR	Intellectual Property Rights
IS	Information Systems
ISV	Independent Software Providers
IT	Information Technology
ITAM	Information Technology Asset Management
ITC	Information Technology Consumption (financial products)
ITG	Information Technology Governance
ITSM	Information Technology Service Management (e.g., ServiceNow, BMC Remedy)
KPIs	Key Performance Indicators
LT	Leadership Team
MDOE	Minimum Degree of Effort (Survey measure)
MLFA	Master Lease & Finance Agreement (financial product)
MTC	Medium (customer segment) through the Channel (partners)
NPS	Net Promoter Score (survey)
OAD	Opportunity Assessment Document (SDLC Document)
OLCA	Online Credit Application (& Quoting system)

Acronym	Full Form
OP	Operations
OpEx	Operational Excellence
P@YS	Pay-at-your-service (Financial product)
PBR	Platform Boundary Resource
PCT	Partner Connection Tool
PDO	Program Development Office
POC	Proof of Concept
PPU	Pay-Per-Use
PSIC	Punctuated Socio-technical Information system change
RPA	Robotic Process Automation
RRC	Rapid Response Centre (America's based operation)
SDLC	Software Development Lifecycle
SDT	Self Determination Theory
SEC	US Securities and Exchange Commission (www.sec.gov)
SMB	Small & Medium Business (customer segment)
SME	Subject Matter Experts
SOW	Scope-of-Works (SDLC Document)
SSI	Semi-structured Interviews
TBR	Technology Business Research (www.tbri.com)
TCE	Total Customer Experience (Survey)
TRC	Technology Renewal Centre (asset return processing centre)
UI	User Interface (e.g., Customer Portal)
UX	User Experience
WD	Wongdoody (Experience Design house)
WLS	World Learning Series (cross HPEFS training events)
YTD	Year-to-date

Appendix 4 Chronological Development

YEAR	PLATFORM DEVELOPMENT
Pre-2012	• **Core Platforms in HPEFS** – supporting the traditional internal processing of the leasing business, managing the contracts through their lifecycle and asset return.
2013	• **Digital platform - Customer Portal officially launched (https://h22155.www2.hpe.com/)**
2014	• **Digital platform – Partner Connection officially launched (https://h22165.www2.hpe.com)** • **Partner Connection** - VERTEX Tax Engine integration for the USA (www.vertexinc.com) to drive state and city tax calculations. • **Customer** – full emulation in Customer Portal to provide support by internal colleagues to direct customers. This allowed full access to act on behalf of the customer within the platform. • **Customer eSignature** – implementation of DocuSign (www.docusign.com) to core system. • **HP Subscription –** initial designs and concepts developed to present a monthly payment-based contract through Partner Connection. • **Asset Recovery Services (ARS)** introduced into Customer Portal to allow customers to request and process a return of leased assets.
2015	• **Partner Connection** – initial integration of **FICO** based Credit scoring (www.fico.com) for Customers for the US and UK. • **UX Redesign** (2014) for Customer Portal and Partner Connection user interfaces to accommodate HP Enterprise and HP Inc branding. • **Customer Portal -** Read-only access for internal colleagues to customer accounts for support. To allow reconciling to information in the core systems to allow resolution to customer queries and issues – i.e., that the operations teams can see what the customer sees. Provided extra control as the internal colleagues could not transact on the tool – as compared to emulation which give full access. • **Small Ticket solutions** - allowing non-SMB users to efficiently process specific groupings of small tickets deals within Partner Connection (new User modes). • **IT Consumption (ITC)** – strategy for new financial products to focus on pay-per-use.

YEAR	PLATFORM DEVELOPMENT
	• **Configurable Offers & bundles in Partner Connection** – creating drop-down options in the tool to allow easy selection for the Partners to automatically apply a promotion
2016	• **Partner Pricing (Indicative Quote) & Credit APIs** – first API solutions deployed to allow partners to embed specific HPEFS processed (as are in Partner Connection) into a Partner own selling platform. • **Customer** - Credit Card processing (2015) – detailed design and proposal from umber of banking partners – **paused**. • **Customer** – configuring UI presentment based on mode – presents the screens relevant to the role of the user in the customer to match the activities they perform. • **Partner** – management of customer Guarantors (Personal and Corporate) and Loans for Mexico & Peru • **Tiered Pricing** – configured by Partner to allow tiering of pricing to different level of relationships. • **UX Redesign** (2016) for Customer Portal and Partner Connection to improve the User Interface based on flow of tasks. • **Partners** - Insurance offering made available for select countries through Partner Connection.
2017	• **Customer** – **Automated End-of-Term (EOT)** pricing for Customers on self-service basis. Full end-to-end process for customers to present options and pricing in the Customer Portal. Additional automation deployed on the legacy systems to significantly reduce activity for the internal operations teams. • **Customer** - Switch from DocuSign to Adobe (https://www.adobe.com/sign.html) as main eSignature platform for HP Enterprise. • **Partner** – At 28 Countries, 16 with automated credit scoring and 16 Languages in Partner Connection. • **Robotic Process Automation** – assessment of the potential impact on a number of specific use cases. Option to use as a bridging strategy to provide ability to implement automation within the legacy systems. ***APPROACH*** • **WORKSHOP – Forrester (www.forrester.com) – specific engagement to design User experience**
2018	• **APIs (completed ecosystem)** – full suite of steps from quoting, credit application to contract generation available through X APIs. Each could be implemented individually or in a preferred combination depending on the partners requirements.

YEAR	PLATFORM DEVELOPMENT
	• **eSignature** (Adobe) within Partner Connection – allowing partners to offer the ability to eSign financial contracts and other documents. To automatically track the progress of the signing process within Partner Connection to drive an increase in turnaround time. • **Omnichannel strategy for Partners** – seamless integration of the user interfaces for partners – creation of strategy to build interconnection between Partner Connection, Partner APIs and the upcoming HPE Technomics mobile app. • **Completion of the API ecosystem (Credit, Firm Quoting, Document generation and eSignature)** • **Flexible Billing – self-service for partners in US/Canada**. ○ Implementation of new Billing engine in GoTransverse's TRACT® (www.gotransverse.com). • **Omnichannel strategy for Customers** – development of strategy to allow integration of HPEFS digital platform and other IT service management (ITSM) platforms. Goal to allow data transfer and the initiation of relevant services offered by HPEFS for asset management. • **Paperless invoicing** – introduction of automation to reduce the level of adjustments to invoice the drive creation of paper invoices. • **Metering – Flex Capacity and Pay-per-use** – a usage and consumption offering through telemetry software for Servers, Networking, Storage, and Infrastructure. An automated, scalable core framework to collect, calculate, price and bill for metered usage at the asset level. • **Circular Economy** – new solution to provide a comprehensive report for a customer on the level of return, recycle, reuse and scrap of IT equipment. To provide options to r ***APPROACH*** • **Engagement with Accenture (www.accenture.com) – Vision and 3-year roadmap creation (3-stage process)** • **Fjord Co-creation (www.fjordnet.com) workshop for Partners & SMB customers – concepts developed to improve the digital experience with new solution on the digital platform (HPE Technomics Mobile App & Portal+).**
2019	• **HPE Technomics mobile app launched for Partners (Android and iOS)** • **Partner** - **Basware** (www.basware.com) – online and automated supplier invoice management. Ability to accept invoices in any formatted and translate into digital format to allow automatic upload and to allow quick payment processing within HPEFS. • **Customer Asset platform (Service now)** – API Integration

