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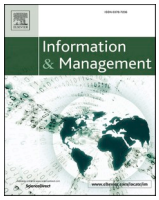

Orchestrating digital technologies with incumbent enterprise systems for attaining innovation

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ABSTRACT

In the late 1990s, most organizations adopted enterprise systems (ES) to automate their core business processes. The very same organizations are presented with a new wave of opportunities to innovate with digital technologies—technologies that purport to have diametrically opposed characteristics to ES. This study explores how organizations integrate digital technologies with their incumbent ES for attaining innovation. The study followed a qualitative approach and gathered data from four organizations consisting of six such projects. By applying a unique theoretical foundation, this study derives interesting insights into the orchestration process of ES and digital technologies for attaining innovation.

1. Introduction

Digitalization of business processes using digital technologies is making a substantial impact on contemporary organizations [60]. Prior researchers, as well as practitioners, argue that these digital technologies (i.e., cloud computing, social media, mobile technologies, artificial intelligence, business analytics, internet-of-things, and robotics) could present innovative approaches for organizations to innovate [8,48,60]. The introduction of digital technologies to the existing corporate information technologies would facilitate innovation in the organization, value creation for the customers, and thereby provide a competitive edge for the organization [88]. Considering the affordability, accessibility, growth, and myriad benefits of digital technologies, contemporary organizations are keen to exploit the capabilities of digital technologies [64]. However, organizations purport facing new challenges when trying to integrate digital technologies into their existing corporate technology landscape dominated by their enterprise systems (ES).

Historically, ES played a substantial role in facilitating innovation through business process standardization [75], introduction of process orientation [25], integration of business silos [66], enhancing corporate governance [32], introduction of best practices [91], and increasing platform stability [94]. As such, over 90% of the Fortune 1000 companies and a substantial proportion of medium-sized organizations have implemented ES for managing their common core business processes [34,47,67]. However, some studies question the ES value propositions for continuous innovation, highlighting the rigid nature of ES that precludes dynamic changes [38], its costly upgrades, and its overall inability to facilitate lifecycle-wide innovation [56,68]. Practitioner outlets such as The Economist, identify ES as 'liquid concrete,' writing, "people still haven't forgotten the old joke that implementing SAP [a leading ES] is like pouring concrete into a company," highlighting the notorious inflexibility of ES. In recent years, the stability of corporate-wide ES allowed organizations to transform the role of the ES from a functional system to a technology platform [11,29], allowing various digital technologies to be 'plugged-in' to the ES. As such, ES as a platform is gaining traction as it facilitates wide-spread adoption across industry sectors and promotes open platform enterprise architectures [30,74]. Gawer [28] recognizes that an ES can act as a foundation for other types of information technology (IT) applications to be integrated. Similarly, Vom Brocke et al. [89] and Sedera et al. [68] concur with this view and highlight how an ES serves as a technology platform allowing integration of other applications.

Anecdotal commentary provides examples of organizations that have derived value by integrating digital technologies to their ES [50]. As Ciarli et al. [14] highlight, digital technologies play a key role in

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promoting innovation in contemporary organizations. The innovation-favoring qualities of digital technologies, for example ease of adoption, ease of use, cost efficiency, and ease of connectivity, break barriers for innovation [12,61]. Furthermore, digital technologies like cloud and mobile technologies can extend the technology platform beyond the organization. As a result, most organizations are presented with opportunities to innovate with digital technologies, minimizing the substantial resource requirements for ES-led innovation that traditionally favored only the resourceful organizations [76,97]. Moreover, digital technologies have the potential to unleash "a wave of both innovation and hype" ([14], p. 1), flexible, and catering to both external and internal business stakeholders.

Though the importance of integrating digital technologies with ES is described in several practitioner outlets (e.g. [4,9]), there remains limited research on this emerging phenomenon. To explore and understand the intricate relationship between digital technologies and ES in attaining organizational innovation, this research attempts to explore the overarching research question of:

How do organizations integrate their incumbent enterprise system with contemporary digital technologies for attaining organizational innovation?

This study attempts to uncover the salient aspects of how organizations integrate their existing ES with digital technologies for attaining organizational innovation. The term 'incumbent' relates to the very nature of ES, in which the system is highly embedded in one's work processes [36]. In doing so, this research provides a theoretical perspective on the individual roles of ES and digital technologies, and their conjoined assembly, launch, and management for organizational innovation. To investigate this phenomenon, the study followed an interpretive qualitative approach [40,45,63], using instrumental orchestration theory [82] as the sensitizing theoretical device. We gathered data from chief information officers (CIOs), senior IT managers, and line-of-business managers.

This paper is structured as follows. First, the background of the study is provided, highlighting the research gap. Then, the methodology followed in the study is presented, providing an overview of the data collection, case descriptions, and data analysis process. The study findings are presented next, followed by the technology orchestration process derived through the analysis. The conclusion section details the academic contributions, practical contributions, limitations, and recommendations for future research.

2. Background

This section summarizes extant understanding in relation to the core aspects of the study. We begin by introducing the role of technology in organizational innovation, narrowing the scope to the roles of ES and digital technologies in facilitating organizational innovation. This section concludes with a detailed discussion of the theoretical gap of the study domain.

