

The Digital Transformation Conundrum: Negotiating Complexity Through Interactive Framing

ABSTRACT

The aim of our article is to explore the interactive dynamics ensuing a digital implementation initiative whilst critiquing the nature and process of digital transformation. We analysed the data emerging out of 59 semi-structured interviews and 90 hours of non-participant observation in order to contextualise our investigation within the healthcare setting which in our case was a large hospital undergoing one of the biggest single-site implementation of digital health technology in Europe at its time. Our empirics is aided by ethnographic techniques and Gioia's methodology has resulted in a grounded model which has implications for both scholars and practitioners. Through discussion with the end-users within the organisation, the findings highlight three processual landmarks which have been theorised using Erving Goffman's conceptualisation of 'framing'. In our study these have been referred to as intrinsic, frictional, and transitional frames, depicting the cognitive progression of end-users when interacting with digital artefacts as well as negotiating the institutional complexity. The three dynamic frames exhibit stage-specific occurrences and offer a complete abstract of a very large and difficult digital implementation project. Theoretically, our study offers a basis for scholars to conceptualise the processual nature of digital transformation through the lens of framing. Interactive dynamics remain underrated or largely ignored when it comes to implementation of such large projects, but we make it salient through the three empirically derived socio-cognitive frames. These frames in our view serves as a practical toolkit for practitioners in any setting visualising the implementation of a digital transformation project.

Keywords: Digital Transformation, Adoption, Cognition, Healthcare, Interactive Framing, Interaction and Socio-Cognition

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INTRODUCTION

Electronic health records, digital imaging, e-prescriptions and enterprise resource planning are among some of the many digital services that have emerged in the expansive information technology systems of healthcare institutions across the globe. Like any other industry, the healthcare sector has harnessed significant benefits from digital transformation and the adoption of an array of services that help secure high-quality patient care whilst drive greater efficiencies (Haggerty, 2017). Digital transformation employs technologies that facilitate interactions between different stakeholders within the sector and help hospitals achieve efficiencies and cost savings. In other industries, digital transformation creates competitive advantages achieved through organizational transformations that leverage existing competencies or develop new ones (Liu et al., 2011). Overall, this digital revolution has opened up new avenues for improving healthcare services whilst uniting scholars and practitioners who unanimously agree on the importance of digital interventions to improve quality and reduce costs (Agarwal et al., 2010, pp. 796-797). In light of increased public and private investments and the potential significance of digital interventions for netizens and the state, further research and analysis of digital transformations in healthcare are critical.

Scholars have critiqued the dual dimensions (i.e., quality of evaluation and nature of evaluation) of digital transformation. However, the continued emergence of digital transformation effects, alongside a persistent lack of progress in the theoretical realm, has prompted renewed efforts to address the questions that affect individuals, teams and organisations negotiating the implementation and adoption of digital transformation projects (Burton-Jones et al., 2020). The metamorphic promises of digital transformation projects are typically accompanied by relatively complex, time-consuming and unprecedented challenges in implementation and execution (Bunduchi et al., 2019). Complexity thus reigns in

institutional efforts to adopt digital transformations – the most pervasive of organizational changes that impact both tasks and processes (Verhoef et al., 2021).

The notion of complexity has been viewed as an “emerging set of processes and objects that not only interact with each other but come to be defined by those interactions” (Cohn et al., 2013, p. 40). Complexity in healthcare institutions can thus be understood through internal agents (i.e., clinical and non-clinical healthcare professionals, or HCPs) who work within a set of internal rules, as they adapt, interact and evolve with their immediate surroundings (Braithwaite et al., 2018; Plsek and Greenhalgh, 2001). When addressing the notion of complexity, digital transformation projects in healthcare institutions cannot be ignored, as these institutions embrace transformative projects with varying rationalities. A simple theoretical approach to digital intervention can be taken if digital transformation projects are comprised of a singular component within a single interactive channel; however, a much greater challenge is presented in contexts characterized by multiple interacting components and numerous agents (Hawe et al., 2009; Shiell et al., 2008).

In this case study, we offer not only timely insights into the macro-micro dimensions of digital transformation but also the impact of two complex and interacting entities of varying magnitude (i.e., institutional complexity, and interactive dynamics of clinical and non-clinical HCPs). We also offer insights into intervention-based complexity arising from the initiation, implementation and adoption of digital services. We thus address a current gap in the literature: the nature of interactive complexities between institutions (i.e., led by internal agents) and digital interventions. At the macro-level, some studies have addressed institutional complexity but the approaches have mostly offered static, stable and overly complicated arrangements of individual elements (Cohn et al., 2013; Greenwood et al., 2011; Oliver et al., 2015). At the micro-level, studies evaluating digital interventions have offered technical analysis aimed mostly at revealing the institutional benefits of investments in digital

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services (Imison et al., 2016; Kraus et al., 2021). Our study offers a theoretical approach to addressing the interaction between the institutional complexities of a large healthcare institution and typical digital project-based complexities, thereby posing questions around the environment within which different entities interact.

With the ever-increasing importance of digital interventions set alongside rising pressures for healthcare institutions to adopt them, our study provides timely theoretical and practical insights as we track the interactive dynamics between the actions of institutional agents and the complications of digital interventions (Urbinati et al., 2022). As managers negotiate the challenges of instituting new ways of working, institutions offer resistance through internal actors who are often the end-users (Fu, 2012). These micro-level effects also appear at the intra-firm level in complex organisations (e.g., hospitals and similar organisations outside the healthcare sector), which are characterised by complexities associated with multiple actors in heterogeneous roles. Organizational dynamics in these contexts is defined by inherent heterogeneity among disparate actors, irrationality of adoption decisions and cognitive complexities of propagation within and between various groups (Zaman et al., 2018).

When scanning the ever-increasing literature on decision-making and adoption practices, studies are largely driven by institutional (Clark & Soulsby, 1999; Strang & Macy, 2001) and sociological (Abrahamson, 1991; DiMaggio & Powell, 1983) perspectives that do not adequately address the contextual disorder associated with instituting novel interventions and associated practices. Our study addresses this gap by focussing on the theoretical issues that arise when applying an institutional or sociological lens in contexts characterized by adoption processes of digital intervention and novel practices. By adopting a socio-cognitive perspective, we follow recent studies that have increasingly employed this approach to