YEAR	PLATFORM DEVELOPMENT

	• **Portal+** - future planned redesign of the portals to integrate partners, customers and internal HPEFS colleagues with a focus on collaboration
	• **Pricing Engine** – future planned core capability to integrate into the digital platform and to apply to different situations.
	APPROACH
	    • **Fjord Co-Creation (www.fjordnet.com) workshop for Enterprise and Global Accounts segment – concepts developed to improve the digital experience.**
	    • **Competitive analysis (capability based)** – TBR (www.tbri.com)

Appendix 5 Documents

Appendix 5.1 Internal Documents

Document Category	Documentation Types
(1) Strategy	**Annual Strategic plans** • Documents that the Global Leadership Team (GLT) and the various extended leadership teams formulate each year outline the strategic initiatives that will be the focus for the coming fiscal year. **Program objectives and goals** • Documents that provide more specific detail for each program in the form of the goals, objectives, and targeted deliverables. **Business priorities and key asks** • These documents capture the decisions by the leadership, the program teams, and various other groups responsible for delivering. They will outline their priorities for a particular program and any key aspects that may require support from the leadership.
(2) Capabilities	**Key features & functionality** • Outline and detail of the critical features within the digital platform and the functionality that the capability performs. Screenshots from the systems can also accompany to give a better view of the functionality and the resulting outcomes or output from the platform. • This material can also provide the content for training and communication of upcoming deployments. **Enhancements** • Articulates the improvement from a change in the digital platform, i.e., enhancing functionality to provide improvement or improved experience for the customer, selling partners or internal colleagues. **Experience-based** • Provides insight into how the experience has changed and will grow due to the digital platform enhancements. **Fixes & issue management** • Outlines the issues found during adoption and subsequent improvements to the digital platform. The documents will generally give some insight into the problem or issue experienced by the customer or the selling partner. They can provide the details of the actual fix regarding the changes and how it addresses the issue.

Document Category	Documentation Types
	Roadmaps • An outline of the upcoming and intended capability to be deployed or designed. To create a view of the '*future*' based on a targeted timeline to deploy the upcoming capabilities. The roadmaps align with quarterly deployment releases within HPE's fiscal calendar (November to October). Off-cycle deployment releases occur from time to time, and the roadmap is adjusted accordingly. **Technology Roadmapping** • The output from the analysis to determine potential forthcoming capabilities and the trends found to influence how they can be incorporated into the digital platform as '*future solutions*'. **New financial product offerings and programs** • Details of new or enhanced products, programs, or offer that HPEFS has created to generate more revenue, increase profitability, and provide a new value proposition to customers or selling partners. • Partners, in this case, are typically incentivised to sell the programs, offers or promotions to customers as functionality in the digital platform allows them to gain additional profit margin (in the form of adding an uplift to the quoted price). **Country and regional assessment and requirements** • Adjusting or customising the digital platform capabilities as part of the deployment across regions and countries. There are generally specific country requirements that require to be incorporated into the digital platform. These documents provide the output and the analysis from assessments, which leads to the capability and requirements to fulfil those local needs based on the country's requirements.
(3) Business Processes	**Policies** • Overarching guiding policies of the business that support the subsequent processing of opportunities and deals. They drive requirements for the digital platform to ensure alignment to the processes and fulfil the policies' core requirements. **Process and procedures** • These documents are the detailed process steps, activities, instructions, or procedures to fulfil the business activities and business tasks of HPEFS. As with policies, the documents are required to ensure that the digital platform capability aligns with the underpinning or foundational process and procedures that apply within HPEFS.

Document Category	Documentation Types
(4) Go-to-market	**Go-to-market (GTM) research** • The output of the Go-to-market team and the research they do across several different areas, i.e., the offering of products, competitive analysis, experience of the customers in dealing with HPEFS and the experience of partners. The documents also show the alignment and connection to the broader HPE product offering and HP Inc (pre-and post-split from 2015). They provide the information that demonstrates how the financial products align with the HPE business units and their selling strategy. **Customer and selling Partner feedback (includes surveys, feedback from sales and operations and direct engagement)** • Output, analysis, and findings from research that has been completed directly with selling partners and customers, with a critical objective of assessing experience and engagement. They provide measures on standard key performance indicators such as Customer Loyalty index (CLI), Net Promoter Score (NPS) and other forms of satisfaction and the experience of dealing with HPEFS. **On-going promotion and selling of the HPEFS capability** • Generally, these documents are collateral about the products, services, and capabilities that HPEFS provides to both customers and selling partners. They provide materials to '*sell*' and '*position*' the products and services. They offer insights for the customers and the partners to the benefits of taking or adopting the products from HPEFS. It can also outline instructions for the customers or partners to perform tasks on the online digital platform and show how easily they can be completed. **Capability Overviews & Value propositions to Customers / Partners** • Key aspects of a given set of capabilities to outline the functionality, possible outcomes, and the proposed benefits. • Provides the value proposition for a given capability.
(5) Competitive position	**Detailed Competitive analysis** • Internally generated from publicly available information or engagements with external research companies specialising in competitive analysis. Generally, it provides insights into the customer perceptions of one competitor to another. • Additional focus is also put on the detailed feature level to compare the digital platform offerings between HPEFS and the relevant competitors to determine if they are behind, the same or ahead. They can also identify specific sources of differentiation in the products and services provided by HPEFS or the competitor.

Document Category	Documentation Types
(6) Planning & Execution	**Program structure** • These documents outline how the digital platform's design, development and deployment are effectively executed. They generally outline the proposed program plan and the structure of the core activities and key deliverables for the program, thus allowing communication to the leadership team. Additional information such as resource allocation for each given program can be included. **Deployment and implementation planning** • These documents provide a clear outline of the approach to deploying the capabilities in the digital platform and the implementation plan. They generally include training and creating process, policy, and procedure documents. It can also include handover from the strategic program development team to the day-to-day business teams. **Readiness planning** • Documented output from assessments such as country readiness and specific capability readiness for pilots. The assessment outlines subsequent activities required to complete the desired '*readiness to implement*'. **Status updates** • Those documents provide progress to the numerous leadership forums, such as the Global Leadership Team (GLT), Digital Transformation Steering Committee (DTSC), and the business process leaders. • Allows for governance to be applied around the direction of the strategy implementation and provides a vehicle to ask for help from the leadership. • Requires various aspects of the digital platform development to be communicated regularly and generally allows a revisit to the activity's objective, where things are '*today*' (current status), and potential risks and roadblocks.