2.1. Attaining organizational innovation through technology

Innovation is a vital aspect for organizational competitiveness [87,93]. It is considered the lifeblood of organizations, and as a result has been a commonly studied area of research [27]. The term 'innovation' in this study captures 'organizational innovation' which includes product and process innovation. Considering such contexts, organizational innovation is defined in this study using Crossan and Apaydin's ([17], p. 1155) definition as "production or adoption, assimilation, and exploitation of a value-added novelty in economic and social spheres; renewal and enlargement of products, services, and markets; development of new methods of production; and establishment of new management systems." This definition captures innovation as something new (e.g. [26]) and as an adopted (imitated) initiative as well.

Technology has a dual role in facilitating or triggering organizational innovation. Nambisan [57] used the terms 'operand' and 'operant' respectively, for this observed duality. In its early stages, the role of technology in organizational innovation was seemingly simple, where the process of digitization (simply meaning converting analogue to digital) itself was "novel" to an organization. Yet, for contemporary organizations, technology's role in innovation is a complex, coevolutionary, multistakeholder phenomenon [27]. Therein, innovation efforts involve diverse actors [27] and technologies [49], with varying capabilities, susceptible to contextual factors [85]. For example, innovation approaches have become more open [53,60], where stakeholders combine knowledge internal and external to the organizational boundaries [83], involve new technology providers, platform providers, technology designers, service brokers, and recipients [62]; it is dynamic [78], with a functional focus [80] for short-term gains [64]. With the consumerization sof IT, organizations have the capacity to include customers to expand their innovations way beyond the traditional organizational boundaries, measured in distance, scope, and time [51]. Such intensities in the current innovation environment have made the innovation process quick, unpredictable, and unstable [22,41].

2.2. The role of enterprise systems and digital technologies for innovation

As described by Davenport [[21], p.122] the advent of ES was one of the most crucial IT developments in the 1990s. An ES provides organizations with "new opportunities to acquire knowledge from external sources, develop common cognitive structures among employees from different functional areas and implement new routines and processes" ([73], p. 54). In the past decade, the role of an ES has changed from a functionally oriented system to a technology platform [28]. A mature ES focuses on enhancing operational efficiency and the effectiveness of existing business processes [67]. Furthermore, ES has the potential to act as a foundation for integration of other non-ES applications [11], possibly increasing the innovation potential.

For example, the introduction of ES is considered an innovation in existing business processes and practices as it allows organizations to integrate, centralize data, and standardize business processes [31,67]. ES acts as a platform, allowing active and real-time collaboration [52,57]. In recent times, ES has been lauded for its ability to act as a basis for other integration of applications [96]. For example, the nature of ES facilitates widespread adoption in diverse industries with the introduction of open platform architectures, such as SAP's NetWeaver [30,74]. Gawer [28] further attests that an ES acts as a building block, allowing integration of new products or digital technologies. Such characteristics demonstrate the role of ES as a platform enabling innovation in the organization. However, ES's role in continuous contributions to organizational innovation has been questioned due to its costly upgrades, lack of flexibility for dynamic and ongoing changes, and issues associated with organizational changes [43,68].

Since 2000, organizations have had the opportunity to adopt new digital technologies [62]. Here the term 'digital technologies' refers to resources that include distributed IT solutions that depend on ubiquitous and diverse network protocols [96]. In particular, we conceptualize digital technologies according to Piccoli et al. [64] as modular digital resources that encapsulate objects of value or capabilities and are accessible through a programmatic interface. Information systems scholars have explored the impact and influence of digital technologies [37,62], such as the strong association between digital technologies and innovation in organizations [58,68], and how such technologies have created an ecosystem of new collaborators, resources, and practices beyond the traditional technology ecosystem boundaries [10,56] thereby challenging the traditional process of innovation [1,39,52,96]. Researchers highlight the ease of deployment, cost efficiency, accessibility, availability [33], ability to create collaborative organizational networks [70], and ease of learning of such technologies as characteristics that facilitate innovation. These characteristics suggest the

catalytic nature of digital technologies that minimize barriers for innovation [57,64].

Digital technologies tend to inspire novel ways of innovation in the organization [57]. Moreover, the value of digital technologies is said to be augmented when they are integrated into a stable ES platform [68]. For example, Goldcorp introduced a connected mine that provides safer, sustainable, and efficient processes through the integration of ES, artificial intelligence, and internet of things applications [50]. While practitioners are currently exploiting such opportunities, reaping the benefits of integrating ES and digital technologies to attain innovation requires a cohesive understanding that looks at the nature and characteristics of each of the technologies. As such, understanding the process of how incumbent ES can be integrated with digital technologies for organizational innovation is timely and important.