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3 decode the inherent complexities of digital interventions (Criado et al., 2022; Heidenreich,
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5 Kraemer and Handrich, 2016; Volberda et al., 2013; Marson et al., 2012).
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8 In this study, we follow HCPs who were central actors in the adoption of innovations
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10 for prescribing medications at a large hospital in the United Kingdom (UK). In the face of
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12 rising prescription errors, governments and policymakers have been advocating for service
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14 transformations through radical change in how HCPs operate. Computer and digital devices,
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16 which have dramatically changed the ways in which HCPs carry out their duties, have been
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18 aggressively promoted. We map the cognitive transformations of HCPs as they adopted
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20 varied prescribing practices aimed at improving the efficiency and quality of health services
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22 in one of the largest hospitals in the National Health Service (NHS) in the UK. Using an
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24 interactive framing perspective (Goffman, 1974), we inductively examine interactions
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26 between teams of implementers and users to reveal how disparate actors frame changes
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28 associated with a new prescribing system and how adoption is propagated across the
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30 organisation. We investigate how different groups of actors make sense of a process that they
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32 experience both individually and collectively. These interactions are largely mediated by
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34 perceptions of the environment within which these actors carry out their professional duties
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42 In sum, we focus on two research questions: (1) what are the cognitive landmarks that
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44 emerge and evolve during a digital transformation project, and why do they matter in the
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46 context of organisational adoption of a novel digital intervention; and (2) how do internal
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48 actors frame multiple interactive events leading to organisation-wide integration of a digital
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THEORETICAL BACKGROUND

Innovation Adoption – Prior Theories and Level of Analysis

There are various sets of explanations of how processes of innovation adoption occur within organisations (Hron et al., 2022; Lyytinen, 2022). A rational actor perspective, rooted in the field of economics, positions adoption and diffusion as an outcome of juxtaposing the intrinsic characteristics of an innovation with its relative purpose and use by individual actors, in contexts where only the fittest survive (Katz & Shapiro, 1987; Mansfield, 1961). The dominant view follows the “diffusion of innovations” theory of Rogers (2003), with five key characteristics influencing adoption decisions (Wolfe, 1994): (1) the relative advantage of the innovation over its predecessor; (2) the compatibility of the innovation with existing values and past experiences; (3) the complexity of the innovation; (4) the observability of the innovation to others; and (5) the temporary trialability of the innovation (Crossan & Apaydin, 2010; Damanpour & Aravind, 2012; MacVaugh & Schiavone, 2010). Adoption and diffusion thus concerns the value of the innovation, drawn from information that is directly observable in the environment or that is communicated by early-stage innovators and adopters as they optimise adoption decisions (Greve, 2003; Greve & Seidel, 2015; Macaulay, 2016). This perspective has given rise to the proliferation of predictive models that assume the rational utility of maximising behaviours among actors (George et al., 2014; Priem et al., 2012; Schreier & Prügl, 2008; Teece, 2010) and imitation processes acting as information cascades for potential adopters (Banerjee, 1992; Bikchandani et al., 1992) This approach also reduces the uncertainty and risk surrounding a given practice (Ansari et al., 2010; Greve & Sirovatka, 2014; Rao et al., 2001).

Scholars, however, argue that current adoption models not only lack simplicity and rigour but also fail to account for contextual differences, such as contingency variables (van Oorschot et al., 2018). Most studies have investigated contingencies affecting the adoption of

different types of innovation in different contexts (Dewar & Dutton, 1986; Kimberly & Evanisko, 1981; Langley & Truax, 1994). And while rational actor perspectives have dominated economics and have proven to be pervasive in some areas of political science (Bulgurcu et al., 2010) and sociology (Powell et al., 2011), the psychological assumptions behind these perspectives have been challenged and disproven by theories of human behaviour (Green & Shapiro, 2009).

Different actors have different estimates of the value and risk associated with an innovation (Yuan & Woodman, 2010), and they make sense of the characteristics and impact of an innovation in non-linear, irrational ways, often influenced by a complex array of constituents and forces (Garud et al., 2013). These differences are particularly salient in the context of complex organisations, where disparate actors within institutional contexts (e.g., healthcare systems) occupy vastly different professional positions (e.g., nurses, physicians, managers and technologists) and are influenced by different, often conflicting, logics (Thakur et al., 2012). A key feature of the spread/decline of successful/failing innovations is that both follow adoption processes whereby late adopters imitate early adopters and repeat previous decisions. It is assumed that organisations imitate or invest in choices to appear legitimate and that these actions allow early adopters and late imitators to align with current norms (DiMaggio & Powell, 1983; Sturdy, 2004). For these actors, success and failure creates a form of path dependency (i.e., standardisation), with asymptotic distribution a factor of process history (Garud et al., 2010).

Relevance of a Socio-Cognitive Perspective

By shifting away from economic and social perspectives, a socio-cognitive perspective presents a unique lens to study the dynamics of adoption. A socio-cognitive perspective exposes how cognitive properties and invariant social interrelations are interlinked (Gadomski, 2002; Ringberg & Reihlen, 2008). It also highlights the role of

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culturally-produced signs and symbols, as well as how historical, socially-constructed meanings mediate cognitive processes (Hjørland, 2004). Extant empirical evidence does show how actors process new information, which helps us decode the complexities of human choice and social processes (Stein, 1997). From the point of view of an actor, realities are created through interactions, which are not only key in the formation of institutions but also the transfer of both substance and meaning during innovation adoption.

For the purposes of this study, we thus employ the notion of interactive framing as the socio-cognitive lens. Considering the different research orientations and levels of analysis used in interactive framing, a comprehensive approach to framing benefits from accounting for mutual and reciprocal influences between language, cognition and culture in complex organisations like healthcare institutions. Interactive framing allows a nuanced conceptualisation that links individual framing to an interactively established group. In the conceptualisation of Goffman (1974), framing is cast within experiences of interaction, whereby actors share socially-constructed and agreed-upon framing activities reflecting principles of interaction, which are connected to social identities of the actors (Tannen, 1985). While the act of framing is also embedded and constrained by institutional settings, actors are creative agents who not only reinforce institutional settings but also reorganize words and thoughts for a completely new view of framing (Diehl & McFarland, 2010; Goffman, 1974). Coined “lamination” (Diehl & McFarland, 2010) and “editing” (Weber & Glynn, 2006), these manoeuvres can also be referred to as reframing, which is grounded in established norms and genres.

Repeated interactions and negotiation not only reveal acts of reframing but also discoveries of common ground or settlements of joint meaning between actors (Granqvist & Laurila, 2011). These processes are also the basis for how new understandings of innovation emerge and are eventually adopted (Lounsbury et al., 2003; Reay et al., 2013). Since extant

research has primarily investigated the emergence and institutional consequences of innovation, our study addresses a knowledge gap concerning how common ground is established through interactions and repeated negotiations (Schneiberg & Clemens, 2006). Our study also addresses how individuals play a role in enacting and performing framing activities in line with institutional logics (Reay et al., 2016). In cases where framing activities lack a firm grounding, actors find it difficult to accept new cognitive frames, which are often related to commitments to existing systems and experience structures. According to Bingham and Kahl (2013), mismatched expectations is one explanation for a lack of grounding in framing activities.

