Organizing Digital Platforms and Customer Needs for Digital Service Innovation

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ABSTRACT

Digital organizations have become highly dependent on digital platforms and customer needs as key resources for digital service innovation. These resources in the competitive environment are making and shaping innovation of digital services because, though external, they remain central to digital organizations' strategic innovation and competitiveness. Yet, how and why organizing these resources influences digital service innovation is under-explained in the literature. This paper, based on an empirical study and grounded theory methodology, addresses this limitation. It explains that digital service innovation occurs through two complementary types of organizing, namely: *foundational knowledge organizing* by combining digital platforms and customer needs, leading to compound and technical knowledge; and *applied knowledge organizing* by creating applications, surpassing customer needs, improvising new solutions, and relating with customers, leading to original, transcendent, rapid, and renewed knowledge. The theoretical contributions of this explanation are discussed along with its practical and future research implications.

Keywords: Digital platform, service, organizing, innovation, customer, knowledge.

INTRODUCTION

One of the practical ways of achieving digital service innovation (DSI) is by organizing digital platforms and customer needs (Srivastava & Shainesh, 2015; Ye & Kankanhalli, 2018). These inputs lie outside the organization's control (Eaton et al., 2015). Hence, the process of organizing them into an internal effective service platform for DSI is a more challenging task than if they were under internal control. Yet, digital organizations are finding ways to leverage the technological resources in digital platforms as well as the information resources in customer needs. These are two key resources in a competitive environment that make and shape the innovation of digital services because, though external, they are central to an organization's strategic innovation and competitiveness in a digital age, such as this has become. These organizations track, monitor, evaluate and exploit digital platform innovations to enrich their technological toolkits and productivity. They also do the same to customer needs to enrich their information stock and service delivery.

Digital platforms, customer needs, and the way in which they are organized together constitutes a distinct and critical input of DSI, which ought to be understood not only practically, but also

theoretically. This is because knowledge of how organizing digital platforms and customer needs resources influences DSI improves our knowledge of DSI in particular, and innovation theory in general. However, extant DSI theory quite lacks this organizing perspective, leaving the unanswered question of *how does organizing digital platforms and customer needs influence digital service innovation.* The attempt to answer this question in this paper leads to development of an explanatory theory of digital service innovation.

Ye and Kankanhalli's (2018) theory of user service innovation (USI) on mobile platforms is a close and valuable attempt to addressing this question, because USI is synonymous with DSI. USI is explained in terms of how user innovators leverage platform technology affordance (design autonomy) and application (toolkit support). However, their explanation is dominated by the user perspective, because their research was motivated to depart from digital innovation contexts, which are dominated by developer and/or organizational perspectives. Additionally, their research focuses on innovation toolkits rather than on core technical components of digital platforms. Their idea of toolkits focuses on easing lead users' access to the components. Similarly, their idea of design autonomy concerns user innovators, who are at the top of the DSI chain, rather than developers and organizations that occupy a lower position in the chain. Furthermore, USI quantity is their main outcome variable, ahead of quality. In sum, two main limitations pertain to their theory: firstly, their focus on user perspective at the expense of platform and organizational perspectives; and secondly, top-down and quantitative approaches as compared with the bottom-up and qualitative approaches of the current study.

Srivastava and Shainesh (2015) have also attempted this question in their study of DSI in India, but from an interactional perspective. They theorize DSI in terms of a combination of technology, knowledge, and institutions, which they refer to as interactional resources. Each of these resources provides an interaction framework for value creation between providers and users. While their attempt is also valuable, they do not quite address this paper's question, because the interactional perspective is analytically distinct from the organizing perspective. This paper focuses on organizing technology and information resources outside an organization (providers), but their interactional perspective excludes them. For example, their conceptualization of technology duly "includes all information and communication technologies that assist in value creation by utilizing and integrating elements of provider and user service systems" (p. 249). However, it excludes digital platforms, which are understood as extensible codebases that enable the development of apps (Reuver et al., 2018; Tiwana, 2013). It also excludes how digital platforms are organized for DSI. Due to these exclusions, their explanation of how and why the resources are orchestrated in the user-provider relationship, though helpful, do not address how digital platforms are organized to complement this orchestration. However, this research addresses that.

There are other extant publications on various aspects of DSI such as platforms, applications, organization, content, process, and customer value (see, for example, Alaimo et al., 2019; Barrett et al., 2015; Eaton et al., 2015; Ghazawneh & Henfridsson, 2015; Kim, et al., 2012; Li et al., 2018; Mendling et al., 2020; Nambisan, 2013; Nylén & Holmström, 2015; Orlikowski & Scott, 2015; Tate et al., 2018). While they make significant contributions to the literature, they are not purposed to theorize DSI. because they do not provide adequate and explicit explanations of DSI in terms of organizing digital platforms and customer needs.

Likewise, extant publications on strategic information systems for organizational competitiveness have not paid attention to DSI as a specific requirement that has to be conceptualized and realized. This is true of the range of strategic information systems literature, from McFarlan, Porter and Miller (McFarlan, 1984; Porter & Millar, 1985), through to Galliers et al. (Galliers & Newell, 2000; Somogyi & Galliers, 1987), as well as Bygstad and Øvrelid (2020, 2021). Explicit theorizing of DSI is missing in these studies, in spite of the recent shift in strategic attention towards DSI (e.g. Barrett

et al., 2015; Pagani, 2013). This strategic attention is mainly driven by digital platforms, and a service-dominant logic (Vargo & Lusch, 2004). Digital organizations leverage innovations in digital platforms to develop digital applications and exchange new digital services (Breidbach et al., 2013; Bygstad & Øvrelid, 2020, 2021; Nambisan, 2013, 2017; Nambisan et al., 2019). All these imply that there is a strong link between digital services and organizational competitiveness (e.g. Ordanini & Parasuraman, 2011; Zacharia et al., 2011). However, scholars are yet to develop concrete knowledge on how and why DSI is practically relevant for organizational competitiveness.

There is the need for this organizing perspective on DSI to complement the extant interactional (Srivastava & Shainesh, 2015) and user (Ye & Kankanhalli, 2018) perspectives, and to explain how and why it is practically relevant for organizational competitiveness. These perspectives tend to take digital platforms and their organization for granted in the service innovation process. Moreover, there has been more research interest in the consumption part of the process than in its organizing part. Nonetheless, DSI practice is challenging on both counts. Hence, knowledge about how these organizing efforts influence DSI must be developed to complement our knowledge of the interactional and user perspectives. Based on an empirical study of two Ghanaian digital organizations using grounded theory methodology, it was found that DSI occurs through foundational and applied knowledge organizing. Foundational knowledge organizing is by combining digital platforms and customer needs, leading to compound and technical knowledge. Applied knowledge organizing is achieved by creating applications, surpassing customer needs, improvising new solutions, and relating with customers, leading to original, transcendent, rapid, and renewed knowledge. Beyond the analysis, these foundational and applied knowledge types are synthesized into a knowledge structure. Hence, this paper proposes a DSI theory characterized by knowledge organizing and structure.

The next section presents reviews of literature on digital platforms, service innovation, and customer needs. After this, the empirical study and methodology are discussed: these include the study context, philosophical approach, methods, and data analysis technique. The following section presents data and data analysis with findings, followed by discussion of the paper's theoretical contributions, as well as research and practical implications.

LITERATURE REVIEW

Digital Platforms and Service Innovation

In the organizational context, innovation refers to "the first or early use of an idea by one or a set of organizations with similar goals" (Becker & Whisler, 1967, p. 463), and "the adoption of an idea or behavior that is new to the organization adopting it" (Daft, 1978, p. 197). Current IT depends heavily on digital platforms, leading to the new term, digital innovation (see, for example, Barrett et al., 2015; Grisot et al., 2014; Nambisan et al., 2017; Yoo et al., 2010). Generally, a platform is a "portfolio of options" for leveraging opportunities and developments in markets (Kogut & Zander, 1992, p. 385).