2.3. Existing theoretical knowledge

There has been a rich discourse in academic studies attempting to understand the role of technologies in organizational innovation [57,60,64,95]. Several dominant theories have been advanced in the academic literature to guide this discourse on the technologies, their unique characteristics, and their contribution to aspects like productivity, competitiveness, and innovation. For example, such theories as dynamic capabilities [81], resource-based view (RBV) of the firm [5], configuration theory [90], and the contingent RBV [3] explain broad resource management and how organizations attain a competitive advantage through such management. However, such theories are often criticized for their lack of perspective on how resources of varying types are bundled to yield organizational innovation. Sirmon et al. [[71], p.273] argues that "to realize value creation, organizations must accumulate, combine, and exploit resources." To assist in this perspective, Sirmon et al. [72] introduced the resource orchestration theory, which provides a framework that focuses on managers' roles in resource management to achieve competitive advantage. Resource orchestration helps organizations to "build complementary resource portfolios with an organic couple between emerging and original resources" ([98], p. 4). For example, orchestration allows organizations to innovate, maximize resource value, improve existing products/services, and create new products/services [2]. Overall, the resource orchestration theory goes beyond the resource classifications of valuable, rare, inimitable, and nonsubstitutable nature of resources, and argues that the competitive edge is obtained not by the mere possession of resources, but rather through their various configurations [18,19]. According to Li and Jia [46], orchestration of resources entails (i) searching for and selecting resources and (ii) configuring and deploying resources. While the resource orchestration theory offers a possible theoretical foundation for explaining the overall phenomenon of integrating ES and digital technologies, it fails to highlight the context, situational need, specific characteristics of each technology type, and role of the innovation initiator.

Especially when considering the (i) diametrically opposing characteristics between ES and digital technologies, (ii) substantial footprint that ES has in organizational business processes, (iii) plateauing innovation capabilities of ES, (iv) growing interest in ES as a platform, (v) ability of digital technology to be easily integrated into ES, (vi) the emerging decentralization of technology-related decision-making, and (vii) the relative affordability, scalability, and trialability of digital technologies, there are opportunities for researchers to investigate new theoretical foundations on organizations integrating their incumbent ES with new digital technologies for attaining innovation.

3. Research methodology

This study used a qualitative approach to investigate the aforementioned theoretical gaps and to understand how the contemporary digital technologies are integrated into incumbent ES to attain organizational innovation. With such a qualitative approach, researchers can identify characteristics, reasons, and activities considered by organizations when integrating ES with digital technologies for attaining innovation. The interpretive method was adopted for two main reasons: (i) considering the novelty and limited understanding of the study phenomenon [24] and (ii) the multifaceted nature of innovation attained through the integration of ES and digital technologies deemed suitable for this method [40]. The method followed herein uses the guidelines of Klein and Myers [40] and Walsham [92], and has been used by Pan and Tan [63] and Leong et al. [45], among others.

3.1. Data collection

The study gathered data using a purposive, snowballing sampling method. We sought companies that had packaged ES implemented in their organizations and that were in the onward and upward phase of the ES implementation lifecycle [55]. Preference was given to those companies with popular ES such as SAP or an established vendor, making the study applicable to a wide audience and hence increasing the generalizability of our findings. When selecting the organizations, a clear distinction was made to select only 'brick-and-mortar' companies rather than 'born-digital' companies. This is because brick-and-mortar companies, unlike e-commerce companies and technology platform providers, have a strong presence of on-premises ES. It has been established that an organization typically takes 5 years after ES implementation to reach the onward and upward phase [54]. When selecting the cases, the following criteria were taken into consideration:

1. The organization must have a dedicated IT team (including a senior IT Lead[1]) that manages the collection of technologies of the organizations
2. The organization must have a mature ES
3. The organization must have initiated an innovative IT project using digital technologies and ES
4. The CIO of the organization is not in transit, as CIOs who are in-transit rarely initiate strategic projects.

Data were collected from four companies, referred to here as LOGI, MULTI, FARM, and INSURANCE[2]. LOGI has operations in Europe and Australia, while MULTI operates on several continents. FARM is a large producer of fruits and vegetables in Australia. INSURANCE is a leading South Asian insurance provider that has won several innovation awards. The cases were selected to (i) extend the characteristics of the sample to varying types of ES (e.g., SAP, AS400), (ii) increase the diversity of contexts, and (iii) observe the governance structures for ES and digital technologies. In all four cases, one or two successful innovations obtained through the integration of ES and digital technologies were observed. The case organizations FARM and INSURANCE includes 2 projects, titled Project 1 and Project 2. The decision to include an additional project was guided by the snowballing sampling, where the additional project provided information that otherwise was incomplete or missing in the original project. As such, the reasons for including these additional projects were based purely on our sampling logic, with the objective of increasing the validity and reliability of our analysis.

Data collection was carried out using multiple methods, including semistructured interviews and document analysis [6]. Overall, the study analyzed 23 semistructured interviews, totaling 32 person-hours. Two distinctly varying respondent groups were included in the analysis: the CIO or an equivalent position (e.g., chief technology officer, IT Manager, and line-of-business [LOB] manager). The CIO was chosen as the primary informant. Given that observed projects were initiated and

[1] Henceforth, referred to as "CIO" for simplicity.

[2] The names of the selected companies are not provided due to confidentiality agreements.

impacted directly at the LOB level, LOB managers were interviewed as well. The approach of considering LOB managers as a respondent group is consistent with the argument of Laforet [44] that the opinions of the LOB managers who had played a central role in such projects or those who were immediately affected should be considered when analyzing such innovations.