Conceptually, a cognitive frame serves two roles: (1) internal cognitive “schemata of interpretation” (Goffman, 1974, p. 21) allow actors to construct ‘sense’ in an otherwise meaningless succession of events; and (2) the explicit articulation of an internal cognitive schema (i.e., through behaviours) is the basis for interaction between multiple actors as they collectively negotiate ‘sense’. From a cognitive perspective, a frame is an internal understanding that guides perceptions of a social reality. A frame is thus a sensemaking tool that allows an actor to not only interpret past and present experiences but also construct meaning (Weick, 1995). In the context of innovation adoption, distinct working groups affected by innovation implementation make sense of it by aligning the new technology with existing representations and understandings (Barsalou & Hale, 1993). Cognitive frames thus shape how organizational actors perceive the world and their own interests.

Internal representations of cognitive frames, in turn, shape actions and choices, the external manifestations of internal understandings. According to an interactionist approach, this process is known as framing, whereby multiple actors communicate through exchanges of individualized cognitive frames (Kaplan, 2008). Frames are thus non-static, evolving interactions that are “constructed, deconstructed, and reconstructed as individuals engage

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with one another in everyday interactions” (Gray et al., 2015, p. 118). In this context, frames are simplified cognitive representations of the environment. If an interactive framing lens is applied in the analysis of the adoption of novel practices, we are able to not only elucidate how various cognitions and interactions of multiple actors unfold over time but also privilege socio-cognitive mechanisms during innovation adoption.

RESEARCH CONTEXT

Prescribing, a common form of therapeutic intervention, has been identified as being central to high-quality patient care (Essien et al., 2021; Soumerai et al., 1990). Once patients are admitted to a hospital, they are allocated a prescription chart, which communicates information within and across healthcare teams (Shemilt et al., 2017). A prescription chart includes medication information specific to a patient (Cho et al., 2014; Ehsani et al., 2013). The responsibility of entering medication information into these charts falls upon doctors, while nurses administer the medications to patients. Using the same charts, pharmacists reconcile medication stocks (Hale et al., 2013).

The prescribing systems within the NHS hospitals in the United Kingdom (UK) have predominantly relied on paper-based records which have been in use for almost 60 years (Cornford et al., 2009). The paper-based model uses paper prescription charts such as ‘Aberdeen sheets’, ‘drug charts’ or ‘Medication Kardex’ (Crooks et al., 1967; Gommans et al., 2008), and there is no standardised system-wide paper-based prescription charts across the NHS (Shemilt et al., 2017). NHS regions and Trust across the UK have developed their localised prescription-based charts shaped by their idiosyncratic practices. These sheets are usually kept in a folder at the end of the patient bed and used by clinical professionals involved in prescribing, dispensing and administering medications (Garfield et al., 2016). There are, however, several problems associated with paper-based medication charts: they make up a sizeable proportion of prescribing, administration and dispensing errors. At the

NHS, it is estimated that over 700 deaths are a direct result of drug administration errors, and a further 17,000 deaths per year have drug administration errors as a major contributing factor (Wise, 2018).

Sustained issues around patient safety eventually paved the way to digitise the prescribing system as hospitals across the NHS have now been forced to transform and implement computer-based prescribing systems (Donyai et al., 2008; Slight et al., 2019). Digital transformation involved the switch from a paper-based to a more sophisticated, digitized prescribing system based on electronic medical chart technology (i.e., EMEDs). The new sophisticated prescribing system was a significant transformation in how medications were prescribed, administered and dispensed by physicians, nurses and pharmacists (Honeyman et al., 2016). In the current research context, they are being referred to as EMEDs which in principle was a computer on a wheel.

Building on the contextual occurrence as above, we found an empirical case fitting the objectives of the research as we witnessed the implementation of one of the largest single-site implementations of e-health technology in Europe. The research is based in one of the hospitals of Yorkshire County located in north-west England. The hospital in question serves more than 100,000 inpatients every year and with more than 100 wards and 1000 in-patient beds. In the light of failed previous transformation project, the NHS hospital in question was seen central to successful roll-out across the country (National Audit Office, 2020). Given our privileged access to the project and our research aims, we have drawn out the key actors in the table (1) below. As we illustrate the importance of cognitive landmark through our research, we focus on internal actors and their framing of interactive events. Table 1 highlights these internal actors and their key operational functions around both paper-based prescribing and electronic prescribing system (EMEDs)

INSERT TABLE 1 ABOUT HERE

A Project Board (EPB) for EMEDs, set up by the hospital management in 2016, was responsible for executing the implementation of EMEDs. Table 2 presents the two distinct implementer groups (i.e., clinical and non-clinical groups) identified by the EPB.

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The subsequent roll-out of EMEDs took place between 2016 and 2017 and involved sensitizing users to the new practices, transition process and decommissioning of the paper-based system. Considering these contextual details, this setting was a theoretically relevant case (Eisenhardt and Graebner, 2007) that was well-aligned with our research aims and objectives: to investigate how digitisation was perceived and adopted across the three actor groups, including non-clinical implementers, clinical implementers and clinical users.

METHODOLOGY

We chose a real-time, exploratory case study to investigate activities within and between the initiation and implementation phases of a novel digital intervention at a NHS hospital in the UK (Eisenhardt, 1989; Yin, 2003). In the first-order analysis, we adopted an interpretive approach to capture key voices as individuals experienced and interpreted events (Van Maanen, 1979). An insider perspective thus became the foundation of our analysis. We then assumed the task of structuring a deeper, theoretical second-order interpretation, reporting internal actor interpretations in light of contextual factors and literary views, which led to an emergent grounded theory (Gioia et al., 1994; Strauss and Corbin, 1990; Van Maanen, 1979).

Data Collection

Our involvement with the EMEDs project began in 2016 and spanned the entire duration of its implementation. After attaining robust ethical and security clearances, the first author acted as an embedded researcher within the NHS hospital. The goal of data collection was to uncover how the cognitions and interactions of non-clinical implementers, clinical implementers and clinical users unfolded during innovation adoption at the hospital. This posed a significant empirical challenge, requiring us to draw from a rich set of qualitative data sources, including semi-structured interviews, ethnographic observations and informal discussions. Table 3 summarizes the collected data.

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Semi-structured interviews. We conducted 59 interviews with key individuals across the three actor groups. Interviews were conducted between September 2016 and August 2017 and were 15 minutes to one hour in duration. A formal, semi-structured interview approach was employed, whereby interviewees were posed questions concerning both their cognitions and actions as they adopted the new practices. We conducted semi-structured interviews during the various stages of innovation adoption, proposing dates for different milestones that culminated in the full adoption and operationalization of the new digitized prescribing system at the hospital. A temporal approach to interviewing the core actor groups allowed us to track changes in communications and cognitions during the interactive process of digital adoption.