Appendix 5.2 Detailed document list (Internal) – (1) Strategy Documents

Document no.	Event Code	Year & Month	Description content	Document name	TYPE	Document Type
STRAT.001	STRAT	2012.11	**FY13 Strategic initiatives** for Customer Delivery (Operations) - incl. moving to "Everything Online" - objectives for the digital platform	2012.11 - FY13 CD Strategic Initiatives	PPTX	Annual Strategic plans
STRAT.002	STRAT	2012.11	Key objective of increasing the no. of financial schedules (and deals) the operation team could process per month - apply lean principles	2012.11 - VALUE (and LEAN)	PPTX	Business priorities and key asks
STRAT.003	STRAT	2013.04	Building (1) Strategy, (2) Process and (3) for each of the key customer segments identified in the business	2013.04 - 0413 - Customer Segment Definition	PPTX	Business priorities and key asks
STRAT.004	STRAT	2013.06	Planning meeting for the Extended Customer Delivery Leadership Team to create key projects for 2013 and beyond. Includes the HPFS FY13 Strategic Initiatives	2013.06 - 0613 - ECDLT Face-2-Face Meeting June-2013 - Strategy	PPTX	Annual Strategic plans
STRAT.005	STRAT	2013.09	Strategy and vision for the Digital Platform (Technical), People, Decision-making, Information systems and rewards (targeting FY15)	2013.09 - 0913 - CD Strategy & Visioning (CDLT Review) - V1 (slide 17)	PPTX	Annual Strategic plans
STRAT.006	STRAT	2013.09	**FY14 HPFS Strategic Initiatives** with Accelerators (targeted projects) - key pillar was to transform through on-line technologies	2013.09 - 0913 - FY14 Strategic Initiatives (GLT Update - 16th Sept)	PPTX	Annual Strategic plans
STRAT.006a	STRAT	2014.10	Update (Dec-13) to the **FY14 HPFS Strategic Initiatives** with Accelerators (targeted projects)	2013.12 - 1213 - FY14 Strategic Initiatives	PPTX	Annual Strategic plans
STRAT.007	STRAT	2014.02	Outline of the MISSION, VISION and key INITIATIVES for the Global Business Process & Online Strategy - 3 x strategic initiatives to drive specific project choices and design.	2014.02 - 0214 - GBPOS Mission-Vision 2014 - V2	PPTX	Business priorities and key asks
STRAT.008	STRAT	2014.10	Investor presentation to notify of the intention to split HP into HP Inc and HPE in FY15 - move to the "New Style of IT"	2014.10 - Oct 2014 Announcement Investor HP Split	PDF	Communication
STRAT.009	STRAT	2014.11	Communication poster for the **selected initiatives for FY15** (3 off) incl. new financial products in the "New Style of IT" and a differentiated experience for Customers & Partners	2014.11 - FY15_Strategic_Initiatives_Banner_opt10	PDF	Communication

Document no.	Event Code	Year & Month	Description content	Document name	TYPE	Document Type
STRAT.010	STRAT	2016.12	Overview (1-pg) on the **FY17 Strategic Initiatives** - focus on Profit growth, improving 'high value' relationships and scaling new solutions. Digital platforms as an enable	2016.12 - FY17_Strategic_Intiatives_Overvi ew_Slide	PPTX	Annual Strategic plans
STRAT.011	STRAT	2017.04	Review of the HPEFS Business - focus on Profit (Gross Margin), Asset Value and spend and Growth areas - key inclusion is "Flexible Payment methods"	2017.04 - HPEFS ELT Meeting	PPTX	Business priorities and key asks
STRAT.012	STRAT	2017.06	Outline of the shift to an Asset Management company and key activities and financial product offering	2017.06 - 0617 - Asset Mgmt strategy (CD LT Update)	PPTX	Capability Design strategy & plans
STRAT.013	STRAT	2017.11	Communication of the HPE Strategy (from CEO Meg Whitman) - focus on Hybrid IT, the Intelligent Edge and support from services groups. Key approach of design with an "outside in" mentality	2017.11 - FastStart_Meg_Whitman (HPE Strategy)	PPTX	Annual Strategic plans
STRAT.014	STRAT	2017.11	Overview (1-pg) on the FY17 Strategic Initiatives - focus on the Core of the business, the Digital Agenda (digital based products), Flexible consumption - platforms as an enabler.	2017.11 - FY18 - HPEFS Strategic Initiatives	PPTX	Annual Strategic plans
STRAT.015	STRAT	2018.06	1 page summary of the FY18 Initiatives - Key shift to have DIGITAL as a separate pillar to the strategy for the business	2018.06 - 0618 - FY18 Strategies Revised - June 2018	PPTX	Communication
STRAT.016	STRAT	2018.09	HPE Overview - provide outline of the products and services to customer and partners	2018.09 - Customer Presentation Guide Hewlett Packard Enterprise Overview	PDF	On-going promotion and selling of the HPEFS capability
STRAT.017	STRAT	2018.09	HPE Strategy - "accelerating your digital transformation agenda" - Technology, People and Economics.	2018.09 - HPE Strategy_Core Presentation - Accelerating Next_v2	PPTX	Annual Strategic plans
STRAT.018	STRAT	2012.07	Review of the FY13 Strategic Initiatives - high level status and outline of the key projects and workstreams	2012.07 - 1212 - FY13 Strategic Initiatives - OVERALL STATUS	PPTX	Status updates
STRAT.019	STRAT	2013.08	Strategy and Country Rollout plans (PCT), Key FUNCTIONALITY release plan, Competitive comparisons, Capability GAPS, Credit Scoring	2013.08 - 0813 - Commercial End State & Portal Capability Planning (Sep13 to Jun 14) V4	PPTX	Capability Design strategy & plans

Document no.	Event Code	Year & Month	Description content	Document name	TYPE	Document Type
STRAT.020	STRAT	2013.08	FICO Credit Scoring Strategy - Major deliverables, Rollout plans,	2013.08 - 0813 - CREDIT STRATEGY - Commercial End State & Portal Capability Planning	PPTX	Capability Design strategy & plans
STRAT.021	STRAT	2013.08	Key Strategic plans and activities to drive growth in the Channel-led / Medium (SMB) business	2013.08 - 0813 - FY14 Strategic Initiative Accelerate Growth in Channel-Led Medium - V1	PPTX	Program Strategy & Deliverables
STRAT.022	STRAT	2013.08	Aligning of HPFS Transformation (Overall system architecture) to the HP sales transformation	2013.08 - 0813 - HPFS Process Transformation	PPTX	Capability Design strategy & plans
STRAT.023	STRAT	2013.08	Current capabilities in Customer Portal and Partner Connection, plan, activity reporting on active customers and asks to Americas Sales team to drive adoption	2013.08 - 0813 - Moving to an On-Line Business (AMS Sales Update - Aug 2013)	PPTX	Capability Design strategy & plans
STRAT.024	STRAT	2013.09	Hi level definition of the workstreams for (#1) Becoming a trusted advisor for the Global Account and Enterprise Segment; (#2) Growing the Channel/SMB Business; (#3) 'Becoming an Online business'	2013.09 - 0913 - FY14 Strategic Initiatives Becoming an Online Business (GLT) V7	PPTX	Business priorities and key asks
STRAT.025	STRAT	2013.10	Major deliverables for each Workstream (3 off) for 'Becoming an Online business' (1) Improving Key Global Processes; (2) Sales Transformation; (3) Moving to an Online Business.	2013.10 - 1013 - FY14 Strategic Initiatives Becoming an Online Business V1	PPTX	Program Strategy & Deliverables
STRAT.026	STRAT	2014.10	Update to the Global Leadership Team (GLT) on the progress for the 'Online Program' - Capability delivered, Key Metrics on Activity & Adoption, next 90day plans	2014.10 - 1014 - Online Program (Status Update)	PPTX	Status updates
STRAT.027	STRAT	2015.01	FY15 plans - Focus Areas, March & Jun'15 Release planning. Gathering insights & feedback for design choice input	2015.01 - 0115 - BPL F2F - IT Prioritisation	PPTX	Capability Design strategy & plans
STRAT.028	STRAT	2015.01	New Style of IT - Hybrid IT, Big Data, Mobility, Security - alignment of HPFS financial products	2015.01 - 0115 - New Style of BUSINESS	PPTX	New financial product offerings and programs
STRAT.029	STRAT	2015.08	Plans for 2016 and beyond - based on 6 x Main Business Capabilities	2015.08 - 0815 - Combined HPE FS IT Detailed capabilities gaps and sizing - HPFS-v3-20150....	PPTX	Annual Strategic plans
STRAT.030	STRAT	2015.08	Plans for 2016 - Technology priorities - Business Outcomes and FY16 focus areas for Customer Portal, GPO, eSignature, EOT, ARS & integration with HP Inc	2015.08 - 0815 - CT_FY16_Priorities	PPTX	Annual Strategic plans