Digital innovation refers to the "recombination of digital components in a layered, modular architecture to create new value-in-use to users or potential users of a service" (Huang et al., 2017, p. 302; see also Lusch & Nambisan, 2015; Yoo et al., 2010). In this digital innovation context, digital platforms are described as generative (Lyytinen et al., 2017; Tilson et al., 2010) and innovative (Gawer, 2021), because they are technology infrastructures used to generate DSI. In view of the generativity of digital platforms, resultant digital products have an innovation logic that is distinct from that of industrial innovation (Lyytinen, 2022).

The digital innovation logic refers to a physical, multi-layered architecture (Yoo et al., 2010) or ecosystem (Hein et al., 2020) composed of core and derived digital platforms. The core digital

platforms such as Apple's iOS and Google's Android Studio lie at the base of the architecture, providing opportunities for generation of multi-sided platforms such as AirBnb, Facebook, and Uber mobile applications. Thus, multi-sided platforms are not core computer technologies, but are examples of digital products generated from the core platforms (Alaimo et al., 2019; Greenwood & Wattal, 2017; Tan et al., 2018).

Core platforms are different from other digital products, because they are open, shared, modular, and quite decentralized in terms of control (Eaton et al., 2015; Kallinikos et al., 2013), implying that they constitute infrastructures (Henfridsson & Bygstad, 2013). For this reason, Bonina et al. (2021) place core platforms within the innovation category (as opposed to the transaction category), due to characteristics such as enabling the creation of applications and services by third-party developers, opening up functional capabilities to them, driving software engineering and innovation management, and re-combinability of digital information and functionality. Their transaction category is exemplified by multi-sided platforms.

Even before the era of core digital platforms such as iOS and Android Studio, Ciborra (1996) had conceptualized the platform organization as a derivative of computer platforms. Shifts in computer platforms dictate the rapid structuring and strategizing of the platform organization, which he describes as "a shapeless organization that keeps generating new forms through frequent combination" (p. 104). Thus, the platform organization (organization-as-platform), like a multi-sided platform, is shaped more by external technology innovation cycles than by internal product life-cycles. This research is a study of a platform organization that was structuring its knowledge system in response to external core platforms.

Both notions of organization-as-platform and multi-sided platform underscore the characterization of digital innovation as distributed and combinatorial (Yoo et al., 2012). Distributed innovation refers to innovation that occurs at all levels of the digital innovation architecture (core, multi-sided, and organizational) and also among users who are described as co-designers during open innovation (Chesbrough, 2012). Combinatorial innovation implies the combination of existing modular architectures and embedded digital capabilities within core platforms into new digital products.

A hallmark of new digital products, reflecting distributed and combinatorial innovation, is service. Service includes issues such as customer needs, value co-creation, and the "process of serving" rather than product output (Lusch & Nambisan, 2015). It requires that service providers develop a service platform, defined as "a modular structure that comprises tangible and intangible components (resources), and facilitates the interaction of actors and resources (or resource bundles)" (Lusch & Nambisan, 2015, p. 166). The service platform ensures continuity and adaptability of service provision. This is because service provision is significantly different from goods production:

> *To produce a service, therefore, is to organize a solution to a problem* (a treatment, an operation) which does not principally involve supplying a good. It is to place a bundle of capabilities and competencies (human, technological, organizational) at the disposal of a client and to organize a solution, which may be given to varying degrees of precision (Gadrey et al., 1995, p. 5).

Thus, Bettencourt (2010) defines a service in terms of service action (e.g. design, develop, and provide), customer's physical job (e.g. select, purchase, and use), the digital job statement (e.g. obtain a loan, pay a bill, and board a bus), service verb (e.g. learn, experience, and discover), and service outcome (e.g. maximized, reduced, and enhanced). For example, a digital service occurs when an organization provides a mobile app that a customer uses to board a bus leading to an enhanced travel experience. In this example, 'provides' is the firm service action, 'mobile app' is the digital technology, 'uses' is the physical customer job, 'board a bus' is the customer's digital job

statement, 'experience' is the customer service verb, and 'enhanced travel' is the customer service outcome.

Innovation of services (called service innovation) includes dynamics such as learning, increments, integration, and evolution (Sundbo, 1997); co-creating value (Bettencourt, 2010; Katzan Jr, 2008); "co-producing and orchestrating, scaling and stretching, and learning and adapting" (Den Hertog et al., 2010, p. 490); as well as non-linearity, emergence, and reiteration (Toivonen & Tuominen, 2009). In the wake of digital innovation, organizations are organizing digital platforms and customer needs to engage in DSI, aiming for simultaneous production and consumption between themselves and their customers (Opazo-Basáez et al., 2022; Lusch & Nambisan, 2015).

Thus, DSI is indeed a paradigm shift in digital innovation, reaching beyond the traditional service industry to influence manufacturing of commodities (Opazo-Basáez et al., 2022). It has also played a significant role in the digital transformation strategies of established organizations (Soto Setzke et al., 2021). However, this research focuses on DSI, where the commodity being delivered is itself a digital one, as compared to non-digital commodities delivered by established or non-established organizations. Hence, in this research, DSI is defined as the use of digital platforms to provide new digital commodities accompanied by rapid exchange of information about those commodities with consumers leading to value co-creation (Wiredu et al., 2021).

Customer Needs

Organizations aim to satisfy customer needs, however, needs vary according to biological and environmental change (Slater, 1997). An environmental change that has emerged recently and is varying consumer needs is digital platform innovation. As customers get to know and use digital goods and multi-sided platforms, which have been generated from digital platforms, their needs tend to change. Besides, digital platforms have infinite capabilities, which many customers do not know at any time (Kallinikos et al., 2013). In general, human needs are "not present in any simple, finished form in man's biological composition. Instead, they are relative to and change with the condition of society at a given time and at a particular stage in the forces of production" (Winner, 1977, p. 83). Furthermore, there is a huge store of "unformed set of urges" (p. 84) in the human biological system. which is formed when people come into contact with technology. These statements confirm the axiom that many customers do not have perfect knowledge of what they want (Riquelme, 2001). Both Henry Ford's cars and Apple's iPhones have adequately proven this axiom.

Customer needs (known and unknown), therefore, are central to the idea of co-creating service value in the service-dominant logic (Vargo & Lusch, 2004). The increasing dominance of service value co-creation in recent DSI literature points to the increasing role of the environment in determining customer needs (Srivastava & Shainesh, 2015; Ye & Kankanhalli, 2018). Thus, Bettencourt (2010) argues that service innovation focuses more on enabling the customer to get jobs done than satisfying biological needs – jobs such as taking a flight, seeing a friend, or taking a class. The global environment is increasingly becoming designed and saturated with digital platforms and goods. As a corollary, the role of digital platforms as innovative capabilities that address customer needs is also increasing (Tilson et al., 2010).

It takes effective DSI to satisfy already formed customer needs, to make them form new needs, and to satisfy them continuously. This requires surpassing or overtaking customers with a value that is far superior to their needs (Schlegelmilch et al., 2003). Thus, the DSI benchmark is neither the customer nor the competitor. It is superior and untapped values, and there are unlimited digital platform capabilities to be organized to form and satisfy them.

METHODOLOGY

The empirical study was informed by the need to understand how and why digital platforms and customer needs are organized for DSI. It involved three minor DSI processes, namely: scanning the environments of digital platforms and customer needs; improvising IT solutions to address customer problems; and providing new digital services with customers to get their jobs done. These were longitudinally studied in two digital organizations in Ghana (HatCom and ApraTek).