Ethnographic observations and informal discussions. In addition to conducting semi-structured interviews, the lead researcher was also seconded by the EMEDs team to act as a passive observer to document the progress of innovation implementation for eight hours

per week over the span of a year. The lead researcher was thus able to collect several hundred hours of observations and informal discussions, attend team meetings (i.e., within and across each group) and be included in email exchanges and threads, ward observations and informal discussions. These activities helped us accomplish three main tasks: (1) uncover evolving communication dynamics within and across groups; (2) understand how individuals made sense of the old paper-based and new digitized EMEDs prescribing systems; and (3) correlate these insights with the prior interview data during the transition from the old to new practices.

Data Analysis

Our data analysis followed an inductive approach (Gioia et al., 2013; Lincoln & Guba, 1985): three separate stages of coding allowed us to distil the communicative steps and cognitive mechanisms undergirding the diffusion of EMEDs within the hospital. We conducted a temporal analysis of the data derived from each group, focusing our efforts on drawing the insights into a process-based narrative (Langley, 1999) to demonstrate the cognitions and interactions of the different groups as adoption and implementation unfolded over time.

We moved from these data to grounded theory by applying naturalistic inquiry, an approach that features processes of constant comparison and theoretical sampling (Glaser and Strauss, 1967). We cycled these data, reviewing the related literature and the emerging theory to develop a stronger understanding of cognition as the dynamics of innovation adoption were uncovered through the experiences of the actors involved. Initially, our first-order analysis involved a thorough coding of the interview and transcript data (Van Maanen, 1979). We then developed more than 200 in-vivo first-order codes, applying them to the interview texts as we consolidated emerging codes into informant-specific concepts. Relying on actual language used by the various actors (Gephart, 2004), we employed a constant comparative

method to analyse these data over time and across different informants. Actual language was thus the source for our concept labels whilst short phrases in first-order terms were employed when in-vivo codes were unavailable.

Throughout the analysis process, we also used a computer-based qualitative software (NVivo) for text scanning and coding, as well as facilitating multiple cycles of coding that were instrumental in identifying nestings and overlaps in the codes. The software also allowed us to search for terms across the interview transcripts and assemble the quotes. In addition to reliance on this software, we developed a set of excel sheets for a manual account of the codes. We ensured analytical rigour and accurate code matching by employing the services of independent coders. These additional mechanisms ensured the trustworthiness of our coding scheme and allowed us to justify the emergent theoretical framework.

The first-order codes helped us to not only discover interpretive elements but also establish deeper patterns and further relationships. To further develop our grounded theory, we also employed a systematic second-order analysis to investigate the data at a higher level of theoretical abstraction, in line with previous research (Gioia et al., 1994). In this second phase of analysis, we again employed a constant comparison method to arrive at a limited number of second-order themes, relying on the software application to identify nesting and overlaps. In the third and final stage of our analysis, we assembled nine second-order themes into aggregate dimensions. This process involved examining the relationships among the first-order codes and second-order themes, which were structured as a set of complimentary groupings.

Our analysis resulted in three aggregate dimensions, following “member checks” with our interviewees to ensure validity, gaining affirmation from those actors at the heart of the new practices. A pivotal step in our analysis is the representation of the entire data set in the data structure. We are thus able to demonstrate the depth and breadth of our analysis by

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clearly mapping our progress from raw data to themes and eventually to aggregate dimensions (Gioia et al., 2013). This approach is a vital step in demonstrating rigour when conducting qualitative research (Pratt, 2008; Tracy, 2010).

RESULTS AND FINDINGS

Figure 1 illustrates the data structure, highlighting the three main aggregate dimensions that emerged from our analysis: (1) the dynamics of communicating the attributes of the new practice to the different groups of implementers and users; (2) the mechanisms of addressing existing practice values to disconnect users vested in paper-based charts from associated ways of working; and (3) the means of transitioning from old to new practices. Figure 1 also depicts the nine second-order themes underpinning each aggregate dimension and their constitutive first-order codes. While Figure 1 provides a static representation of the data, the second-order themes do reflect the ascending temporal progression of the adoption process.



Our findings are structured in sub-sections according to the three aggregate dimensions and nine second-order themes, which highlights their interactive and dynamic nature according to observed cognitions and interactions. The aggregate dimensions and subsequent second-order themes represent wide-ranging occurrences, shedding light on both macro- and micro-level interactions between actors and the novel digital intervention. The simplified form of our dimensions and themes thus offer insights into the complexity of internal institutional actors interacting with novel digital interventions. Table 4 presents supporting empirical evidence for each second-order theme, including a descriptive narrative of the temporal progression of the interactive adoption process. We present our findings in a

manner that offers a comprehensive and nuanced picture of what took place and what dimensions emerged. Forming the basis for our grounded theory approach, we conducted a comprehensive analytical process of our raw data to find first-order codes (i.e., through multiple iterations), followed by nine second-order themes and three aggregate dimensions. The three aggregate dimensions discussed below cover the entirety of our findings in accordance to Gioia's methodology (1994), we have presented them coherently.

INSERT TABLE 4 ABOUT HERE

Communication of Innovation Attributes

During the initial stage of our study, non-clinical implementers sought to control how the new digitized EMEDs prescribing system was communicated to clinical implementers and users, with a particular focus on driving cognitive frames related to the technical attributes and proposed efficiencies of EMEDs as compared to the existing paper-based system. Our analysis revealed that this drive was initially met with significant resistance and was rejected by users. Three factors contributed to this dynamic: (1) the perceived pathway of efficiency noted by non-clinical implementers; (2) the complexity of the user landscape highlighted by clinical implementers; and (3) the resistance, problematization and rejection by clinical users.

Perceived pathway of efficiency. Non-clinical implementers drew up adoption plans, identified the sequencing of implementation across different hospital wards and then operationalized the new EMEDs digitizing system. The non-clinical implementer team first audited each ward for their readiness for the implementation of a new digitized system based on metrics of efficiency and operational performance. As stated by a EMEDs System Trainer: "We go to the ward, tell them what we are coming to do, how it is going to work technically

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and emphasize the benefits, and how we will support them for preview and rolling out”. And according to the Deputy Manager: “We do a thing called ‘Ward Health Check’, it’s an indicator of how good you are on your medicine management, how good you are at infection control, on your patient complaints”. Approaching high performing wards was viewed as a logical first step as non-clinical implementers were expected to have a lower resistance to change and a heightened sensitivity to attributes of efficiency. Framing communication and implementation in this way was viewed as a good benchmark for imitation among other users and in other wards. According to the Deputy Manager: “When they [users] say it won’t work for us [ward], it’s like well it can work for you because we’ve proven it elsewhere”.