The interview questions were focused on understanding the process of innovation that occurred in each of these companies. The interview protocol is provided in Appendix A. The interviews were held for 1-2 hours. When clarification was required, additional interviews were conducted with the respondents. The initial interviews were performed face-to-face in the English language. Some of the later interviews were conducted online, via telephone or online platforms due to travel restrictions. After each interview, two researchers took memos pertaining to what was learned. Based on these memos, new interview questions were added to confirm, further explain, or to refute our interpretation of data. The interviews were transcribed and analyzed. When analyzing data, a profile was developed, from respective company websites, reports, and general web searches. This background knowledge gained about the case organizations was vital for data triangulation purposes.

3.2. Case descriptions

Table 1 provides an overview of the case organizations.

3.2.1. Case name: FARM

FARM is an Australian family-owned farming company that produces fresh vegetables all year round. The company was founded in the 1950s and offers services for multiple wholesale and retail partners. The company employs more than 100 people. They have implemented SAP as their ES. FARM is ardently investing in new technologies such as business intelligence solutions, analytics, and mobile technological solutions. The company's SAP system is centrally managed by more than 10 dedicated IT staff in Australia led by a CIO. Two projects were considered in FARM for the study.

Project 1 - FARM introduced an interactive digital display for their wholesale customers, where the retail customers can see details of the vegetables from the supermarket floor. The idea was presented by the biggest wholesaler (FARM's customer). The cost of the initial hardware was shared between the customer and FARM. The digital signage was perceived as a relatively low-cost opportunity for the company to comply with and go beyond the new food labelling regulations introduced in the country. A cloud platform allows the remote hosting of information relating to fruits and vegetables. Much of the functionality is automated, with the orders placed by the supermarket synchronized with their product barcodes.

Project 2 - FARM launched a mobile app to identify and report issues relating to crops. The main users of the app are their 1500+ farm workers across the country. The app connects to the company's incident management system, SAP. The mobile app records the global positioning system (GPS) coordinates and allows pictures to be uploaded. The idea for the app was initiated by the manager of a farm, and the project was commissioned by the CIO. This was first trialed at one of the farm sites before being deployed to all farmers. An extension to the app has been designed to add irrigation and fertilizer lines of all farms mapped on Google maps.

Technologies - The fundamentals of the SAP system are sound and stable. Further enhancements to SAP are restricted due to high costs and the lack of appropriate skills in remote farming areas. Processes within SAP are not considered optimized. The master records of products and customers are used in Project 1. Project 2 extracts information from SAP regarding each farming area, and the incidents are written to the SAP system in real-time. A cloud solution was also used in Project 1. The mobile app used in Project 2 is deployed to all 'farmhands' as a bring-your-own-device plan.

Connecting with the wholesale customers makes Project 2 an outward-focused project. Several new functional areas have emerged through Project 1. The mobile app in Project 2 is available only for the employees of FARM. Project 2 supplements an existing mature business process of reporting crop diseases. A clear central structure has been the governance strategy for ES. The digital signage project (Project 1) required that FARM share their related product inventory, cost of the cloud, and infrastructure with their customers. A federated structure was created for this. The mobile app project (Project 2) is managed within the IT department.

3.2.2. Case name: INSURANCE

INSURANCE is a leading South Asian life and general insurance solutions provider. They offer a wide range of customized insurance products and have more than 1600 employees. INSURANCE has an AS/400 ES for managing all the core business activities, centrally managed by more than 10 IT staff led by a CIO. The company is very keen on investing in new technologies and thus have introduced mobile technologies and analytics to gain insight for providing better services for their customers.

Project 1 - INSURANCE introduced a mobile app for their customers to report motor accidents. The owner of the insurance policy can 'tap' the mobile app and report basic information about the accident. The app connects the customer with the company's assessment center. The assessment center can see all customer records that are linked through the customer's mobile number and a unique identifier. The idea to implement this app was initiated by the claims processing department.

Project 2 - Another mobile app was launched that connects the customer app with the 'nearest assessor.' Through GPS locations, field assessors are informed about accidents. The company has set a new industry benchmark, to send an assessor within 30 minutes of customer notification of an accident. Furthermore, for low-cost assessments, the assessor can process the claim and instruct the customer to collect the payment from the nearest bank. This idea was initiated by the IT team after observing the success of Project 1.

Technologies - INSURANCE uses an AS/400 system, with no major upgrades in the past 4 years. Data in the system are stable, and the IT team is well-experienced using the current system. The master records of insurance products and customers are extracted from the AS/400 system in both projects, and the incidents are written back into the system as batches overnight.

The company relies on the existing customers and assessors to download and connect through their own smart mobile device in both Project 1 and Project 2. In insurance assessments (Project 2), assessors' data, which include photographs of the assessment, are first uploaded into a local cloud. The staff at the head office then downloads the information for further processing.

Project 1 is outward-faced, and supplements the existing business processes of claims in connecting retail customers efficiently. Project 2 is

Table 1
Companies and their description.