The study was approached using interpretivism, because there was interest in the respondents' own interpretations of their experiences and observations, as well as the researcher's ongoing interpretations of data. These interpretations were necessary for understanding DSI from the multiple, recurrent, and cumulative progressions – from scanning through improvising to providing. These subjectivities are important for process and explanatory theory development, because many information processing tasks in digital organizing are not prescribed, but constructed. Moreover, the units of change are multiple (digital platforms, customer needs, DSI), rather than single. The subjectivities also pertain to the currently limited understanding of the relationship between the phenomenon of DSI and the context of digital organization.

Such a limited understanding provides fertile ground for a case study of a phenomenon in its natural and cultural contexts (Yin, 2013), as well as for adopting a grounded theory methodology for data collection, data analysis, and theory development (Lehmann, 2001). One reason for adopting grounded theory is that this research includes a "hybrid of human, social/organisational and technological case elements" (Lehmann, 2001, p. 45), which when combined with grounded theory methods yields middle-range knowledge contributions (Urquhart et al., 2010). Vannoy and Salam (2010), for example, have undertaken a grounded theory and case study of the role of information systems leading to knowledge contributions to firm performance, with practical implications for competitive advantage.

General Contexts of Organizations

Purposeful sampling was the primary criterion for selecting the two organizations. They were selected because they were leveraging digital platforms and customer needs for DSI. In both, there were active processes of organizing for DSI, which could be studied empirically. The two were selected to capture similar and different, as well as centralized and dispersed process data on digital organizing. The secondary criteria for selecting them were opportunism and convenience. There was an opportunity to study their digitizing and DSI, because they were willing to cooperate and collaborate with the researcher in the longitudinal mode. The study was also convenient because they operate in Ghana, where their natural and cultural contexts were well understood by the researcher.

HatCom was co-founded in 2012 by the Chief Executive Officer (CEO) (who was also Chief Technology Officer (CTO) as well as Chief Financial Officer (CFO)] and the Chief Operating Officer (COO). The empirical study period was from November 2017 to April 2020. It had nine staff (including the two co-founders) and focused on digital communication services based on three digital platforms: short messaging service (SMS) telecommunication protocol, Android operating system, and Laravel web development framework. It produced web- and mobile-based short messaging services, bulk voice calling services, interactive voice response (IVR) services, and short (unstructured supplementary service data (USSD)) and long codes messaging services (Table 1). ApraTek was also founded in 2012 by the CEO. It had seven staff (including the CEO) and was studied for this research between April 2018 and April 2020. It focused on digital financial services provided via mobile and web apps using the Android operating System and Laravel web development frameworks. The digital financial services were mobile banking, shares management, asset management, and loan management services delivered to small and medium financial

institutions, such as rural banks, savings and loans companies, micro-finance companies, and credit unions across Ghana (Table 1).

Table 1

Summary of Respondents' Profiles

HatCom		ApraTek	
Location	**Interviewee Profile**	**Location**	**Interviewee Profile**
Accra	Software Engineer 1		CEO
Accra	COO		Senior Software Engineer
Accra	Marketing Officer 1		Software Engineer 1
Kumasi	Software Engineer 2		Software Engineer 2
Kumasi	Software Engineer 3	Kumasi	Software Engineer 3
Kumasi	Administrative Secretary		Software Engineer 4
Accra	CEO/CTO/CFO		Secretary
Accra	Marketing Officer 2		
Accra	Administrative Assistant		

Data Collection

In both organizations, multiple methods were employed for data collection, but the predominant method was semi-structured interviewing. The other methods were conversations, observations, as well as document studies. The employment of multiple methods was, firstly, meant to understand the multiple perceptions, perspectives, contexts, and situations pertaining to staff. This reflects interpretivism. Secondly, the multiple methods enabled the operationalization of both within-method and between-method triangulations, which are critical requirements for qualitative data validation (Flick, 2004). The accounts provided by the staff of both organizations consisted of their own interpretations of their situations. Those accounts were validated with corroborative accounts by other staff, documents studied, meetings and observations.

The semi-structured interviews were disciplined by the Myers and Newman (2007) dramaturgical model of interviewing, which characterizes the interview as a drama. Social interaction and reciprocal influence between interviewer and interviewee are the central tenets of this drama. The interviewer is obliged to interact more than 'interview', because the interviewee knows more about the practice of organizing for DSI than the interviewer. Its benefits were the sustenance of the interview and the interviewee's greater willingness to provide needed data. Except for the secretaries of both organizations, all other staff members were interviewed. The secretaries were excluded, because they were not directly involved in organizing for DSI.

Generally, the interviews sought to understand how and why digital platforms and customer needs were being organized to innovate digital goods and services. Data collection on the processes of forming concepts (scanning) and developing technologies (improvising) were informed by Järvi et al. (2016), Barrett et al. (2015), Nylén and Holmström (2015), and Ye and Kankanhalli (2018); and data collection on providing digital services was informed by Lusch and Nambisan (2015) (see Appendix A). However, given that the staff had different schedules, the extent of interactions and corresponding responses differed according to schedule. Interactions with the executives and software engineers focused on leveraging digital platform capabilities as well as interpreting and

responding to customer needs. Interactions with the non-IT staff focused on their external relations with customers to know and respond to their needs, and internal relations with the executive and software engineers. All the interviews were digitally recorded after permissions were granted by the executives. Notes were taken during each interview, and all the digital audio was transcribed.

Besides the interviews at HatCom, there were five major meetings held with its staff that produced additional data about the organization and its DSI. Likewise, two meetings were held with the ApraTek staff before the interviews. One was with the CEO and the other was later, with all staff.

At both organizations, their physical spaces, arrangements of furniture, interfaces of different business applications being used, management practices, and customer support communications were being observed. They enabled some understanding of the structures and processes of DSI. For example, these spaces, arrangements, technologies, practices, and communications were shreds of evidence that both organizations were quite loosely or informally structured in terms of processes and procedures. The observations contributed to the triangulation of data on service exchange, heavy dependence on ITs, and the digital organizational context.

To complement the interviews and observations, the organizations' profiles, missions, visions, histories, and products were studied on their websites and flyers. The studies focused on understanding their range of technology solutions, services, customers, and success stories. This understanding contributed to the development of the semi-structured interview guides, and to questioning that elicited data on their digital organizing processes.

Data Analysis

The main unit of analysis is digital organizing – information processing, knowledge, structures, functions, and service innovation. In harmony with Weber's (1947) suggestion, data analysis began during the data collection and sought to explain relationships between digital organizing and DSI. Following the data collection and transcription of interview records, themes based on both pre-set and emergent coding processes were identified during the analysis. The analysis included careful readings of the nearly 300 pages of text transcribed from the interviews with staff of both organizations. Based on suggestions by Corbin and Strauss (2014) and Urquhart et al. (2010) for grounded theory coding, as well as Vaismoradi et al. (2016) for theming qualitative data, there was a manual search for statements made by interviewees on their responses on forming concepts, developing IT, and providing services. Given the aim to build a process and explanatory theory of DSI, manual search and interpretation were creative meaning-making exercises (Hunter et al., 2002) using disciplined imagination (Weick, 1989).

Open, axial, and selective codings were used to extract higher-level concepts and themes from the raw data (Corbin & Strauss, 2014; Urquhart et al., 2010). During open coding, meaningful statements in the data were interpreted based on the literature on digital platforms and customer needs, as well as on researcher creativity. These codes (emergent and pre-set) are first-level concepts and categories abstracted from the data. Further interpretation of these concepts (axial coding) involved linking them based on relationships understood from the literature, theory, and the narratives in the data. The linking was done by identifying the substantive digital organizing processes, their causal, contextual and moderating conditions, as well as their relationships and consequences. This was a further process of abstraction that resulted in the set of second-level concepts. During selective coding, the second-level concepts (axial codes) were further interpreted by abstracting the core or central themes. This was done by searching for the underlying causes and critical conditions for DSI to occur. All the different second-level concepts were compared and interpreted using the conditions, consequences, actions, and interactions understood during axial coding. Appendix B reveals more details about these codes and themes.