Complexity of the user landscape. First interactions in the selected wards with the clinical implementers revealed unforeseen complexities in the user landscape. Clinical implementers perceived the change to EMEDs practices as a huge departure from the existing paper-based system. According to one Pharmacy Technician: “My perception is that nurses are cautious, there is a lot of anxiety associated with it and that’s understandable because we’ve been using paper charts forever”. Another Trainee Specialist Pharmacist also noted: “When initially I first saw the electronic prescribing, I was like, ‘okay what am I looking for, what am I picking up?’ On a paper chart you know straight away what you need to look at because you start from the top and go work your way through, whereas obviously with the electronic system, everything’s all over the place”. These perceptions revealed varying degrees of nervousness with the inherent complexities of the new EMEDs system among the different clinical implementer groups. According to a Lead Pharmacist: “I did spend a couple of hours up on the surgical ward using it and everyone we came across had a problem that nobody seemed to be able to resolve. So, it made me more nervous, because there was EMEDs support up there and that still, things were not clear”.

Resistance, problematization and rejection by users. Almost immediately following communications between non-clinical implementers and the clinical implementers, several clinical users were made aware of the technical attributes and efficiencies of EMEDs. The way information was disseminated led to significant resistance to and problematization of EMEDs among users. For varying reasons, some actors began to fault EMEDs for some issues that ran counter to efficiency. According to a Junior Nurse: “I think that’s what people are worried about because people have had so many medications here. It’s not like on the ward where you do medicines at 8, 12, 6 and then 10 o’clock at night. You can be doing medicines non-stop with EMEDs”. Several other actors also exhibited resistance and reluctance to move from paper-based to digitized practices. According to one Pharmacist: “Everyone grows up writing, so the use of a paper drug chart is absolutely intuitive”. Users continued to avoid using EMEDs in their day-to-day work, reverting to paper-based practices. The initial experience of EMEDs also added to workloads through changes in how “ward rounds” and inspections were conducted, as well as “longer wait times” for medications to be prescribed by doctors and administered by nurses.

Infiltrating Existing Values

Given the widespread resistance and problematization among clinical users of EMEDs and of cognitive frames that focused on the technical attributes and proposed efficiencies of EMEDs, non-clinical implementers and clinical implementers were induced to communicate deeper meanings, re-focusing their communications on values undergirding the new practices and re-framing the new practices in terms of patient safety and clinical governance. By addressing the values of users, these changes helped disconnect users from old practices and trigger an affinity for EMEDs.

Re-focusing on value-based benefits of EMEDs. Non-clinical implementers met various other stakeholders to gain insights into user values and potential rationales for

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EMEDs implementation in each ward. Given the resistance and rejection of EMEDs among clinical user groups, non-clinical implementers were compelled to communicate benefits beyond efficiency to both clinical implementers and users, a shift that did allay fears of some users. Non-clinical implementers met various other stakeholders who highlighted what EMEDs could do in terms of the fundamental issues of patient safety and health-related outcomes. According to the Deputy Manager: “We changed tact and started to push EMEDs as a clinical concern to users around issues patient safety.... [EMEDs] offers tremendous benefit here but some don’t realise what they are getting out. So, for like prescribers the clinical decisions are part of what the system does, and all that kind of stuff is really helping them be safer with their prescribing and there’s allergies constantly there for the lifetimes of the patients, so the risk of missing allergies is reduced”.

Re-framing existing values. Building on the new value-based frames culminating from interactions between non-clinical implementers, clinical implementers now focused their attention on re-framing or ‘hacking’ existing paper-based practices, casting them as a breach of patient safety. According to one Pharmacy Technician: “The nurses having talked to them had read it [prescribed the wrong drug] because it was prescribed so poorly”. In another instance one of the Junior Nurses noted that paper charts were not ideal in many ways: “There is no sort of safety net or level of interacting with the drug chart that can be monitored. So, there’s problems there, a lot of the time when you pick up a drug chart it wasn’t written very well”.

Given the general consensus concerning the shortcomings of paper charts, actors within the clinical implementer group began to embrace EMEDs and its potential benefits. Working closely with non-clinical implementers, the clinical implementer group learned the nuances of the new practice and made connections to their user group. According to a Junior Nurse: “Yeah, I am more of a ‘hands-on’ person, I need to see and do it myself to learn. So, I

was given access and think that probably from the next day, I was a bit more into contact with using it, so that's how I learned to do it". Acclimatization and acceptance were critical factors in propagating EMEDs within the hospital and communicating the specific value-based frames for different users. In addition to the newly acquired knowledge on EMEDs, the clinical acumen that the clinical implementer group possessed helped stimulate interest more widely among users.

Disconnecting users from old practices. For clinical users, discrediting paper-based practices, by emphasizing the core values of patient safety and positioning EMEDs as a new, value-laden practice, was critical to disconnect users from old ways of working. Through awareness and training, users were introduced to practices that supported patient safety and health-related outcomes. Prior to EMEDs, users often struggled with the legibility of paper charts, creating a safety risk. Positioning EMEDs at a value-laden practice disconnected users from old ways of working. As one Ward Doctor noted: "I think with EMEDS its much better... you've got a proper document of all the medications, you can access GP records as well and bring up the past medications. They obviously don't easily get lost either".

Transition to Innovation

Clinical users were now warming up to the idea of the new EMEDs practices: focussing on patient safety values made them feel much more comfortable with change. Non-clinical implementers also benefitted from this context and were also induced to widely promulgate EMEDs throughout the hospital. This shift in position was predicated on the communication of value-based benefits through clinical- and user-sponsors that framed and juxtaposed the deficiencies in the old ways of working with the advantages of the new ways of working through collaborative efforts.

Implementation by projecting disconnection. After the first few test runs, it was time to actually implement EMEDs throughout the hospital. Non-clinical implementers were

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keen on projecting that EMEDs was not a major transformation in the primary purposes and values undergirding their practice and, therefore, could be easily adopted and diffused. According to the Deputy Manager: “Because we weren’t changing the meaning of the process even though we were replacing it with something new, it stayed the same so doctors prescribe, nurses administer, and pharmacists order and review medications all for purposes of patient care and safety. EMEDs is a better way of serving this purpose”.

Sensegiving by defining practice boundaries. With their newly acquired affinity for EMEDs, clinical implementers helped non-clinical implementers with various aspects of execution. Clinical implementers were assigned to mostly training duties; however, they also showed initiative, utilizing their clinical experience to establish strong lines of communication with clinical users. According to one Nurse: “So, you’d go along and even though I couldn’t deliver the training myself, I could assist, with showing them where things were on the system, so I could put EMEDs into the context of our work”. Clinical implementers also began to evaluate and redesign the overall implementation process according to nuances within their area of expertise.

Adoption of innovation. Despite early resistance, EMEDs was now being positively communicated to the clinical user group by clinical implementers. Positive reactions towards EMEDs was due, in part, to various forms of training and learning that allowed feedback and continual refinement of the use of EMEDs, all the while aligning it with the primary value of patient safety. As one Nurse noted: “We’re making less errors, then even if it’s taking us longer to do them, that’s a positive”. EMEDs adoption was also an opportunity to revisit and re-learn some prescribing practices, including how medications were being prescribed, administered and dispensed.