Document no.	Event Code	Year & Month	Description content	Document name	TYPE	Document Type
STRAT.031	STRAT	2015.08	HPE Strategy - New Style of Business & New Style of IT - Hybrid IT, Big Data, Mobility, Security	2015.08 - 0815 - Hewlett Packard Enterprise Strategy	PPTX	Communication
STRAT.032	STRAT	2015.11	Program planning for the EMEA Medium through the Channel (MTC) program to grow sales towards a FY18 goal.	2015.11 - 1115 - EMEA MTC Workshop	PPTX	Program Strategy & Deliverables
STRAT.033	STRAT	2015.11	Outline of the Program Development structure and process to bring new financial products to market	2015.11 - 1115 - HPEFS PDO Governance (Nov-15)	PPTX	Communication
STRAT.034	STRAT	2015.11	FY16 Priorities for Partner Connection, Consumption Products and Partner API (Web Services)	2015.11 - 1115 - IT prioritisation - FY16 Priorities - Partner Connection	PPTX	Capability Design strategy & plans
STRAT.035	STRAT	2016.02	Overall plans for the Medium Through the Channel (MTC) program - specific focus on differentiated processes, enhancements of PCT and Partner API's	2016.02 - 0216 - FY16 DELIVERY Summary	PPTX	Program Strategy & Deliverables
STRAT.036	STRAT	2016.03	FY15 Delivery (#16 - #20) & FY16 IT Roadmap (#21 - #24)	2016.03 - 0316 - Channel Program Priorities	PPTX	Capability Design strategy & plans
STRAT.037	STRAT	2016.03	Summary of the capability in place (Mar-16) for Customer Portal, Partner Connection, eSignature, Partner API's and Reporting on Activity (PCT and CP)	2016.03 - 0316 - On-line Strategy (Hi-level overview)	PPTX	Key features & functionality
STRAT.038	STRAT	2016.09	Presentation at Global Partner Conference on PCT, Partner Connection API's, HPE iQuote integration and the HPEFS Value proposition to Selling Partners	2016.09 - 0916 - Partner Connection Overview_HPE Showcase V3	PPTX	On-going promotion and selling of the HPEFS capability
STRAT.039	STRAT	2017.01	2017 Goals & Focus for the SMB segment - includes review of 2016 performance for Sales Volume, Profitability, Documentation, Savings, Deals with <$50k etc.	2017.01 - 0117 - 2017 SMB Plan - v5	PPTX	Program Strategy & Deliverables
STRAT.040	STRAT	2017.08	Strategic approach to define Digital Strategy (0-3yrs) - outline focus on Technology Roadmapping, Business Capability Planning, Program Development, Future Offers, Other Strategic Forums	2017.08 - 0817 - DIGITAL AGENDA_FUTURE CAPABILITY	PPTX	Capability Design strategy & plans
STRAT.041	STRAT	2017.08	Overall planning for Digital solutions for integration with other HPE business units and HP Inc. Includes Current (tactical) and Strategic Capabilities	2017.08 - 0817 - HPE_HP IT Investment (1st Aug)	PPTX	Business priorities and key asks
STRAT.042	STRAT	2017.10	Brainstorm inputs to future Digital capabilities to drive value for Customers - using automation to improve the experience	2017.10 - 1017 - DIGITAL AGENDA INPUT	PPTX	Key features & functionality

Document no.	Event Code	Year & Month	Description content	Document name	TYPE	Document Type
STRAT.043	STRAT	2017.10	Digital Transformation Strategy planning for 2018-2020. Built on (1) Innovation - Enhance Digital Experience and New Business Models, (2) Core legacy system transformations	2017.10 - 1017 - FORRESTER WORKSHOP (NJ)	PDF	Annual Strategic plans
STRAT.044	STRAT	2017.10	End-to-end Product, Program and Offer development process	2017.10 - 1017 - PRODUCT_PROGRAM_DEVELOP MENT - V3	PPTX	Process & procedures
STRAT.045	STRAT	2018.02	Digital Transformation Strategy approach for FY18 and beyond (links to FY18 Strategic Initiatives) & Digital Transformation dimensions.	2018.02 - 0218 - Digital Transformation Program Summary	PPTX	Program Strategy & Deliverables
STRAT.046	STRAT	2018.05	Digital Strategy from 2018 to becoming 'Digital Driven' (as an end state target), defining value cases, SDLC process and plans for FY18	2018.05 - 0518 - Digital Transformation Strategy - v2	PPTX	Annual Strategic plans
STRAT.047	STRAT	2018.06	Detailed planning for Digital Transformation Strategy approach for FY18 and beyond (links to FY18 Strategic Initiatives) & Digital Transformation dimensions - detailed workplan and outcomes by each dimension	2018.06 - 0618 - Digital Transformation Summary - V4	PPTX	Annual Strategic plans
STRAT.048	STRAT	2018.06	Output from Digital Immersion workshops (with Accenture) - key selected initiatives (22 off), Prioritisation and FY18 to FY22 Roadmap for GLT approval	2018.06 - 0618 - June_2018- Digital_Transformation_Update_ v2	PPTX	Annual Strategic plans
STRAT.049	STRAT	2018.06	Updates to DT Steering Committee - (1) Core Platform evaluation, (2) prioritisation of Initiatives based on Value & Investment, (3) Planned EXPERIENCE changes in 2019/2020.	2018.06 - Digital Transformation - Steering committee Update	PPTX	Status updates
STRAT.050	STRAT	2018.07	Translating the DT dimensions into (1) Desired Strategic Outcomes within each and (2) Projects to realize these outcomes	2018.07 - 0718 - Digital Transformation Summary (Partner) - V5 - Input to Accenture	PPTX	Capability Design strategy & plans
STRAT.051	STRAT	2018.07	GLT update on (1) Core Legacy platform evaluations, (2) Initial 5 x Projects from DT planning, (3) Co-creation workshop with Fjord (Accenture experience design house) in NYC	2018.07 - Digital Transformation Strategy - GLT Update - 2018-07-16	PPTX	Status updates
STRAT.052	STRAT	2018.08	Proposals for SMB Experience from Co-creation workshops (with Fjord) - Mobile app, Sales analytics and Collaboration portal for HPEFS, Partners and SMB Customers	2018.08 - 0818 - FJORD EXPERIENCE DESIGN (Partner_SMB) SUMMARY	PPTX	Capability Design strategy & plans
STRAT.053	STRAT	2018.08	Update to the Global Leadership Team (GLT) on Design & Strategy planning from Experience Design workshop (Key experience principles & Illustration of 3 x design concepts)	2018.08 - 0818 - HPEFS_ExperienceDesignGLT_V1 0as (14-Aug)	PPTX	Status updates