ORGANIZING FOR DIGITAL SERVICE INNOVATION

This section mixes the relevant empirical data with analysis. The purpose and benefit are easier appreciation of the interpretations and explanations, due to greater ease of referencing between the data and analysis. Thus, several direct quotes are included herein. This mixture mirrors the reflection between data collection and theory development. More raw data from the empirical study are presented in Appendix B.

The initial analysis of the data reveals that the two organizations were achieving DSI through six main organizing processes: *combining* customer needs and digital platforms, *internalizing* platforms, *creating* new applications, *surpassing customer needs*, *relating* with customers, *improvising* new applications. Further analysis (below) shows the interrelations between these processes and explanations of how digital platforms and customer needs are organized for DSI.

Combining Digital Platforms and Customer Needs

Digital platforms and customer needs were external to these organizations, yet they impacted heavily on DSI due to frequent changes in technology and information. For example, the ApraTek CEO noted, "So even today when I […] there's a problem, I say 'ok, can we use the available platforms we have to solve?'"
The HatCom CTO also said:

> So now there's a challenge and it needs to be solved. But we don't know how we're going to go about it. So then that is the starting point. So then trying to find out ok what technologies are out there that can be used to solve this problem?

Besides these platform considerations, they also considered customer needs and combined them with platform capabilities. For instance, the HatCom COO said, "Even before the… we start working on the idea, whenever the idea is shared, we … we all sit down and do some little research to see its viable, we contact few customers to see if they'll be interested." And an ApraTek engineer said, "so one is think […] and another is we get it directly from them […] and another is from the tech point of view, how best is it implemented?" In sum, the two organizations were combining knowledge about digital platforms and customer needs in order to develop, upgrade, and update software applications.

This was not only in response to present customer requests, but also in anticipation of future requests. Thus, the process of combining knowledge was two-fold: creating new software applications; and surpassing customer service expectations. The output of this two-fold process is labelled as *compound knowledge*. This compound knowledge was critical for DSI, because it enabled software engineers in both organizations to develop new digital applications which surpassed customer needs (this is analyzed fully below). For example, a senior software engineer of ApraTek said that although his CEO would want them to develop what the banks want, sometimes the CEO would suggest: "I feel this will make their work better so let's do it." Similarly, at HatCom, an engineer also said, "so you work on that and maybe you think of doing something extra so that they won't also ask something." Thus, although customers of both organizations understood their known needs better than software engineers did, the organizations understood the digital applications for addressing those needs better than customers did. On the whole, through the organizations' combined knowledge, which was superior to customers' knowledge, they were able to form customer needs by developing digital applications.

Internalizing Digital Platforms

The digital platforms constituted an external technological condition. According to Media Ecology theory, people's engagements with technologies cause them to internalize properties of the technology (ahead of its contents) (McLuhan, 1964; Strate, 2017). And indeed, internalization

occurred when the executives of the two organizations engaged with digital platforms. For example, on the HatCom CTO's engagement with digital platforms, he attested that "based on some of the new things that are coming up, it opens up your mind to other things that you can do." And because of the ApraTek CEO's engagements with software applications, he also said, "I can only program in my head … Though I cannot program, but I can tell you how you should write the code to make it work."

Thus, through internalization, digital media (platforms and applications) changed from external conditions to internal or mental conditions. These internalized media together grant the CTO and CEO *technical knowledge*. This knowledge is described as technical because digital media are technological. Because of their technical knowledge, when there was a problem, the solution was technological: "what technologies are out there that can be used to solve this problem?", said the HatCom CEO. And when there was technology, the solution was also technology: "I have seen this technology. What can I do with it?", he added. This technical knowledge was not used only for addressing emerging customer needs. It was also being used to develop new software applications that surpassed them.

In sum, these compound and technical knowledge types, based on the process of combining platforms and customer needs and the process of internalizing digital technologies, constitute the first level of knowledge organizing (labelled as *foundational knowledge organizing*) (Figure 1). Foundational knowledge organizing constitutes the direct basis within digital organizations for processes of creating new applications, serving customers, surpassing customer needs, and improvising new applications. The processes and resultant knowledge types are analyzed in the following sub-sections.

Figure 1

Foundational Knowledge Organizing
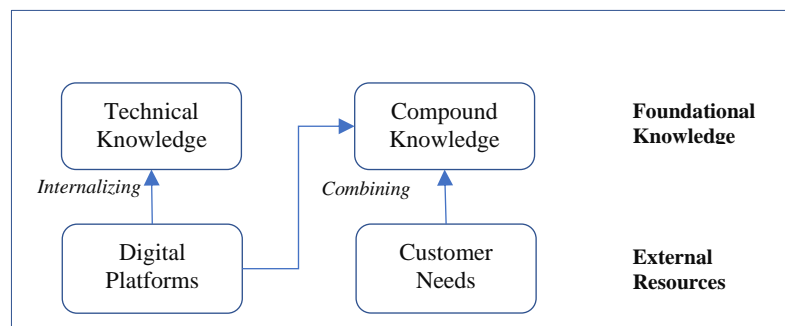
Creating New Applications

Both organizations were creating new software applications, because the digital goods innovated were not only informed by compound and technical knowledge, but also by imaginations and experiences. For example, the HatCom Platform Engineer noted, "ok go and sell the idea for the people, tell them you have this for them. Let them say, 'ok, it's a nice thing, you want it', and we say, 'ok, fine, we're going to kind of re-modify it for you to suit your need.' Then you come, give pressure [sic] to the developers to work." His COO also said, "so even though the customer hasn't come to request for it, but we think that it's something that would benefit them, we go ahead and develop it or work on it [all sic]." Such imagination arises from the almost limitless possibilities for virtualization and simulation of realities with information technology (Bailey et al., 2012; Kallinikos et al., 2013). In both organizations, these possibilities rested on prior compound knowledge and technical knowledge. For example, an ApraTek Software Engineer said, "I put myself in the situation

that, ok if I was a collector and I was out there in the sun, what would be the quick … the quickest way I would want to do this?" The quickest way was not a reference to a manual, but to the technological process of collecting monies, leading to less time spent in the sun.

This imagination was coupled with the engineers' and executives' experiences of dealing with customers. Their experiences also enabled them to imagine and suggest new solutions to what they believed were customer problems. The new solutions included upgrades and modifications. For example, another ApraTek Software Engineer noted, "as a developer, you need to make room for improvement, ok. So, when you're developing something, you need to make sure that in the future someone will be needing this, so you don't just do it once and for all." Creating these solutions (software applications), therefore, implies the presence of *original knowledge*.

Serving Customers

Serving customers enabled the staff to know the new and emerging needs of their customers. It also enabled them to anticipate future needs and use them to innovate digital services. For example, a HatCom software engineer said, "so the more you speak to customers and their needs leads to getting far more applications we're able to provide them with, it opens up more opportunities or more ideas about things." The ApraTek CEO also said: "if they have challenges, ok, they call you come and meet this team, you meet there, we discuss the challenges." The statements indicate that talking to customers alone is not sufficient for knowing what applications to provide them. Prior compound and technical knowledges were critical for identifying the relevant platform capabilities and the software applications to develop. Without compound knowledge and technical knowledge, this identification and development would be unguided and inefficient. However, with them, serving customers contributed to the renewal of staff knowledge by injecting new information into the existing stock of knowledge for re-processing. This implies staff development of lateral relationships with customers, leading to *renewed knowledge*.