DISCUSSION

Our findings are informed by the insights gleaned from a comprehensive set of data, presented in the actual language used by our informants. These raw data informed how we chose our first-order codes, second-order themes and aggregate dimensions, which then provided the foundation to develop a grounded theory of the interactive dynamics of innovation adoption. From a methodological perspective, our data structure not only offers transparency but also demonstrates the depth and breadth of data informing the development of a theoretical model of transition and evolving dynamics of internal actors in a complex institutional context.

While our data structure (see Figure 1) is a static representation of the key concepts that emerged in our study, Figure 2 is a dynamic illustration of an interactive framing model – a processual depiction of how we have depicted the interaction of three groups of institutional actors adopting new practices prompted by a novel digital intervention. The model in Figure 2 illustrates framing as a conceptual point of departure and serving two roles: (1) as internal cognitive “schemata of interpretation” (Goffman, 1974, p. 21) that allow actors to construct ‘sense’ in an otherwise meaningless succession of events; and (2) as explicit articulations (i.e., behaviours) of an internal cognitive schema that serves as the basis for interaction between multiple actors as they seek to collectively negotiate ‘sense’. These frames of reference are key to organising and shaping the interpretations of events and organizational phenomena by relevant organisational actors (Patriotta, 2020; Weick 1979).

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Our model depicted in Figure 2 also illustrates that interactive framing was an important subprocess within adoption, motivating the cognitive transformation of

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institutional actors to not only discard their old ways of working but also adopt new practices associated with EMEDs. As suggested by Orlikowski and Gash (1994, p. 33), shared cognition is an effective means to investigate and assess the impact of a digital intervention in organisations that have multiple, interacting actors who are responsible for the successful adoption of new interventions. From a theoretical standpoint, our findings have led to the development of a theoretically grounded model comprised of three types of framing (i.e., intrinsic, frictional and transitional), which represent cognitive transformation within actors as they experience the interactive process of innovation adoption. Cognitive transformation is linked by three critical landmarks, representing the socio-cognitive roadmap of institutional actors, which not only succeed the framing activities at each step but also serve to link the activities together. These landmarks include: (1) communicating new practice attributes; (2) infiltrating existing values; and (3) transitioning to new practice.

Intrinsic Framing and Communicating New Practice Attributes

As soon as the new prescribing system was initiated at the NHS hospital, institutional actors engaged in intrinsic framing. Framing around the new practices is rooted in socio-cognitive research examining collective cognitions (Bijker, 1987; Bijker et al., 1989). Members of a social group interact to come to a common understanding concerning their knowledge of the innovation and the local/contextual understanding of the innovation (Roper et al., 2017). Meaning and significance of an innovation is thus contingent upon the context of its use and its users.

When most of the institutional actors at the NHS hospital were still unaware of the new EMEDs digital prescribing system, non-clinical implementers were operationalising and formalising plans to equip all hospital wards with the new system. However, these plans were remodelled and renegotiated following interactions with the two other actor groups. For clinical implementers and users, they projected their allegiance to the old paper-based

system, which had been in use at the hospital for a very long time. Both negotiated the initial stage of EMEDs operationalisation by projecting the issues they associated with the new digitized system. The clinical implementers and users exhibited significant resistance to and problematization of EMEDs, mostly due to a lack of exposure and awareness of what EMEDs could offer. Their resistance was inherent at this stage and was reminiscent of reshaping implementation objectives on part of non-clinical implementers and resistance on part of clinical implementers and users.

We thus define intrinsic framing as a wide-ranging process to comprehend complexity in the initial stage of digital intervention projects. In our context, management-led agendas, in the form of communicative channels, were promoted to end-users who were building their own perceptions of the novel digital intervention. For management of large complex organisations, we build on the theoretical underpinning of what Goffman (1974) coined “lamination” – whereby varying perspectives of the same situation are superimposed one over the other. As an iterative sub-process, navigating intrinsic framing involves identifying all internal actors and their respective roles in the process of adoption innovation.

Frictional Framing and Infiltrating Existing Values

Interactions between actors determine interpretations, which in turn are shaped, reshaped and constrained as a result of varying motives, knowledge and power (Balogun et al., 2014; Bijker et al., 1989). In our study, nurses had different notions and knowledge of EMEDs compared to pharmacists, who in turn had different interpretations than doctors. At this stage, the attributes of the new EMEDs system were familiar to most actors in the AHS hospital, which brought into focus discrepancies in how each of the three groups were negotiating their existing practice values. Both clinical implementers and users were deeply vested in the practices of the old paper-based system. Each group had their own respective framing, which they were unlikely to share with the other actor groups. On the one hand,

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non-clinical implementers were expected to have technical perspectives on EMEDs, since they treated it as a tool that could be manipulated and deployed to accomplish implementer tasks. On the other, clinical users had developed a strategic view of the new system, expecting EMEDs to improve how medications were prescribed and, in the process, enhance patient safety. An instrumental viewpoint highlighted how clinical users expected immediate, task-specific benefits from the EMEDs system, including better eligibility and remote working. Following their projections of the attributes of the new technology in the initial stage (i.e., intrinsic framing), the non-clinical implementers had to reframe the attributes to infiltrate deep-rooted linkages with the paper-based system.

The theoretical significance of the frictional framing sub-phase is that its salience is contingent upon the varying logics and rationales of different internal actors. The focus of frictional framing activities should not only be addressing diversified views and evolving perspectives but also prompting managers to investigate the root causes of varying perspectives. Questions concerning engagement and end-user responsibilities can reveal root causes of emergent frictional framing activities. Thus, managers of large organisations, who undertake high-stakes digital transformation projects, should investigate frictional framing activities, including how to substantiate external views and how to value consultancy.

Transitional Framing and Transitioning to New Practice

A process view facilitates the examination of the conditions under which framing changes (Orlikowski & Gash, 1994). In our study of innovation adoption, institutional actors first initiated intrinsic framing, then followed with frictional framing and eventually culminated in transitional framing. The final sub-phase of transitional framing included settlement of the new practice in terms of its respective position at the hospital, including how non-clinical implementers were approaching implementation plans at this late stage. At this point of the process, clinical implementers adopted a more relaxed approach that

involved more risk-taking. Non-clinical actors hinting at how EMEDs was being positioned for widespread acceptance throughout the hospital, framing and then reframing its use in the hospital wards. Initially pitching it as a novel product, now EMEDs was being projected as a mere upgrade of the paper-based system. Reframing of the new system allowed clinical implementers and users to situate themselves more centrally in the implementation process. Since clinical implementers and users continually assessed the new the system and compared it with the old system, their affiliation was strengthened over time.

Transitional framing is the most significant theoretical sub-process in our grounded model, since the events and experiences that unfolded during this phase reveal how management should communicate novel ideas to end users. In the terminal phase of a project, a wide range of issues are either assumed or taken for granted, but, as these data suggest, framing can be a crucial step in ensuring a satisfactory adoption process in the final stages of innovation adoption. The nature and mode of communication play a pivotal role in how internal actors cognitively align themselves. Communications between actors also shape how an organisation embraces a novel digital intervention.