Document no.	Event Code	Year & Month	Description content	Document name	TYPE	Document Type
STRAT.054	STRAT	2018.10	Call with SMB Leadership - Release plans for Q1'19 (Dec-18), Q219 (Mar-19) and Q319 (Jun-19)	2018.10 - 1018 - Digital Transformation (16-Oct-18)	PPTX	Capability Design strategy & plans
STRAT.055	STRAT	2019.01	Update of Digital Strategy to the EMEA Leadership Team & Sales Leaders for FY19 - Q419 to Q319 Roadmap (API Ecosystem, Mobility & eSignature	2019.01 - 0119 - Digital Transformation - EMEA LT_SL (8-Jan-19)	PPTX	Capability Design strategy & plans
STRAT.056	STRAT	2019.04	Summary SCOPE for new Portal + (to support all aspects of Partner, Customer & Colleague journey) - full brainstorm on capabilities	2019.04 - 0419 - PORTAL+ v3	PPTX	Capability Design strategy & plans
STRAT.057	STRAT	2019.05	EMEA All hands to provide overview of Digital Strategy & Roadmap (Summary of vision, key priorities, Digital Experience focus and Projects)	2019.05 - 0519 - Digital Transformation - EMEA All-Hands (28-May-19)	PPTX	Communication
STRAT.058	STRAT	2019.05	Comprehensive update to GLT on Current status and upcoming release plans across the full range of Digital Transformation (e.g. Partner API's, Mobile App, eSign in PCT etc.)	2019.05 - 0519 - Digital Transformation - GLT Update - 2019-05-13-V2	PPTX	Status updates
STRAT.059	STRAT	2019.07	Scope of DIGITAL DNA program to drive consistency in building and applying web/mobile/digital usability best practices and design standards.	2019.07 - 0719 - Digital Transformation - DIGITAL DNA	PPTX	Experience based
STRAT.060	STRAT	2019.07	1 page summary of the FY19 and FY20 Digital Roadmap for the SMB segment (update to GLT)	2019.07 - DT - SMB update -GLT 07-19	PPTX	Capability Design strategy & plans
STRAT.061	STRAT	2019.08	HPEFS Vision driving Architecture design, transformation of legacy core systems (solving Tech Debt), Customer Experience (CX) & the FY20/FY21 Roadmap	2019.08 - 0819 - HPEFS Business Vision and Roadmap (21-Aug-19)	PPTX	Capability Design strategy & plans
STRAT.062	STRAT	2019.09	Strategy for Customer Omnichannel - using IT Service Management Platform (ITSM) to deliver services to customers (3 x Use Cases)	2019.09 - 0919 - CUSTOMER_OMNICHANNEL	PPTX	Capability Design strategy & plans
STRAT.063	STRAT	2019.10	Summary of the key capability delivered (by Oct-19) to support the growth in the SMB Business - integrated into a PARTNER OMNICHANNEL strategy	2019.10 - 1019 - Partner OMNICHANNEL - v4	PPTX	Capability Design strategy & plans
STRAT.064	STRAT	2019.11	Overall communication Digital Strategy & Roadmap (Vision, Experience pillars, Customer Experience (CX) Architecture & Annual Transformation journey (to 2021 & beyond)	2019.11 - 1119 - Digital Transformation - CDM_COP (19-Nov-19)	PPTX	Communication
STRAT.065	STRAT	2020.02	EMEA Leadership Update on KEY programs for enable the Customer Experience (CX) architecture - (1) Portal +; (2) Digital Experience; (3) Core Platforms; (4) Robotics	2020.02 - 0220 - EMEA-LT_SL_Digital Update	PPTX	Capability Design strategy & plans

Appendix 5.3 External Documents

Category	Documentation focus
(1) Strategy	**Public communication of key changes in the HP, HPE, or HPEFS organisation.** • Outline and communicate structural changes of the overall organisation or specific business units.
(2) Capability	**Overview of the key features messaging the benefits to customers and partners.** • Collateral in pdf form and is generally given to customers or selling partners, e.g., handbooks, briefing documents, solution briefs or flyers. • Key aspects of a given set of capabilities to outline the functionality, possible outcomes, and the proposed benefits. • Provides the value proposition for a given capability.
(3) Business Processes	**Training material, videos, and other collateral to help customers and selling partners.** • Provision of training material (video, user guides or presentations) to help customers, selling partners or internal colleagues adopt the digital platform or specific new enhancements. • Generally, will be presentations by HPEFS colleagues with slideshows or online informational tutorials, webinars, podcasts, or tutorials. • If available, accompanying collateral for demonstration systems allows customers and selling partners to trial capability.
(4) Go-to-Market	**Key HPEFS statistics** • Outline of fundamental business statistics that generally includes employee count, countries served, customer and selling partner statistics and value of assets on the balance sheet for HPE, among others. **Overviews and value proposition of the financial products to customers or selling partners** • Handbooks, solution briefs or informational flyers for products and service offerings. • Social media (e.g., Twitter, LinkedIn) and press releases through the HPE newsroom provide a conduit for key announcements on products and services, e.g., HP and HPE's annual Global Partner Conference (GPC). • Interviews with key leaders in HP, HPE and HPEFS provide additional support to the value the products and services can provide to customers and selling partners.

Category	Documentation focus
	Relevant go-to-market research from IDC, Gartner, and others to help message the value of the products and services. • Research and opinion from key thought leaders and market intelligence providers such as IDC on financial services and the competition faced by HPEFS. • They provide a perspective on the product offering from HPEFS and potential growth, and where the industry is headed in the coming years. **Current landing pages and offerings (as of Oct 2019).** • Websites for HPEFS and HPE that provide information on products and services, customer testaments and links to key collateral.
(5) Competition	**Review of the publicly presented data for the main competitors of HPEFS** • Investigation into the digital platforms and collateral to provide insights on offering and capability. • Accessing publicly available collateral such as demonstration sites, an overview of products and services, brochures, user guides and online tutorials. • Press releases by competitors and relevant industry competitive reports provide other available sources of capability. **A similar focus on capabilities, financial product offerings, and value propositions to allow for triggering design choices within HPEFS.**
(6) Leasing Platforms	**Overview of current leasing platforms to act as core systems and other third-party applications** • Detailed information on the platform capabilities and features. They are generally used in comparison and decision-making matrix analysis for design choices. • Review of the Gartner® Magic Quadrant™ for a given capability to gauge the position of a given third party solution or platform to other competitive products.
(7) HP & HPE Financial Earnings	**Quarterly earnings to provide insight into the financial results (revenue and profit) from 2013 to 2019.** • Quarterly earnings presentation and announcements and submission to the Securities and Exchange Commission (SEC) in the US - Form 10Q (comprehensive submission of the financial performance of HP and HPE quarterly) and 10K form (annual submission). • Quarterly Earnings presentations (PDF) presented by HP and HPE as part of their announcements (distributed by the Investor relations organisation)