Surpassing Customer Needs

The foundational knowledge also generated the process of surpassing customer needs. Surpassing implies, for example, that creating new applications was not a wild or random process, but a disciplined one, linked to customer needs. This is because an organization may be creating software applications that surpass customer needs, but which are far de-linked from those needs. An organization may aim at creating, without surpassing. However, the process of surpassing customer needs in both organizations was disciplined, and critical to the development of new software applications that were meant to be launchpads for DSI.

Thus, the Senior Software Engineer of ApraTek gave this testimony about his CEO: "Ok sometimes when he comes and it's from the bank he says that … 'these people say we should do this for them.' But other times he says, 'I feel this will make their work better, so let's do it.'" At HatCom, an engineer also said, "so you work on that and maybe you think of doing something extra so that they won't also ask something." Their colleagues corroborated these testimonies. For example, the ApraTek CEO said. "Then somebody tells us, 'no, we've done this for 10 years - 30 years now. It is not now that …' Yeah, so … getting the people to understand that this is a problem that needs to be solved is another one." [all sic] Likewise, a HatCom customer support officer said, "we try to engage them to make them more aware."

Without their foundational knowledge, they would not have been able to take such bold and disciplined DSI steps. The surpassing process implies the presence of *transcendent knowledge* for DSI. This knowledge type is labelled as transcendent because it was useful for anticipating and forming customer needs, and for disciplining the process of creating software applications.

Improvising New Applications

There were many instances of improvising new software applications in both organizations, which were testified to by their staff. Not all customer needs received by the organizations conformed to existing or proposed applications. Many of them required the development of new plug-ins, enhanced functionalities, or improved usability features for existing or proposed applications. Additionally, innovations in digital platforms were also demanding for improvisations to meet customer expectations. For example, in both organizations, Android Studio was constantly being updated with new libraries, especially those developed by other platform users and contributors. Similar updates characterized CodeIgniter and Laravel frameworks were used by their engineers. These improvisations and their releases were rapid. They contributed to DSI because, with time, they enhanced the engineer's capacities to respond to customer needs and platform innovations. The engineers' improvised because they knew how to rapidly scan, identify and exploit digital platforms to address changing customer needs. However, this rapid knowledge depended on the foundational knowledge that formed the basis of identifying new updates during scans, and of determining what to exploit to satisfy customer needs. Such improvisation is a process that implies that the organizations had acquired *rapid knowledge* for DSI.

In sum, original, renewed, transcendent and rapid knowledge types based on processes of creating, serving, surpassing, and improvising constitute the second level of knowledge organizing, based directly on the foundational knowledge. These knowledge types are together labelled as applied knowledge (Figure 2). Furthermore, both foundational and applied knowledge types are proposed as specific qualities of a service platform.

Figure 2

Applied Knowledge Organizing
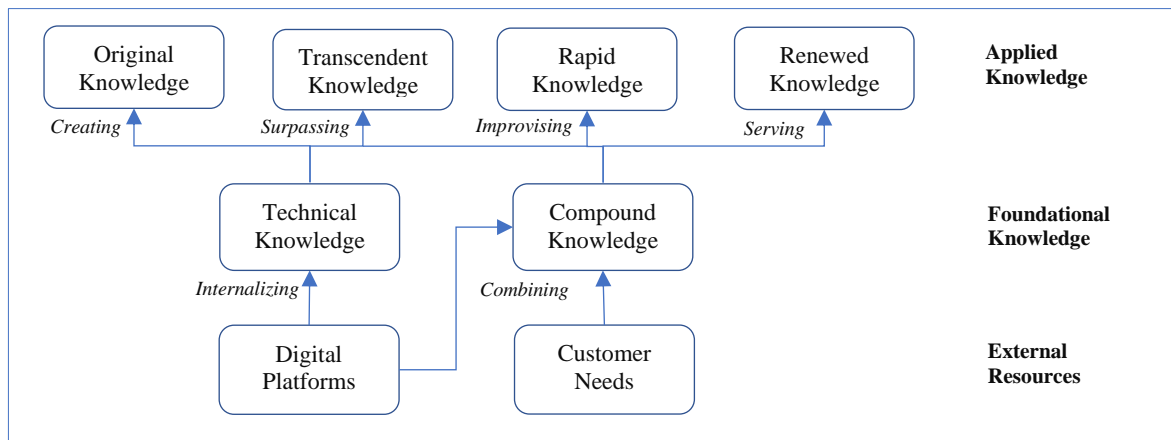
Knowledge Organizing for DSI

DSI in both organizations arose directly from their knowledge platforms. Both achieved DSI because their outputs were not just new digital goods, such as software and interfaces (Figure 3). The outputs were new digital services, which are evidenced by the new digital goods and the frequent exchanges of information about those goods between staff of both organizations and customers. Thus, both the empirical data and analysis reveal knowledge organizing processes of serving, through which both organizations were continually developing foundational and applied knowledge types. These are service provisions which exceed mere goods production. In both organizations, service exchanges based on knowledge organizing involved all staff including the executives and software engineers (not only the customer support staff). In fact, ApraTek did not even have an official or formal

position called customer support. In both organizations, all staff were continually receiving information about customer needs and responding to them with both digital goods and information about them.

Knowledge organizing by both organizations resulted in DSI, due to two main causal factors. The first is the need for novelty in providing digital services (which is the final cause of the knowledge organizing processes). The need for novelty will not leave a digital organization's knowledge platform in a potential state. It will cause the organization to continually develop foundational and applied knowledges by engaging with digital platforms and customers. The second is the innovation principle in digital platforms and in customer needs. Based on knowledge organizing processes, this principle travels through the digital organization to customers. It is more than information. It is information, knowing, and knowledge at the same time. This innovation principle deliberately pulled and pushed by the digital organization to staff and customers.

Knowledge organizing and the resultant knowledge types enabled both organizations to provide personalized services to their customers. Personalized services underscore value co-creation between organization (innovator) and customer (consumer), which lie at the heart of the service-dominant logic (Vargo & Lusch, 2004).

For example, the ApraTek CEO commented:

> In our society, people hardly have the ear to listen to what you're saying, they look at you, they listen to what you're saying through you, not what you're saying […] if they don't know you, the kind of data you're going to work with, for example, we have an HR system with a payroll. It is not so easy for somebody somewhere to say I'm going to upload all my salaries, no. [all sic]