PRACTICAL IMPLICATIONS AND RESEARCH CONTRIBUTIONS

Understanding why end users and organisational stakeholders choose to adopt or reject a market-driven innovation is critical for managers when formulating adoption strategies. Extant literature lacks the required theoretical edge to inform managers how their organisations can best invest in new technologies. The NHS in the UK is one prime example of such an organisation. In light of how little is known about the dimensions and indicators of the process of innovation adoption, our study reveals how different actor groups interact, engage and frame novel technologies. It also informs managers on how to formulate effective strategic responses to counter indifference and negative attitudes, as well as mitigate potential impacts on organisational efficiency, operations and revenues.

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For each stakeholder group, specific information regarding how each group views innovation and persuasion are ideal bases for managers to position change. Projection can transmit information within the organisation but persuasive communication, such as written messages (e.g., internal emails, memos and posters), open forums and meetings, are more likely to bring about attitude change. Overall, our study offers organisations means to comprehend attitudes, norms and interactions as significant indicators of the intent to adopt digital technologies.

Overall our grounded theory model not only offers a theoretical basis to scholars in deciphering the human-technology interaction but freezes the respective stages i.e., intrinsic, frictional and transitional for managers to take note. Each of the stages have value for organisational leaders who are overwhelmed by the challenge of digital implementation (Mihardjo et al., 2019). As an isolated frame or collectively these stages can be reviewed and applied to determine contextual issues or used as enablers to make progress in a process which faced challenges of various nature. The study combines the focus on technological and human dimensions which can be looked at collectively to determine the strategic objective of the organisation. In fact the model derived underlines the need for strategy which can stretch the capabilities of actors experiencing the digitisation process (Tabrizi et al., 2019).

CONCLUSION

Through this rich case study, we found salient new theoretical and practical insights that broaden and deepen our understanding of the process of innovation adoption. From a theoretical standpoint, we advance a socio-cognitive understanding of innovation adoption, which focuses not only on changes in cognitions but also the all-important interactions between implementers and users. Contrary to the assertions of rational theories, we find that communicating the technical attributes and proposed efficiencies of an innovation is insufficient to stimulate adoption (Gonzalez and Gulbrandsen, 2022). Rather cognitions,

triggered at a deep, value-based level, induce change in existing processes, practices and structures (Heidenreich et al., 2016; Volberda et al., 2013). Defining the boundaries of innovation – the endeavour of early adopters – not only triggers imitation but also drives collective sensemaking among implementers and users, delineating the nuances of the innovation for each actor group (Maitlis & Sonenshein, 2010).

Our study is not without limitations; our findings on innovation adoption within the NHS, with its own unique set of complexities, may not generalize to other lesser complex organizations. Future research should not only test our findings in similar as well as other contexts but also adopt alternative methods, such as quasi-experiments and network analysis, to investigate and reveal the nuanced dynamics of shared cognitions and interactions in adoption processes. Despite these limitations, our research provides new insights into how managers can deal with the complexities of new innovative practices, as well as the associated cognitions and interactions associated with initiating and implementing a novel innovation. In doing so, we contribute to the exciting potential of a socio-cognitive lens to further refine and inform our understanding of innovation adoption.

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For Peer Review Only

Table 1. End users and their key functions in paper-based and EMEDs prescribing systems.

End-Users	Key Functions
Physicians	Prescribing Medicines
Nurses	Administering Medicines
Pharmacists	Reconciliation of Medicines

Table 2. User groups for EMEDs implementation and data collection.

User Group for EMEDs Implementation	Constituting Members
Clinical users	Ward-based physicians, nurses and pharmacists
Clinical implementers	Non-ward-based physicians, nurses and pharmacists. As the core user groups affected by EMEDs, clinical implementers were the team of clinical sponsors for each user group and comprised a mix of physicians, nurses and pharmacists.
Non-clinical implementers	Non-clinical implementers. This group was the technical team with knowledge of EMEDs.

Table 3. Summary of data collected and time spent.

Type of Data	Number of Interviews/Hours Spent
Semi-structured interviews	59 interviews
Non-clinical implementer interviews	9 interviews
Clinical implementer interviews	25 interviews
Clinical user interviews	25 Discussions
Formal/informal discussions	90 hours
Team meetings	15 hours
Non-participant observations	90 hours

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Table 4. Representative first-order data for second-order themes