Pseudo Name	Industry	Region	No. of Interviews	Interview Hrs.	Interviewee Designation	ES Type
LOGI	Logistics	Europe	5	11	CIO, Retail F&B Manager	SAP
MULTI	Multiple	Europe	5	4	IT Manager, Sales Manager	SAP
FARM (Two projects)	Farming	Australia	8	12	CIO, IT Manager, Farm Manager	SAP
INSURANCE (Two projects)	Insurance	Asia	5	5	Senior IT Manager, CIO, Claims Processing Manager	AS400

inward -focused, where it empowers the assessors as new process owners for low-cost assessments to approve funds. The AS/400 system is managed by the IT department. However, three regional processing cloud centers were created to facilitate the data exchanges between the assessors and the company, and thus a federated structure was created. Both mobile apps are supervised by the IT department.

3.2.3. Case name: LOGI

LOGI is a more than 50-year-old popular logistics company based in Australia. The company is well established in 50 countries and has more than 7000 employees working in the Australian regional office. They offer services in automotive, fresh food, consumer goods, manufacturing, and defense. In the early 1990s they invested in an integrated SAP solution. The SAP included sales and distribution, materials management, financials and controlling, and asset management modules. LOGI's SAP system is managed centrally using a global template. The company has a CIO with more than 25 dedicated IT staff in Australia. They have three regional CIOs in the USA, Europe, and Latin America. They have identified the importance of investing in digital technologies for gaining operational efficiencies.

A regional office in Europe introduced a mobile app to identify the location of their truck drivers and to enter the number of pallets collected at each customer site. Once the customer site has been entered through Google Map's geographical locator, the app then automatically generates an electronic invoice and sends an email with the invoice. The app immediately notifies the company and to the customers of consumption of pallets. The mobile app is an easy-to-use system that communicates to the SAP system to generate the invoice. The CIO identified this as the most innovative IT in that year and deployed it in all countries of operation.

Technologies - LOGI has used SAP since 1995. The fundamentals of SAP system are sound and stable. The company had no plans to invest further in any of the core SAP enhancements or upgrades when the current system upgrade is near mandatory. The mobile app can be downloaded to any smart mobile. The app is simple to use with the complete menu fitting on a single page.

The project focused on improving the process of invoicing. The process now includes participants (i.e., truck drivers) that were traditionally not included in the sales order fulfilment process. LOGI corporate IT governance was a federated structure with much flexibility in creating country-specific applications and systems. However, all corporate IT installations maintain a mandatory reporting global template for core business processes. Each country has its own CIO who has the authority to decide on the noncorporate applications.

3.2.4. Case name: MULTI

MULTI is a large multinational company manufacturing a range of dairy, health, nutrition, and food products. There are more than 10000 employees in Australia and Asian operations. The company has 11 factories and more than 10 distribution centers. In addition, they have more than 20 offices across Oceania and Asia. In 1996, MULTI introduced a global SAP ES implementation. By 1999, SAP was successfully implemented across several countries. The implementation of SAP included financials and controlling, materials management, customer relationship management, business warehousing, sales and distribution, supply chain management, in-memory computing, and business intelligence modules. The SAP system is managed using a semicentralized approach. The IT center in Australia has more than 50 IT staff, headed by a CIO. Each country with substantial operations has a country CIO that directly reports to a regional CIO. The Asian and the Gulf subsidiaries of MULTI, particularly in India and Saudi Arabia, pushed the head office of MULTI to introduce new products for seasonal festivals. Several business cases were prepared for the production, marketing, and sales for specific religious and cultural events. A prototype mobile app was developed for customers to download recipes, to provide information on promotions, and to send festive food to relatives and loved ones. Sales executives in the region had lobbied to introduce seasonal products and services, and their competitors are far more aggressive in promoting their seasonal products.

Technologies - MULTI is a single-instance SAP system across their world-wide operations. Investment into SAP continues with MULTI keeping their SAP system up to date with regular upgrades. Management of the system is delegated to three regional centers in Australia (for Asia and Australia), America (for North and South America), and The Netherlands (for Europe and the Gulf). Product and service master data changes can be made only through a biannual request to the service centers related to the country of operations. MULTI does not allow country-specific product or service changes. A pilot project for a mobile app that includes recipes was initiated only for the Gulf region.

The mobile app works on any smart mobile device. The app had over 1 million subscribers in less than 3 months of launching prior to a major religious festival. The app contains information about how MULTI products can be used in general and includes recipes for seasonal desserts. The app is simple to use, and users can upload, share, and comment on each recipe. The app focuses on what the customers commonly have during their festive times. The app allows MULTI subsidiaries to move away from a product-specific business model to a customer-centric view. The data related to customer interactions in the app are collated and fed to the marketing, sales, and production departments. The existing federated structure of SAP management was too restrictive to allow implementation of the pilot project. Thus, it required MULTI to create an additional entity of SAP management in a Gulf nation (which was previously reporting to The Netherlands). The Gulf IT management center was in charge of the mobile app and their SAP system.

3.3. Data analysis

The data analysis and data collection were conducted concurrently. This approach allowed the researchers to adapt the interviews based on the insights gained through the analysis. The analysis of data collection involved three main steps. An overview of the analysis is provided in Table 2.

Table 2
Data analysis process.