Figure 3

Knowledge Organizing for DSI
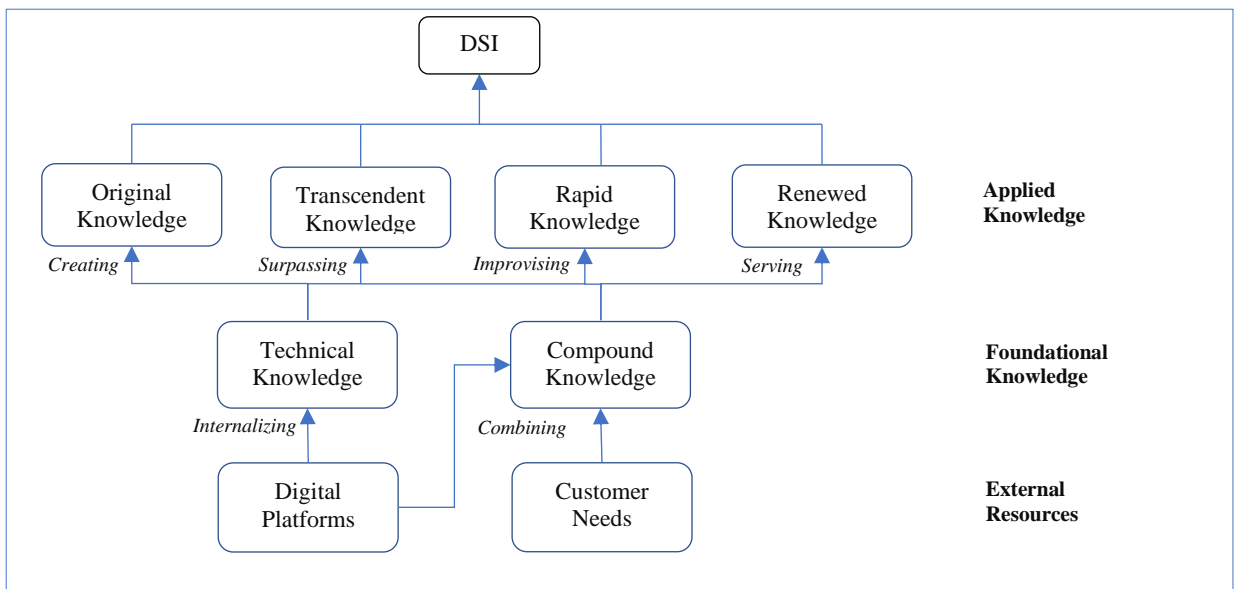
Note. DSI = Digital service innovation

This statement implies a relationship challenge that digital innovation and general customer relations alone cannot address. Faced with this challenge, the CEO used his organization's knowledge platform developed through knowledge organizing to build personalized relationships with

customers in order to address it. Thus, he said: "[…] so that one demands […] some personal knowledge; you know the person, you know what they do, whom they work for."

Using knowledge organizing to build personalized relationships was not only based on ApraTek's desire to surpass customer needs. It was also based on the customer's personalized knowledge of the organization as represented by a key officer such as the CEO. In this particular case, the issues of payroll and people's personal data in a 'foreign' organization's system is partly the cause of the relationship challenge. However, the problem goes beyond this particular case, because personalizing relationships is also caused by other generic factors, such as knowledge organizing, the resultant knowledge platform, novelty of software applications, organizational reputation, and liaison between the organization and the customer. Hence, knowledge organizing for DSI through personalized relationships implies that each relationship differs from others, and each one also evolves, subject to the degree of mutual knowledge between the organization and the customer.

DISCUSSION

Theoretical Contributions

The modelling of DSI in terms of knowledge organizing contributes new epistemological and ontological insights that complement existing theories. Knowledge organizing, which leads to foundational and applied knowledge types, resonates with Srivastava and Shainesh's (2015) idea of knowledge orchestration between providers (organizations) and users (customers), as well as with Ye and Kankanhalli's (2018) theory of user service innovation. This is because they also explain how knowledge shared between provider and user systems enables value creation in DSI. However, because this paper is predicated on knowledge organizing approach and inclusion of digital platforms, it has discovered foundational and applied knowledge types as new ideas, which complement Srivastava and Shainesh's idea of knowledge orchestration as well as Ye and Kankanhalli's idea of user service innovation.

Both foundational and knowledge types lie at the heart of the platform-organization part of DSI. This aspect is overlooked in Srivastava and Shainesh's theory, which focuses instead on the organization-customer aspect. By explaining the role of the platform-organization aspect in terms of foundational and applied knowledge types, our understanding of DSI is enhanced with the specific knowledge organizing processes and specific knowledge outcomes. The knowledge organizing processes of combining customer needs and digital platforms, internalizing platforms, creating new applications, surpassing customer needs, relating with customers, and improvising new applications, together provide a deeper understanding of DSI. This is because they explain the digital platform basis underlying knowledge orchestration of provider-user (or organization-customer) relations in their theory. Consequently, the processes which occur at the interface between provider and customer in Srivastava and Shainesh's theory are given a deeper explanation herein.

Similarly, the knowledge organizing outcomes described as compound, technical, rapid, transcendent, original, and renewed, together deepen our understanding of DSI because their interrelations constitute a knowledge structure linking digital platforms to digital services. Given that this structure derives considerably from digital platforms, it is enriched with platform innovations that have enabled the characterization of both organizations' service platforms in terms of foundational and applied knowledge types. Therefore, from the proposed knowledge structure in Figure 3, we gain new understanding of how DSI arises from platform innovation. So far, this innovation chain linking digital platforms to digital services is not clear from the theories of Srivastava and Shainesh, as well as Ye and Kankanhalli. However, the proposed knowledge structure has clarified the linkage, by providing us with a new structural explanation of how digital platform innovation translates into DSI.

The knowledge organizing processes and types as well as knowledge structure found from this research accounts at once for platform, organization and user and their interrelations in DSI. Together, the ideas of platform, organization, user and their interrelations constitute a theoretical span, which is more comprehensive than previous research. Previous research accounts for aspects of these ideas. Therefore, the proposed DSI model is not only deeper, but also broader than previous ones. It also has comparatively more specific constructs to define knowledge organizing processes and structure. For example, Ye and Kankanhalli's explanation of the roles of design autonomy and toolkit support (their key independent variables) in user service innovation provide organizational descriptions of user innovation. However, those descriptions do not explain specific knowledge organizing processes, which are critical to user innovation. Indeed, a digital organization may fully understand and implement design autonomy and toolkit support; yet its staff may lack understanding of how to organize knowledge from digital platforms and customer needs for DSI. Similarly, without this paper's contributions, researchers who use their user innovation theory to study underlying organizing processes would not have adequate explanatory tools to explain DSI practices.

For instance, Bonina et al. (2021) have recently commented on how core digital platform are characterized by "the ability to attract capabilities and resources from the global marketplace and combine them with African entrepreneurship and deep knowledge of local markets to advance their position" (p. 882). However, their paper only points to the significance of mobilizing 'deep knowledge' in the local context for development, without explaining how the knowledge may be organized by African entrepreneurs. Even though the research behind the current paper was conducted before the publication of theirs, the knowledge organizing processes, types and structure proposed here provide an explanation based on two African digital organizations. Thus, the proposed DSI theory constitutes a valuable explanatory framework to address their question, "what do digital platforms mean for development?" This is because it contends that digital platforms and deep contextual knowledge are mobilized through knowledge organizing processes that yield foundational and applied knowledges for DSI, ensuring development of digital organizations, digital services, and consumers.

Practical Implications

These theoretical contributions suggest a knowledge organizing approach to thinking about and practicing DSI. Compared with the other perspectives discussed in this paper, this perspective directs managers' attention to specific organizing processes, as well as resultant foundational and applied knowledges, in order to leverage digital platforms and customer needs. For example, it suggests that managers ought to practically create enabling environments for these knowledge processes and types in order to achieve competitive advantage. Hopefully, managers will see this proposed knowledge approach to DSI as a critical link between digital platforms and organizational competitiveness, which has to be practiced on a day-to-day basis. The practice ought to involve conscious processes of organizing knowledge, deriving specific knowledge types from digital platforms and customer needs, and developing a knowledge structure for sustainable innovation.

Digital platforms and customer needs that lie outside the organization do not automatically make these knowledge organizing processes and knowledge types effective. Nor do they automatically generate an effective knowledge structure and competitive advantage. Therefore, managers ought to commit resources to enable the flow of innovation and information from these critical external resources (digital platforms and customer needs) into the organization. They should create an environment for staff members to actively and continuously engage with digital platforms and customers as much as they engage among themselves. For example, training programmes that expose even non-technical staff to digital platforms, which equip them with skills to identify customer needs, and which enable them synergistically organize knowledge from the platforms and the needs, would increase organizational competitiveness.