Appendix 5.4 External Documents – searching keywords and sources

Initial KEYWORDS (and combination	2nd iteration searches/keyword combination		Information Sources (used in searches
HPEFS HPE Financial Services HPFS Partner Connection IT Consumption DaaS Pay as you Grow Customer Portal Partner Connection API HPE Technomics	hpefs customer pledge hpefs customer brochures hpefs twitter customer portal hpefs twitter partner connection	hpfs customer portal dell channel handbook HPE iQuote HP Financial Services strategy HPFS strategy 2016 HPEFS SMB Dell Financial Services / DFS IBM Global Finance / IGF De Laga Langan / DLL CHG Meridian ARROW Equipment Leasing and Financing Association (ELFA)	Newsroom Solution Briefs Press Releases YouTube videos Embedded Videos

HPE Financial Services **Document count – TOTAL =** **104**

2013	2014	2015	2016	2017	2018	2019
1	4	13	22	6	22	36

HPEFS COMPETITION – TOTAL = **80**

Dell Financial Services (DFS)	IBM Global Finance (IGF)	De Laga Langan (DLL)	CHG Meridian	ARROW
28	8	24	15	5

HP / HPE published Financial Results – TOTAL = **16**

Appendix 5.5 External Documents – Tracking table (example)

2013

DOCUMENT TYPE	REFERENCE TITLE	Public	DATE	URL	KEY COMMENTS
(4) GTM - On-going promotion and selling of the HPEFS capability	Interview with CEO Irv Rothman on How To Win in Any Economy *[2013_001]* ✅ End-note: HPEFS_2013_001 **[SALES_9] – sales messaging**	**Y** **8-Aug-21** **Accessed** **23-Apr-21**	**Oct 20, 2013**	https://sourcesofinsight.com/interview-with-ceo-irv-rothman-on-how-to-win-in-any-economy/	

2014

Document Type	REFERENCE TITLE	Public	DATE	URL	KEY COMMENTS
(2) Capability overview – messaging what can be done (Partner Connection & Customer Portal) **(4) GTM – Value proposition to Partners** (Incentive fees & Margin uplift)	Westcoast.co.uk (flyer on SMB, PCT) *[2014.001]* ✅ EndNote : HPEFS_2014_001 **CODING:** **[PCT]** **[CP]** **[CAF]** **[ARS]**	**Y** **6-Aug-21** **Accessed** **10-Jun-21**	**Feb 2014**	http://www.westcoast.co.uk/Admin/Downloads/HPFS%20Handbook.pdf	**Earn more with** partner incentive fees **[p.2]** New online portal [p.2] – Partner Connection **Pay for the use of IT equipment [p.2]** Partner Connection Usage Incentive 1% **of total financed amount (Applies for transactions initiated and completed by partner using Partner Connection portal) [p.3]** Margin Uplift Option Up to 4% **optional margin uplift (varies by country and finance program) [p.3]** **Partner Connection [p.4]** Generate a quick quote **to respond to customer queries regarding leasing options** Generate a credit application **on behalf of customers and track the application through its lifecycle (submit, withdraw, declines, approvals).** **Create and save** firm quote **terms to provide customers with options.** **Download** PDF proposal **document for each option.** **Easily convert a quote into an accepted proposal and contract documents in seconds**

					HP Financial Services Customer Portal
					• The HP Financial Services Customer Portal is a free, web-based, self-service lease management tool. **From lease origination to contract and asset management, the Customer Portal provides support through its comprehensive step-by-step suite of tools.**
					   ○ Access real-time lease management / asset reporting
					   ○ Access real-time invoice **information**
					   ○ Manage Global Lease Documents in a single repository
					   ○ Proactively manage maturing assets
					
					Currently, Partner Connection is set up to support completing transactions up to $500,000 USD **within the portal. [p.8]**
					
					CREDIT REQUESTS TAT & $
					Typical turnaround time for HP Financial Services to assess credit approval is up to 24 hours for transactions less than $500,000 USD, **up to 48 hours for larger transactions.**
					
					4AA1-6814EEE, February 2014

Document Type	REFERENCE TITLE	Public	DATE	URL	KEY COMMENTS

(2) Capability overview – messaging what can be done
 	
(4) GTM – Key HPEFS company stats (Assets, Revenue, Employee, Country coverage etc.)
	Your Partners for Success
	
	End-Note: HPEFS_2014_002
	
	[2014.002] ✅
	
	[PCT]
	[SALES_3] - countries
	[SUBS]
		Y
		6-Aug-21
		
		Accessed 31-Mar-21
			18-Sep-14	https://present5.com/your-partner-for-success-hp-financial-services-aaron/
				
				https://studylib.net/doc/5314968/hpfs-aaron-kaplan_ [Accessed: 31-Mar-21]
					• **Director of Channel Partner Programs**
					• SLIDES (PPT)
					• Data on HP Financial Services
					  o $12.1B in Portfolio Assets
					  o $4B Revenue
					  o 1300 employees
					  o 50 Countries
					  o 50% through the Channel
					  o 75% Repeat Customers
					• Presentation on **PARTNER CONNECTION** screens and process (full design and flow)
					  o Quick Quote
					  o Credit Application (Customer Information & Other information)
					  o Firm Quote
					  o Dashboard
					• **HP Subscription process**

(2) Capability overview – messaging what can be done **(4) GTM – HPEFS Overview**	**Your Partner for Success** HP Financial Services *[2014.003]* ✅ *NB – subsequently updated version of presentation [2015.010]* **[PCT]** **[SUBS]**	Y 6-Aug-21 **Accessed 11-Aug-21**	18-Sep-14	https://slideplayer.com/slide/5250776/	HPFS Channel Sales Manager, NA Region **Updated screen shots from [2014.002]**

Document Type	REFERENCE TITLE	Public	DATE	URL	KEY COMMENTS
(4) GTM – Financial Product Offering and its value proposition to customers (Subscription)	Subscribe and simplify **HP Subscription** *[2014.004]* ✅ **[SUBS]**	Y 6-Aug-21 **Accessed 6-Aug-21**	Aug-14	https://www.hp.com/et-en/pdf/hp_subscription_brief_tcm_1960_1983173.pdf	*"Help maximize cash flow with a monthly* **subscription** *to use best-in-class hardware and services—plus, it allows you to renew your technology every three years for a* **low monthly payment**.*"*
(2) Capability overview – messaging what can be done	HP Helps Partners Capitalize on the New Style of IT *[2014.005]* ✅ **[PCT]** **[SALES_9]** **[SALES_1]**	Y **Accessed 30-Apr-22**	Mar-14	https://www.hp.com/ie-en/hp-news/press-release.html?id=1590362#.YmzjltrMJD8	*HP Financial Services (HPFS) is supporting HP partners with its* **partner connection** *and* **pledge***:* *The HPFS* **partner connection** *online portal allows channel partners to quickly respond to customer inquiries, process deals more efficiently and gain access to flexible investment solutions that make it easy to sell bundled solutions and increase profitability.* *The HPFS partner* **pledge** *sets a clear standard for what partners can expect from HPFS and includes specific commitments from HP for support of their business.* **HP Global Partner Conference 2014** *The HP* **Global Partner Conference** *is HP's largest annual partner conference. At this year's event—March 24-26 in Las Vegas—HP will present the HP* PartnerOne *Awards to celebrate partners who have demonstrated outstanding market leadership, portfolio sales and overall growth and performance over the past year.*