Analysis step	The STUDY PRocesses	Outcomes
Development of case narratives and initial coding	Development of the narrative of each of the cases. When constructing the cases by cross-checking the interviews against the documentation and case memos, factors such as initiators of the innovation, sequence of the innovation activities, identification of the technologies involved, and characteristics of innovation were identified.	Identification of the innate characteristics of ES and digital technology. Identification of nature of the ES and digital technology integration.
Identify the contextual factors of the ES and digital technology integration process	Synthesizing case study data to provide a meaningful classification of the salient constructs and contextual variables through open, axial, and selective coding.	Identification of the stakeholders, process, and outcomes of ES and digital technology integration efforts leading to innovation.
Development of the process model	Developing a theoretical model with appropriate inputs, outputs, and activities for ES-digital technology integration process, corroborated against the case study data.	Derivation of the process model for the ES and digital technology integration.

Once the data are collected, the analysis process followed the interpretive case study data analysis approach reported by Klein and Myers [40] and Walsham [92]. It involved three steps: deriving open codes, synthesizing them into axial codes, and arriving at selective codes that generate a theoretical model. Step one involved deriving open codes. As per Corbin and Strauss [16], open coding is an interpretive process in which the researcher analytically breaks down data with the objective of obtaining new insights. The researcher breaks down the data by following the standard ways of interpreting or thinking about the phenomena observed in the data. Two researchers collated all interviews and secondary data (e.g., company reports) and decomposed them into open codes. The breakdown of the data involved the extraction of contiguous phrases, without any modifications. Decomposing the data, the researchers derived 925 open codes.

The second step involved developing axial codes. Here, the open codes are synthesized to derive meaningful groups and the relationships to higher-order entities. This is an iterative process in which all entities and relationships interpreted during axial coding are considered interim codes until confirmed through data collection. Table 3 provides a sample of all axial codes developed through the analysis process.

As the third step, the axial codes were unified around core elements to describe the phenomenon of interest, where the central phenomenon of the study is represented in abstract terms. The phenomenon thus will be represented through relationships, actions, conditions, consequences, or interactional strategies.

To ensure rigor and reliability of the study, several techniques were adopted following the guidelines of Klein and Myers [40]. To ensure construct validity, multiple sources of evidence, such as interviews, web search, and internal documentation, were used for triangulation purposes. In addition, a thorough literature review and an interview protocol were used to ensure rigor of the case studies. The internal validity was achieved through following case selection logic, a sampling method, rigorous data collection approach, and a proper literature review that guided the analysis process. The application of the multiple case study method confirms the external validity of the data. This further assisted us in generalizing the findings of the case study. Reliability of the findings was ensured through the application of case protocol for all interviewees and conducting follow-up interviews to confirm the emergent categories of the data analysis.

Table 3
Sample axial coding.

Case	Quotations	Sample axial code
INSURANCE – Project 1	*"…The accident claims department [LOB] launched our [INSURANCE] new claims processing app in 2 weeks to allow us to connect with customers instantly. Once an incident is lodged, we verify it."* IT Manger – INSURANCE	1. Digital technology-led innovations initiated by LOB. 2. Immediate value. 3. Short implementation time. 4. Mobile and ES working collaboratively. 5. Customer connecting via mobile app.
INSURANCE – Project 2	*"Our assessor must reach the location in 30 minutes. He [the assessor] can complete the entire assessment of an accident using his mobile…and it talks to our AS400 for processing…"* CIO – INSURANCE	1. ES provides a strong backbone. 2. Solution deployed has a narrow functional focus. 3. IT project initiated by a non-IT department. 4. ES providing core data. 5. Employee connected to ES via mobile app. 6. Mobile app extending the functionality of ES.
FARM – Project 1	*"…We are trialing a new digital signage solution…The idea came from our XYZ [their biggest customer] …we use our ES details and shared only the related ones via a cloud… Time was mostly spent on the ES data verification part, rest of it was easy"* CIO – FARM	1. Cloud and ES working collaboratively. 2. Trialability leading to early prototypes. 3. Idea initiated by the customer. 4. Shorter implementation time. 5. Cloud extending the functionality of ES.
FARM – Project 2	*"…We developed the mobile app with a very low budget. The farmers can use a normal mobile app, this was nothing fancier. They took pictures, filled in a form, and shared the crop related issues. This created an incident in our SAP system. It was very simple, yet very efficient."* CIO – FARM	1. ES and mobile working collaboratively to deliver innovation. 2. The ES provides the backbone. 3. Narrow focus of the application. 4. Ad-hoc, opportunistic solutions. 5. Mobile app extending the functionality of ES. 6. Farmer connecting via mobile app.
LOGI	*"…The supply chain related information was taken from the SAP and then they [European regional office] shared the basic information with the truck drivers using a mobile app. Their sole objective was to make the delivery process efficient."* CIO – LOGI	1. Use of ES with mobile collaboratively to deliver innovation. 2. An IT project initiated by a non-IT department. 3. Narrow focus of the application 4. ES provides the backbone. 5. Immediate value.
MULTI	*"…through our mobile app, the customers can view our products. They also could share recipes with their family and friends via social media"* Sales Manager - MULTI	1. Use of multiple technologies to deliver innovation collaboratively. 2. ES provides the backbone. 3. Narrow focus of the application. 4. Social media feeding data to the ES. 5. Mobile app extending the functionality of ES for the customers.