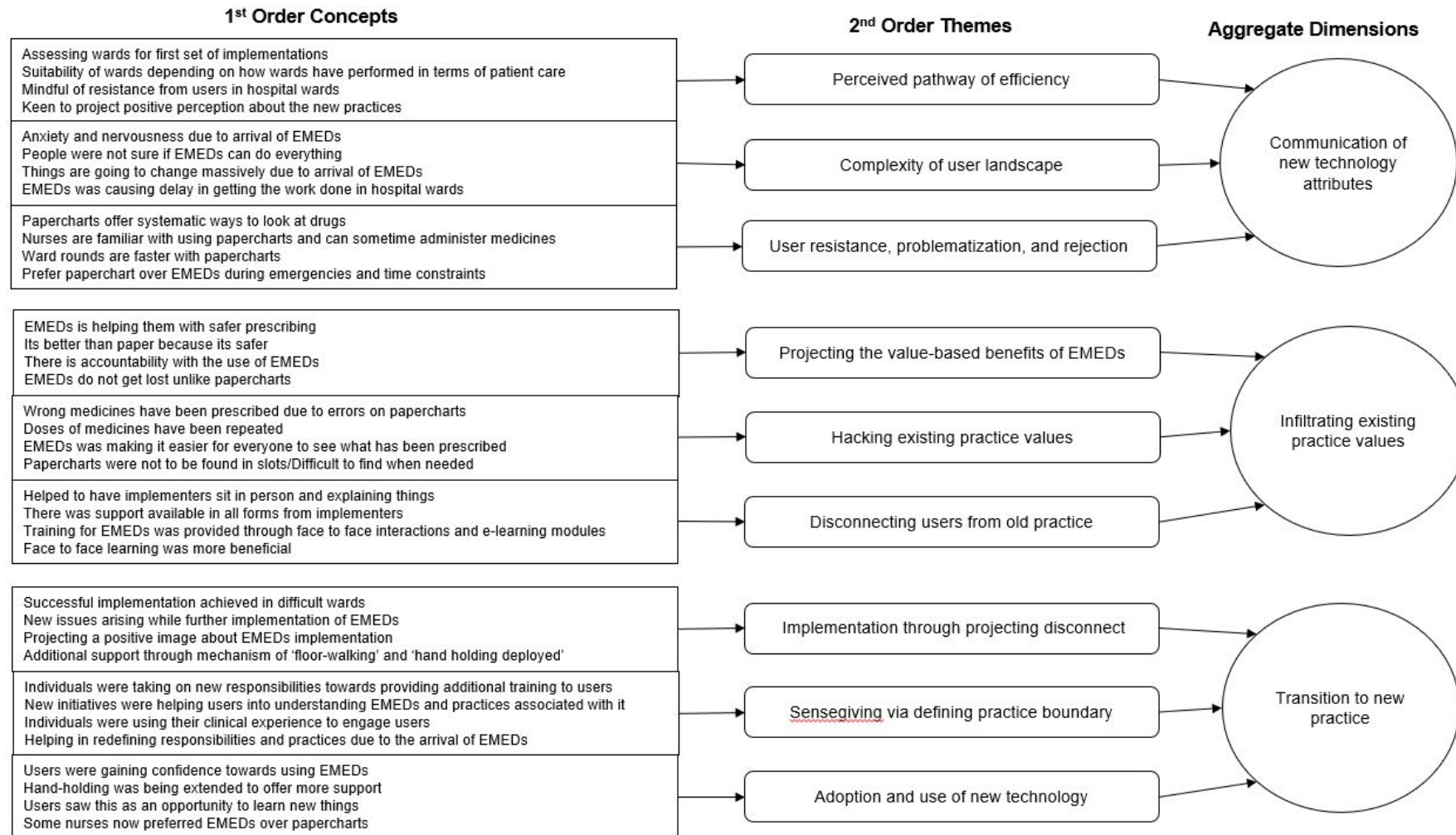
Second-Order Themes	Representative First-Order Data
Aggregate Dimension: <i>Communication of Innovation Attributes</i>	
Perceived pathway of efficiency	<p>“So, we knew that if we wanted to test the implementation of a new way of working, we couldn’t have gotten a better ward. It could be more difficult in lower performing wards. The idea is to prove the technology and new practice” (Deputy Manager).</p> <p>“Yeah, I mean I think it’s a similar attitude so from when we were in theatres and working with anaesthetist. A lot of them were quite reluctant upfront and it’s finding out and scoping where to sell the performance benefits first” (EMEDs System Trainer).</p>
Complexity of the user landscape	<p>“As an EMEDs team we have to do all the training but it’s so much information all at once, I found that really difficult” (Trainee Specialist Pharmacist).</p> <p>“Doctors on the other hand from working on the ward, I remember rolling-out, they seem to think it’s timelier in what they do. So, prescribing medicines takes longer than it would do on paper and that’s because they’re having to use the system, find the medicine, you know do the whole process changes” (Charge Nurse).</p> <p>“Other people who you’d have expected to have just taken to it like that, have been really scared of it and unsure of what they’re doing and wanting to ask lots of questions and being, “oh but what if this happens, what if that happens?” (Lead Pharmacist).</p>
Resistance, problematization and rejection by users	<p>“So, that when we make a huge number of amendments to drug charts, the time we spend making those amendments and changing those things is so much greater now than it was, and I think there is a great investment in time, in making sure the drug chart is correct at the outset, the longer that an error is continued in EMEDs the more difficult it becomes to rectify it later on” (Ward Pharmacist).</p> <p>“The advantages at the moment are that, I know where to find what medicines are prescribed. So, antibiotics are all together, the regular medicines are all prescribed together, and I</p>

Second-Order Themes	Representative First-Order Data
	suppose you build up over a period of time a systematic way to look through a drug chart, so that you know that you've done the right thing" (Ward Pharmacist).
Aggregate Dimension: <i>Infiltrating Existing Values</i>	
Re-focusing on value-based benefits of EMEDs	<p>"So, it is kind of safety and the objective is to make sure the medication process is a bit safer. Sometimes prescriptions are incomplete that helps whoever the pharmacist or doctors are prescribing to make it more complete because the system is supposed to guideline you and give you alerts if they say anything" (Clinical System Trainer).</p> <p>"So, the thing is that you don't need someone before, you need someone to come all the way. If you call a pharmacy, "can you please give this person medication or add this medication to the person's list," you have to wait like an hour until for the pharmacist to come all the way down to the ward. But now they don't need to come down at all" (Clinical System Trainer).</p>
Re-framing existing values	<p>"Well just clarity, and you can actually read what it says because you frequently couldn't and that's a problem. And things like oxygen, they prescribe oxygen as an anaesthetist coming out of theatre, fine they need oxygen and they do it regularly, but then when the patient doesn't need it anymore or it could have been swapped to when required, or that kind of thing, it's just left and ignored, but it's not actually crossed out on paper chart it's just there" (Lead Pharmacy Technician).</p> <p>"In relation to my role, you no longer have to go around and physically search for drug charts, a drug chart could be with a nurse, it could be with a doctor, pharmacy could have it, it could have gone to theatre. So, there is time saved there not having to search for a physical drug chart" (Pharmacy Technician).</p>
Disconnecting users from old practices	<p>"XXXX was around as well, various other members of the team and staff, they were really helpful, they'd be here until about midnight-ish and then go and then come back, but there'd be someone around if we needed them, so they'd come back for the morning meds round in the morning" (Ward Nurse).</p>

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Second-Order Themes	Representative First-Order Data
	“I was on nights in, over the both weeks when they were here, and the EMEDs team were implementing it, and we knew about it, the EMEDs team had brought up laptops and given us all information, our clinical education team had been out and helped us to relieve each other and be able to do the training, for a nursing point of view and the medics were putting session after session on for the medical staff to attend and the consultants were attending and trying to get all the junior staff to go” (Ward Nurse).
Aggregate Dimension: <i>Transition to Innovation</i>	
Implementation by projecting disconnection	“I think that the other thing that we were worried about was whether it would delay or increase time that it takes to do certain jobs. It was fairly clear from the literature and what had happened to other people because we went around quite a lot of other places to see what they were doing. Although it did reduce quite a lot of the common errors, it also introduced new errors, that need to be managed, so, although we knew what some of those were, we aren’t really seeing them all yet” (Lead Doctor).
Sensegiving by defining practice boundaries	“The closer the actual roll-out plans became, the bigger the push was towards EMEDs, you know, your ward sister’s told you to do, so I took it upon myself to complete the training quite early on and completing the training compared to medicines on a paper chart” (Junior Nurse). “Basically, we would be there we’d do a drug round with them and then depending on their needs obviously we would either escalate it if they were having trouble or slowly step back and try and give them as much independence as possible” (Junior Nurse).
Adoption of innovation	“I think there are some very quick and easy wins to EMEDs. You know that you don’t have to transcribe drug chart, its immediately legible. The prescription is clear, and the ability to pick medicines means there is a, it’s kind of like a restricted formula” (Ward Pharmacists). “I’ll say so, I mean I am quite comfortable now with EMEDs, I got used to it afterwards, you just need to adapt for the better” (Ward Nurse).

Figure 1. Data structure.



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FIGURE 2: Interactive framing model.