2015

Document Type	REFERENCE TITLE	Public	DATE	URL	KEY COMMENTS to add to REPORT

(2) Capability overview – messaging what can be done
 	
(4) GTM – Value proposition for Partner (flexibility to work 24hrs)
	Tech Data leverages HPFS Partner Connection to help resellers deliver New Style of IT solutions
	
	[2015.001] ✅
	
	[SUBS]
	[PCT]
	[STRAT_2] – New Style of IT
		Y
		8-Aug-21
		
		Accessed 11-Aug-21
			16-Mar-15	https://www.ultimedia.com/default/index/videogeneric/id/s8uxl0	**VIDEO** on leverage and benefit of **Partner Connection - SUBSCRIPTION**
					• **TechData Spain**
					  o Review of the **SUBSCRIPTION** Program as a way to buy IT
					  o Ability to RENEW IT technology
					  o One monthly payment
					  o Partner Connection gives then flexibility and ability to work 24hrs
					  o Applies to HP or non-HP products
					  o Rapid and fasters solutions than the competitors
					  o HPFS is a TRUSTED Partner for them.

(2) Capability overview – messaging what can be done (Partner Connection Portal)
 	
(4) GTM – Value proposition for Partner (from PCT)
	#HPFS Partner Connection Portal enhancements help #partners win opportunities w/ speed & ease
	http://bit.ly/1jNXllS
		Y
		8-Aug-21
		
		Accessed 10-Feb-20
			7-Oct-15	https://twitter.com/hpe_fs/status/651787987749236224	• TWITTER feed from HPFS – screenshot of the key benefits of Partner Connection
					  o **Automated Credit Scoring in seconds**
					  o Price based on Hardware, Software and Services.
					  o **Bundled offers**

Appendix 6 – Coding

Appendix 6.1 Open Coding (Sub-Codes)

CATEGORY	[Label / Code]	CATEGORY description	Sub-codes
MARKET-DRIVEN PLATFORM CHOICES	**[MARKET]**	Digital platform choices that originate from the external market needs	Market-Driven Customer Expectations for a digital platform [MKT_1]
			Market-Driven Partner Expectations [MKT_2]
			Market-Driven RESEARCH and TREND analysis [MKT_3]
			Technology-based Market Shift [MKT_4]
Embedding improved USER EXPERIENCE in the digital platform	**[UX_STRATEGY]**	Platform choice is driven by the deliberate focus on improving the user experience-based outcomes and from direct 'asks'	Transaction speed [UX_1]
			User FLEXIBILITY & TAILORING [UX_2]
			Ease of Use [UX_3]
			Simplicity [UX_4]
			Self-guiding / FLOW / error-proofed low touch / high touch / Fully Integrated [UX_5]
			Effortless Experience Design (6 Principles) [UX_9]
			Experience Strategy & Pledge (Customer & Partner) [UX_10]
			Digital DNA (UX_11]
	[UX_INSIGHTS]		Partner Ask (Indirect feedback) [UX_6]
			Customer Ask (indirect feedback) [UX_7]
			Digital 1st / Digital natives [UX_8]
			Customer Portal Experience Survey / TCE / ECE [UX_12]
			Design feedback Sales / CD / HPE Presentations [UX_13]
			Direct engagement with Partners [UX_14]
			Direct engagement with Customers [UX_15]
			Journey Mapping / Experience Co-Creation [UX_16)
			Impact of LEARNING from PREVIOUS Platform work [AD_12]
	[UX_DESIGN_PROCESS]		Needs based design [UX_17]
			Impact and Benefits assessment driven [UX_18]
			Usability - design and testing to measure usability [UX_19]
			Prototyping driven design [UX_20]
			UX Design Processes (Internal & External) [UX_21]
			Using external consultants / UX Designers - BEST PRACTICES and INDUSTRY STANDARDS [AD_4]

CATEGORY	[Label / Code]	CATEGORY description	Sub-codes
Conforming to dominant 3rd party applications to aid integration to the platform	**[3rd_PARTY]**	Choices that are driven by the need to integrate to the 3rd party applications to successfully deliver on the capability they provide	Customer Driven [3RD_PTY_1]
			Partner Driven [3RD_PTY_2]
Platform changes from assessing the future Technology Lifecycle (Emerging_Growing_Mature_Decline)	**[LIFECYCLE]**	Seeking out and adopting future capability to improve the digital platform and the impact on the products, services, and internal processing improvements that can be achieved.	Technology disruption [TECH_1]
			Technology Roadmapping [TECH_2]
Issue impact on Experience	**[EXP_ISSUE]**	Issues that impact on Customer or Partner Experience	[EXP_ISSUE]
Product Offer driven experience	**[PRODUCT_EXP]**	Product offering driving an improved experience	[PRODUCT_EXP]
Platform change driven experience	**[PLATFORM_EXP]**	Platform improvement driving an improved experience	[PLATFORM_EXP]
Strategic Direction	**[STRAT]**	Platform direction aligned to and driven by the business strategy	Digital transformation vision , guiding principles , strategic goals & design for experience (key components) [STRAT_1]
			Strategic Shift in Product Offering [STRAT_2]
			Business or Financial Value driven [STRAT_3]
			Business Growth led strategy [STRAT_4]
ENABLING SALES GROWTH through DIGITAL PLATFORMS	**[SALES_GROWTH]**	Digital platform design choices that are driven by different events and actions to result in increased sales growth of HPEFS financial products	Having new Capability for CONFERENCES [SALES_1]
			DEMO & CONFERENCE based Feedback [SALES_2]
			COUNTRY EXPANSION [SALES_3]
			New / Enhanced Offers - digitally enabled (incl support of HPE Products) [SALES_4]
			OFFER Flexibility to Tailor & Target [SALES_5]
			Partner Business Needs (indirect feedback) [SALES_6]
			Technology enabling partners to sell [SALES_7]
			Increasing the reach of the infrastructure [SALES_8]
			Marketing & Sales enablement (messaging) [SALES_9] Includes PLEDGE, new experience as well as communicating on NEW OFFERS, INTERNAL MESSAGING (e.g., training - STEPS, communication collateral)
			Partner Incentives / Channel Assistance [CAF]

CATEGORY	[Label / Code]	CATEGORY description	Sub-codes
Competitive Landscape drivers of platform design choices	**[COMP]**	Design choices are driven by the competition of HPEFS	Fast Follower [COMP_1]
			Playing Catchup [COMP_2]
			Competitive threats [COMP_3]
			Competitive analysis & insights [COMP_4]
Meeting REGULATION and maintaining COMPLIANCE	**[REGS_COMP]**	External regulation and compliance-driven choices to the digital platform	Regulation and compliance [REGS_COMP]
Tech enabling transformation in core activity through the digital platform choices	**[CORE_TRANS]**	Platform choices that improve the internal efficiency and effectiveness of HPEFS	Operational scaling [CORE_1]
			Sales expansion [CORE_2]
Global Process Consistency choices for the platform	**[GLOBAL_CONSIST]**	A choice that is connected to the HPEFS strategy is to have global consistency in the processes employed in all geographies.	Localisation [CONSISTENCY_1]
			Flexibility [CONSISTENCY_2]
			Ease of Scaling [CONSISTENCY_3]
Build vs. Buy – non-core applications decisions for the platform	**[BUILD_BUY]**	Making design choices based on the alternatives of (1) to build internally versus (2) to '*buy*' the capability externally	Leverage Best-in-Class capability [BUILD_BUY_1]
			Bridging strategy - overcoming legacy system issues [BUILD_BUY_2]
Replacing and retire outdated solutions in the core legacy platform	**[REPLACE_RETIRE]**	Managing technical debt	Core legacy system [REPLACE_RETIRE]
Policies & Procedure alignment to the platform capability	**[POLICY_PROCESS]**	Digital platform choices to drive alignment of the internal processes and policy of the business. Support messaging, through training on Sales / Operations to '*sell*' the digital platform	Policy and process alignment [POLICY_PROCESS]
Challenges to realising the evolution of the platform	**[EVOL_CHALL]**	The specific design choice to overcome challenges to drive change and evolution to the digital platform	[EVOLUTION_CHALL]