4. Findings

The axial codes derived through analysis provided insights into the phenomenon of organizational innovation facilitated by the amalgamation of digital technologies with incumbent ES. Specifically, it highlighted (i) the innate characteristics of digital technologies and ES in relation to organizational innovation (Section 4.1), (ii) integration of digital technologies with ES (Section 4.2), (iii) governance mechanisms that encourage innovation through integration of digital technologies with ES (Section 4.3), (iv) the nature of the organizational innovation arising through the ES-digital technology matrimony (Section 4.4), and (v) overall process in which organizational innovation was inspired and managed (Section 4.5).

4.1. Innate characteristics of ES and digital technologies

4.1.1. Stable ES backbone scoping organizational innovation

Associated with axial codes 6, 9, 18, 26, and 29 in Table 3, when an organization possesses a 'stable ES,' it seems to encourage innovation. The stability of an ES is established through access to quality data, information, consistency of data, and standardization of the business processes [11,68]. An ES platform usually makes it easier for innovation initiators to develop the prototype and extend it to other related LOBs. Here a stable ES platform allowed the digital technology to 'plug-and--play' with an ES in a flexible manner through the prototypes. Furthermore, the open and stable architectures of ES platforms have empowered organizations to be flexible in their selection of the digital technologies being used for innovation.

> "We now have much better accessibility to SAP…They [SAP company as the vendor] have opened it [the SAP system] up with NetWeaver." (IT Manager – MULTI)

When referring to innovation projects, the respondents mentioned how they 'extract certain information from [the ES],' 'updating information back to [ES]' / 'transferring data to ES,' and 'limited access to

data in ES.' This highlighted that when initiating innovation, the case organizations utilized the single truth of data sourced from their ES.

> "*I made only one demand to the dev [development] team. When my farm supervisors come back to the office, they should be able to go online and transfer all data back to the SAP [their ES].*" (CIO – FARM)

The cases also highlight that although a stable ES platform is essential for innovation, such innovations are not dependent on the *newness* of the ES.

> "We still use AS/400…we do not have a high-end platform. Still, we are able to connect the third-party applications to the platform." (IT Manager – INSURANCE)

Moreover, the case organizations were reluctant to upgrade their ES until it was mandated by the software vendors. They viewed ES upgrades as expensive and complex and not essential unless not upgrading their ES led to compromised data integrity, platform limitations, or compromised security or service level agreements.

> *"It is not the newness…it is the stability… We have not upgraded [our] SAP for a long time. We don't need to…we will wait till [the] mandatory upgrade."* (CIO – LOGI)

As such, the ES upgrades, albeit done only when mandated by the ES vendor, increased the perception of stability of the ES, which in turn provided an additional sense of encouragement to the case organizations to innovate with ES.

Furthermore, the stable ES platforms enabled the digital technologies to extract and interact with data and processes of the organizations. Yet the ES platforms provided a degree of restraint to the innovations in relation to how data are accessed, are disseminated, and augment business activities. Overall, the capacity of the ES supported the potential of the new initiatives with digital technologies.

> "Our customers have many touchpoints for tracking, placing orders, and user detail updates. We have mobile, web, and manual. They are all essential for us to be a customer-centric company. They [mobile and web] all extract data and write to SAP." (CIO – LOGI)

Furthermore, the exposure of business functions moved away from the ES into digital technologies, creating a layer of easy-to-use technologies. The ease of use and cost efficiency of digital technologies promote integration and adoption. However, alignment with the ES was deemed important for such innovation.

> "It [the app] must be consistent with the business rules of SAP … whatever that we do with the mobile app, it [mobile app] has to align with the business rules." (CIO – LOGI)

4.1.2. Digital technologies providing unique value proposition

Represented using sample axial codes 1, 5, and 22 in Table 3, digital technologies have opened up unique opportunities for organizations to initiate innovation. Similarly, the observations of the cases highlighted that contemporary organizations depend heavily on digital technologies when initiating innovation. For example, companies make use of the consumerization of IT and use mobile technologies to innovate.

> "We added extra features like finding the closest fuel station to our app. This increased the usage [of the app]. We then analyzed the usage data to identify new customer needs…This is possible only because of analytics and mobile." (CIO – INSURANCE)

The introduction of mobile apps for the customers to interact with within the organizations was the most pronounced initiative in all case organizations. For example, the senior IT manager of INSURANCE explained how it sets a new industry benchmark to send an assessor within 30 minutes of the customer notifying of an accident.

> *"Developing a mobile application for assessors was not complicated…we extended our existing data and free technologies to our assessors."* (IT Manager – INSURANCE)

The increasing number of new digital technology providers demonstrates the scalability of these technologies. Organizations initiating such innovations have the benefit of accessing the resources when required. The CIO of FARM commented on the availability of many cloud service providers in the market and the benefit that they gained due to cost efficiency, availability, and accessibility of digital technologies.

> *"It is good to know that they [a cloud provider] are not the only one in the marketplace…in fact, there are many cloud providers….so our risk is minimum."* (CIO – FARM)

Furthermore, the case organizations created project-specific collections of technology bundles to facilitate innovation. The project-specific technology bundles included the ES as its foundation and at least one digital technology. When selecting digital technologies, prominence was given to the capabilities and limitations of each digital technology. In several cases the technologies were suggested by the LOB managers, but IT staff assisted in assembling them.