When, organizations frequently sponsor their staff to participate in local and international conferences on digital platforms and service innovation, when they also effectively lead staff to practice knowledge organizing through teamwork, brainstorming sessions, and frequent conversations with customers, they will be practicalizing the link between platforms and competitiveness. Such practical steps are needed because digital platforms and customer needs are critical resources obtained from the organization's external environment (and hence outside the organization's control), but they must be consciously and conscientiously organized within it.

The proposed DSI theory should also lead managers to emphasize the conversion of knowledge organizing processes into knowledge structure. Both the conversion and resultant knowledge structure are emphasized as critical for organizational competitiveness, but they can easily escape managers' attention. This escape usually occurs due to high attention paid to visible and pressing issues such as software development, customer support, marketing campaigns, and sales for profit. There is also the traditional organizational processes and structure that has been institutionalized in organizations, further obscuring knowledge organizing and structure. However, knowledge organizing and structure are real and valuable internal resources for DSI which, as this paper indicates, are better foundations for achieving organizational competitiveness than traditional organizing processes and structure.

Limitations and Research Implications

The proposed DSI model is more explanative than predictive, due to the limited empirical study breadth and relatively small sample. However, the empirical study has depth, and the case description and data show the presence of social mechanisms (Avgerou, 2013) that adequately explain DSI. Social mechanisms are human actions that explain the creation of a social phenomenon. Thus, customer needs, digital platforms, and knowledge organizing and structure constitute social mechanisms that explain how and why DSI occurs. While these mechanisms are not determinate, they have been unearthed through this analysis and found to be strong bases of DSI. These are social mechanisms that can be transferred by research and practice to other DSI contexts.

To address the low-prediction limitation, the theory ought to be used to deduce a conceptual framework for testing using a larger sample. Aspects of its depth may be lost, but its breadth will increase for statistical generalizability. Besides this, more specific metrics of knowledge organizing, types, and structures can be developed for both research and management purposes. The application ought to be in contexts where digital platforms, customer needs, and DSI are critical for sustaining competitiveness. In this application, further exploration of knowledge organizing processes and elaboration of the knowledge types and structure are in order. They can lead researchers to seek an understanding of how they are caused by or related to specific organizational practices, such as stakeholder engagement, software testing, virtual teamwork, tele sales, service quality, technology implementation, and platform dependence.

The proposed DSI model is also useful as an explanatory framework for further inductive analysis in future research. That is, it can be used as an independent variable to either approach or explain any dependent variable in organizing for DSI. For example, its influence on competitiveness can be researched to develop new theories of digital competitiveness, business intelligence, organizational resilience, and digital transformation. In such research, the elaborate knowledge structure will enable the researcher to identify the key focal constructs during empirical studies. The explanations of relationships among the constructs will also arm the researcher with interpretive tools for data analysis.

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Appendix A

Interview Guide

Forming concepts (need-related)	Developing technologies (solution-related)	Providing services (value-related)
Present	*requirements specification*	*interactions*
What services does the company currently provide customers?	How does the company process (analyse, coordinate, manage, and prioritise) information about customer needs and ICTs (service requirements)? Why?	Which ways does the company interact with users? Why?
How long have you been providing these services?	Which people? How and why?	Which ways does the company interact with other collaborating companies? Why?
Do these services make this company different? how and why?	What tools? How and why?	Which ways does the company interact with distributers/resellers? Why?
What is your personal/professional role in providing those services?	What times? How and why?	Which ways does the company interact with your suppliers? Why?
What specific benefits do customers get from these services? how and why?	Which places? How and why?	What is your purpose of interacting with these stakeholders?
How do you get to know customers' needs?	What communications? How and why?	Do your interactions with them impact your delivery of new services? How and why?
How does the company know the customers' have not met those needs? why?		
How does the company know the customers' have met those needs? why?	*toolkit support*	*engagements*
How does the company know your services satisfy your customers? why?	*effort*	What roles do your customers play in your delivery of new services? How and why?
How does the company know your services do not or have not satisfied your customers? why?	How do technology platforms (Android, iOS, Laravel, SMS Protocol, etc.) make it <u>easy</u> for you to develop your technologies? Why?	What roles do your potential customers play in your delivery of new services? How and why?
What ICTs (infrastructures, platforms, frameworks, protocols, etc.) do you use to provide the services?	How do technology platforms (Android, iOS, Laravel, SMS Protocol, etc.) make it <u>difficult</u> for you to develop your technologies? Why?	What are the different experiences you want the users to enjoy with your services? Why and how?
… how do you use each of them?	… SDK	Do you think that users of your services achieve these experiences? Why and how?
… why do you use each of them?	… API	Do these roles they impact your delivery of new services? How and why?
How did the company identify the ICTs for providing the services?	… app configuration and publication	
How did the company know that the ICTs would enable it provide the services?		*adaptations*

Forming concepts (need-related)	Developing technologies (solution-related)	Providing services (value-related)
What other stakeholders (technological, organizational, user, legal, financial, etc.) are involved in the company's provision of services?	*exploration*	Has the company changed any of your services in order to align with another company? Why and how?
	Do any of the technology platforms you use make you do searching and exploring?	What internal arrangements have you made in the company to accommodate users' ideas?
future	Do any of the technology platforms you use allow you to use designs of other developers? how and why?	Do these changes and arrangements impact your delivery of new services? How and why?
What new services does the company want to provide customers in future?	does any of the technology platforms you use allow you to try new ideas? how and why?	
How long has the company been thinking about them?		
Will they make this company different? How and why?	*development autonomy*	
What personal/professional role will you play in providing those services?	*scheduling autonomy*	
What specific benefits will customers get from these services? how and why?	Do you have freedom to schedule your development work on technology platforms? how and why?	
How did the company get to know customers' needs?	Do you have freedom to sequence your development work on technology platforms? how and why?	
How and why did the company know the customers' have not met those needs?		
How and why did the company know the customers' have met those needs?	*work-method autonomy*	
Why is the company not providing the services yet?	Do the technology platforms you use have strong strong rules about how you may develop technology? why and how?	
When will the company start providing them to customers? Why?	… contract terms and conditions	
What ICTs (infrastructures, platforms, frameworks, protocols, etc.) will the company use to provide the services?	… programming language policies	
… why will you use each of them?	… design and interface guidelines	
… how will you use each of them?	… publishing and downloading requirements	
How will the company identify the ICTs to provide the services?		
How will the company know that the ICTs will enable it provide the services?	*decision-making autonomy*	

Forming concepts (need-related)	Developing technologies (solution-related)	Providing services (value-related)
	Do the technology platforms you use have strong rules about what kind of technologies you may develop? why and how?	
past	… criteria for evaluation, rewards and punishment	
What are the services the company used to provide customers in the past?	… review guidelines	
How long did the company provide them? how and why?		
Did they make this company different? how and why?	*improvisation (some also for CEO/MD)*	
What personal/professional role did you play in providing those services?	How do technology platforms (Android, iOS, Laravel, SMS Protocol, etc.) make it <u>easy</u> for you to reconfigure your technologies? why?	
What specific benefits did customers get from these services? how and why?	How do technology platforms (Android, iOS, Laravel, SMS Protocol, etc.) make it <u>difficult</u> for you to reconfigure your technologies? why?	
How did the company get to know customers' needs?	Does the company's management allow you space and time to be creative in your technology development work? wow and why?	
How and why did the company know the customers' had not met those needs?	(CEO/MD) how do you allow your Software Engineers to improvise when they are developing technologies? why?	
How and why did the company know the customers' had met those needs?		
When did the company stop providing the services? Why?	*coordination*	
What ICTs (infrastructures, platforms, frameworks, protocols, etc.) did the company use to provide those services?	How do you coordinate your technology development work with other developers in this company? why?	
… why did you use each of them?	How do you coordinate your technology development work with other staff in this company? why?	
… how did you use each of them?	Do you collaborate with other developers outside this company to develop your technologies?	
How did the company identify the ICTs to provide the services?	Do you collaborate with customers to develop your technologies?	