CATEGORY	[Label / Code]	CATEGORY description	Sub-codes
Additional drivers of the digital platform design choices	**[ADD_DRIVERS]**	Less prevalent design choices in the digital platform	User Testing (those that would be very critical - Negative test [AD_1]
			Being more confident in saying NO to DESIGNS [AD_2]
			Bringing in NEW BLOOD with a new perspective [AD_3]
			Impact of the TECHNICAL KNOWLEDGE of the BUSINESS to IT tech [AD_5]
			Structural and AGILE approach shift drove evolution [AD_6]
			DESIRE to BE SUCCESSFUL [AD_7]
			Impact of seeing DEVELOPMENT OUTPUT EARLIER [AD_10]
			Impact of PROTOTYPING [AD_11]
			Ease of Integration between systems [AD_14]
			EUROPE_APJ_ahead of NA for INNOVATION [AD_15]
End-to-end Software Development Lifecycle process	**[SDLC]**	Overarching process to design, develop, deploy, and implement the digital platform (incl. structure)	[SDLC]
Performance Improvement cycles & Issue management applied to the platform	**[IMPR_ISSUE]**	Improvement in or rectifying issues in key business metrics (cost, quality, revenue, etc.), experience of the user or underlying processes / tasks - that influence platform choices.	Drive additional Revenue (Value Capture) [IMPR_1]
			Improvements to gain efficiencies / Reduce Costs (Value Capture) [IMPR_2]
			Remove adoption roadblocks [IMPR_3]
			Making Improvements in the CORE system to enable Key Functionality [IMPR_4]
			Key Performance Metrics (KPIs) & Performance Measurement [KPI_MGMT]
			Improvements to achieve an Effortless / better experience [IMPR_5]
			Incremental improvement in process or tasks on the platform [IMPR_6]
			Rectify issues in process or tasks on the platform [IMPR_7]
			Due to POOR RESEARCH initially - had to rectify subsequently [IMPR_8]
			REACTIVE CHANGES [IMPR_9]
			Poor development from IT - solution didn't meet the need [IMPR_10]
Improving the potential in data management and Insights from platform design choice	**[DATA_INSIGHTS]**	Design choices to improve the availability, impact, and insights from data to business decisions and actions.	[DATA_INSIGHTS]

Appendix 6.2 Contextual triggers (2013 – 2019)

Digital Design Strategy

[Business driven activities, processes and capabilities that inform a firm's own digital strategic direction & focus on competitive outcomes]

CONTEXTUAL TRIGGERS	Description	[Label / Code]	Internal Documents	Semi-Structured Interview	External Documents	TOTAL
Strategic Direction	Platform design direction aligned to and driven by the business strategy	[STRAT]	176	14	1	191
ENABLING SALES GROWTH through DIGITAL PLATFORMS	Digital platform design choices that are driven by different events and actions to result in increased sales growth of HPEFS financial products	[SALES_GROWTH]	165	77	22	264
Competitive Landscape drivers of platform design choices	Design choices are driven by the competition of HPEFS	[COMP]	24	47	0	71
Meeting REGULATION and maintaining COMPLIANCE	External regulation and compliance-driven choices to the digital platform	[REGS_COMP]	1	2	0	3
Tech enabling transformation in core activity through the digital platform choices	Platform choices that improve the internal efficiency and effectiveness of HPEFS	[CORE_TRANS]	0	5	0	5
Global Process Consistency choices for the platform	A choice that is connected to the HPEFS strategy is to have global consistency in the processes employed in all geographies.	[GLOBAL_CONSIST]	0	3	0	3
Build vs. Buy – non-core applications decisions for the platform	Making design choices based on the alternatives of (1) to build internally versus (2) to 'buy' the capability externally	[BUILD_BUY]	0	8	0	8
Replacing and retire outdated solutions in the core legacy platform	Managing technical debt	[REPLACE_RETIRE]	11	4	0	15
Policies & Procedure alignment to the platform capability	Digital platform choices to drive alignment of the internal processes and policy of the business. Support messaging, through training on Sales / Operations to 'sell' the digital platform	[POLICY_PROCESS]	53	11	6	70
Challenges to realizing the evolution of the platform	The specific design choice to overcome challenges to drive change and evolution to the digital platform	[EVOL_CHALL]	0	1	0	1
Additional drivers of the digital platform design choices	Less prevalent design choices in the digital platform	[ADD_DRIVERS]	2	12	0	14

	CONTEXTUAL TRIGGERS	Description	[Label / Code]	Internal Documents	Semi-Structured Interview	External Documents	TOTAL
Value Creation Outcome	MARKET-DRIVEN PLATFORM CHOICES	Digital platform choices that originate from the external market needs	[MARKET]	9	33	0	42
	Embedding improved USER EXPERIENCE in the digital platform	Platform choice is driven by the deliberate focus on improving the user experience-based outcomes and from direct 'asks'	[UX_STRATEGY]	82	119	1	413
			[UX_INSIGHTS]	50	69	3	
			[UX_DESIGN_PROCESS]	46	43	0	
	Platform changes from assessing the future Technology Lifecycle (Emerging_Growing_Mature_Decline)	Seeking out and adopting future capability to improve the digital platform and the impact on the products, services, and internal processing improvements that can be achieved.	[LIFECYCLE]	7	7	4	0
Generating interaction and involvement of stakeholders for design Input (Internal or External)	Issue impact on Experience	Issues that impact on Customer or Partner Experience that drive solutions on the digital platform	[EXP_ISSUE]	5	2	0	7
	Product Offer driven experience	Product offering on the platform to drive an improved experience	[PRODUCT_EXP]	8	1	0	9
	Platform change driven experience	Platform improvement driving an improved experience	[PLATFORM_EXP]	5	14	0	19
	Improving the potential in data management and insights from platform design choice	Design choices to improve the availability, impact, and insights from data to business decisions and actions.	[DATA_INSIGHTS]	2	5	0	7
EXECUTION	End-to-end Software Development Lifecycle process	Overarching process to design, develop, deploy and implement the digital platform (incl. structure)	[SDLC]	70	17	0	87
CORRECTIVE	Performance Improvement cycles & Issue management applied to the platform	Improvement in or rectifying issues in key business metrics (cost, quality, revenue, etc.), experience of the user or underlying processes / tasks - that influence platform choices.	[IMPR_ISSUE]	206	84	0	290