Forming concepts (need-related)	Developing technologies (solution-related)	Providing services (value-related)
How did the company know that the ICTs would enable it provide the services?	(CEO/MD)how do you manage the technology development work by your Software Engineers? Why?	

Appendix B

Coding and Themes

Raw Statements (keywords underlined)	Open Coding (concepts)	Axial Coding	Selective Coding (themes)
Foundational Knowledge Organizing			
I have seen this <u>technology</u>. What can I do with it? Then there's the other part where, ok I've seen there's a problem that <u>needs</u> to be solved.	• Combining digital platforms and customer needs • Digital platform • Customer need • Compound knowledge • Superior knowledge	• Combining digital platforms and customer needs reflect development of compound knowledge • Internalizing digital platforms reflect development of technical knowledge	Digital platforms and customer needs generate compound and technical knowledge
So now there's a challenge and it <u>needs</u> to be solved. But we don't know how we're going to go about it. So then that is the starting point. So then trying to find out ok 'what <u>technologies</u> are out there that can be used to solve this problem?'			
We were using the Scrum … the agile development process. So we develop <u>prototype</u>, we give it to the client, they give us <u>feedback</u>, yeah.			
Currently it's more of they bring the <u>idea</u> then we develop it, then we push <u>it</u> out there, then we keep improving.			
The initial thing I did was, after seeing the <u>problem</u>, then ok, I study to see 'do we have a <u>technology</u> that can solve this?'			
So even today when I … there's a <u>problem</u>, I say 'ok, can we use the available <u>platforms</u> we have to solve?'			
For us, we're a <u>technology</u> organization. So without technology we wouldn't even exist as an organization.	• Internalizing digital platforms • Customer need • Technical knowledge		
… based on some of the new things that are coming up, <u>it</u> opens up your mind to other things that you can do.			
I have seen this <u>technology</u>. What can I do with it?			
The way to curb the challenge is all about learning, learning, learning, learning, and knowing more about <u>technologies</u> as they come about.			
I can only <u>programme in my head.</u>			
Though I cannot programme, but <u>I can tell you how you should write the code</u> to make it work.			
Whatever we send out, that one <u>I understand what exactly it does,</u> and how it is done, and what can be done.			
Applied Knowledge Organizing			
So the more you <u>speak to customers and their needs</u> leads to getting far more applications we're able to provide them with, it opens up more opportunities or more ideas about things.	• Serving customers	• Serving customers based on compound and technical	Renewed, rapid, transcendent and original

Raw Statements (keywords underlined)	Open Coding (concepts)	Axial Coding	Selective Coding (themes)
If they have challenges, ok, they call you <u>come and meet this team</u>, you meet there, we discuss the challenges.	• Compound knowledge • Technical knowledge • Renewed knowledge	knowledge types leads to renewed knowledge • Improvising new applications based on compound and technical knowledge types lead to rapid knowledge • Surpassing customer needs based on compound and technical knowledge types lead to transcendent knowledge • Creating new applications based on compound and technical knowledge leads to original knowledge	knowledge lead to DSI
she gathers their feedback, she finds out their experiences with the system, any challenges, any recommendations that they have […] so that's one way that we're <u>able to interact with our existing customers</u> and get their needs.			
We always like to follow up and find out what we can do to make sure that at least <u>our customer is happy.</u>			
That's as per what I have seen when I go out there <u>to meet them.</u>			
<u>Talks to them and then listens</u> to what they have.			
<u>We went to the … to the place directly, and then we had a talk</u> with to some of their managers.			
There are some people who are having some challenges with one of these apps, may be do it and push to this email, <u>they'll be communicating with you</u> directly.			
Based on what I've gathered from them, and then I come and … may be add a feature or improve on something that they it to be improved, yeah. So I speak with them. And it's like <u>every semester they have to call me.</u>			
I have to also make sure that ok this <u>customer has been … is well taken care of, because if they have issues they'll call me</u>. And some of them too because … most of our clients we get from referrals.			
So you realize is, to send a thousand calls, I have to make sure that like the SIMs are active, <u>doing re-tries, re-sending, and stuff like that.</u> So that bit of it too is tiring, because even on weekends …	• Improvising new applications • Compound knowledge • Technical knowledge • Rapid knowledge		
So you realize that after it's done, the person will not even get up to like 60%, 70% delivery, aha. So <u>I just try to re-strategize in a way that I can manually push to the server, even before the re-trying times, I'll just push, push, push …</u>			
… and then you can't tell them that our current infrastructure cannot support. So it means that the <u>human resource bit that is handling this has to go the extra mile and everything</u>			
And you realize the person will state like 10 needs, and then currently you have like 6 or 7. Then, aha … so you <u>state the remaining and then maybe you'll put it somewhere …</u>			
… right now it's not straightforward for the user. So … that's why <u>I adapted the text and email notification as a way of notifying the user.</u>			

Raw Statements (keywords underlined)	Open Coding (concepts)	Axial Coding	Selective Coding (themes)
But I'm mostly concerned with <u>what we have and how well it's performing</u> … I'm mostly into performance, performance … you may do all the things, but you click something, it takes 2 minutes to load. That's very bad. So I find myself doing a lot of profiling and all that.			
It was an <u>addition,</u> where we had added some values to some values that we should not have added.			
We want this project, oh can you <u>finish in the next month</u>?			
So we check what they do, and study the <u>problems and challenges they will be facing.</u>			
So you work on that and may be you think of <u>doing something extra</u> so that they won't also ask something.			
… explaining things to people, explaining problems to people. So sometimes even the people <u>don't even know the problem is a problem.</u>			
We design solutions in such a way that what they're coming to do is just coming to <u>fit in the solution.</u>			
You need to see the problem by yourself, <u>solve it, and go and tell them</u> this is the problem.			
To deal with unhealthy competition, we don't study the competition, we may not even care about that, we need to just understand what we have done and make it <u>what we think it should be</u>, and present it that way.	• Surpassing customer needs • Compound knowledge • Technical knowledge • Transcendent knowledge		
These people say we should do this for them … <u>I feel this will make their work better</u> so let's do it, yeah.			
I put myself in the situation that, ok if I was a collector and I was out there in the sun, <u>what would be the quick … the quickest way</u> I would want to do this?			
The people who require the applications <u>they don't know what they want.</u>			
So sometimes you have to use tech … you know how the thing people actually use it, and how it works, and <u>how it's going to be if in future</u> somebody is using.			
… that's one thing that I've learnt that as time goes by, <u>clients are always demanding new things,</u> ok, into the app … new things in the app. So you have to make provision for that.			
Ok go and sell the <u>idea</u> for the people, tell then you have this for them. Let them say, 'ok, it's a nice thing, you want it, and we say, 'ok, fine,	• Creating new applications		

Raw Statements (keywords underlined)	Open Coding (concepts)	Axial Coding	Selective Coding (themes)
we're going to kind of <u>re-modify</u> it for you to suit your need.' Then you come, give pressure to the developers to work.	• Compound knowledge • Technical knowledge • Original knowledge •		
I put myself in the situation that, ok if I was a collector and I was out there in the sun, <u>what would be the quick … the quickest way</u> I would want to do this?			
As a developer, you need to make room for <u>improvement</u>, ok. So when you're developing something, you need to make sure that <u>in the future someone will be needing this</u>, so you don't just do it just once and for all.			
So even though the customer hasn't come to request for it, but we think that it's something that would benefit the, we go ahead and develop it or work on it.			