> *"Each [digital technologies] has their own strengths. We must harness all of them together. For example, mobile is weak as a platform, but great for interaction. Whereas, cloud is great as a platform, but cloud has an issue of data sovereignty. Bringing them together to achieve harmony is what the new CIOs do."* (CIO – FARM)

4.2. Integrating digital technologies to ES to extend capabilities

A substantial number of axial codes (as observed in axial code examples 4, 10, 11, 12, 16, 17, 21, 23, 28, 31, and 32 presented in Table 3) focused on various extended capabilities organizations derived through the integration of digital technologies to their incumbent ES.

Furthermore, it was noted that the integration of digital technologies was not limited to a particular type of digital technology. While some organizations embarked on integrating cloud services to ES (e.g., FARM), others used mobile technologies to extend the reach of the ES functionalities (e.g., INSURANCE). This demonstrated the indiscriminate and agnostic nature of a stable ES.

> *"We have many tech solutions deployed at MULTI… Depending on the objective…We have everything from cloud, mobile … all connected to our main SAP [ES] system."* (CIO – MULTI)

Moreover, neither the CIOs nor the LOB-managers expressed bias toward any type of digital technology when they choose to integrate them with their ES.

> *"We can choose what we build [using digital technologies] around the ES. There is no limit as to what we can do here. Just because we use one [digital technology], does not mean that we cannot use another [digital technology]."* (CIO – FARM)

The solutions developed by integrating digital technologies to ES either extended the existing functionality of ES or extended the reach of a solution to new constituents. In general, such integration allowed organizations to reduce the cost of operations of expensive ES licensing arrangements and/or upgrades. However, the stability of the ES was an important factor in digital technology integration.

> *"The mobile app picks up policy data from our ES master records…Then it displays the results as-is to the customer. We have the single source of truth in the database [ES]…We could not have done that in a more cost-effective arrangement."* (CIO – INSURANCE)

4.3. Hybrid IT project governance

Axial code examples 8 and 24 in Table 3 demonstrate that all case organizations preferred hybrid IT governance for solution initiation, management, and control. This is contradictory to most prior research, which highlighted the importance of centralized management of IT using dedicated CIO-led IT departments. While this was still true in relation to ES, where all cases governed their ES through centralized IT governance structures, cost-efficient, trailable, and easy-to-use digital technologies promoted the LOB managers' participation in many projects through a federated IT governance structure.

> *"We changed the IT governance structure in 2010. Now, we have given the latitude for any country CIOs to introduce mobile and cloud-based apps. Centrally, we manage master data in the SAP system. If we can ensure that our data is not polluted, then anyone can use the system for new developments."* (CIO – LOGI)

Furthermore, organizations exploited specific geo-political circumstances in their favor through flexible application of digital technologies. In the past, such maneuvers to derive flexibility have been thwarted due to the inflexible structures of ES.

> *"Food labeling is going to be an important requirement not just for the government legislatives, but also for the consumers. We have leaped ahead to create electronic bulletin boards for our products."* (CIO – FARM)

In all these technology-led projects, sustenance and maintenance of the project are the responsibility of both CIO/IT staff and the LOB. Such flexible governance practices and hierarchies shorten the lead time of the project.

> *"The departments are responsible for managing their own mobile app projects. We still do supervise them."* (IT Manager – INSURANCE)

While the responsibility of managing most of the digital technologies was shared or provided to the LOB management level, such a decentralized approach was not followed for governing the ES. Instead, most organizations mandated a centralized governance approach to manage their ES. For example, changes to master data and business rules were carried out only periodically, in most cases only once every 6 months. Such changes often required a carefully crafted rationale for the change or the new inclusion.

> *"Changes to SAP [their ES] need to go through the approval process, even if it is under the normal budgetary approval levels."* (Sales Manager – MULTI)

In addition, the maintenance and management of digital technologies is shared between the IT department and the LOB, and no additional costs beyond the prototyping phase were used in the integration of these technologies.

> *"At the end of the day, we want all applications to talk to [read, write] SAP…the last thing that we want is to go back 18 years to colonies of applications with their own kings [referring to their legacy systems prior to the implementation of SAP]."* (CIO – MULTI)

4.4. Nature of the innovations arising through the integration of ES and digital technologies

4.4.1. Functional focus and the short lead time of innovations

As exemplified through sample axial codes 2, 3, 7, 15, 19, 25, 27, and 30 in Table 3, the analysis also highlighted that the projects had a functional orientation, with a short lead time for innovations. Rather than focusing on introducing innovation/technologies for a whole business process, the cases focused only on specialized functionalities that provided competitive advantage for the organizations. Participants used terms such as 'a particular activity,' 'specific,' and 'function' when describing the projects. Innovation focusing on such specific, narrow focused activities in an organization highlights a non-orthodox view of the ES philosophy [36].

> *"We now build software on free Google Apps for selected functionalities that we expected from SAP…When we have cheaper options, why would we waste money unnecessarily? Every dollar we spend counts."* (IT Manager – FARM)

The case organizations attempted to innovate through augmenting several selected business functions that provide the maximum benefit to them. Here digital technologies provide an opportunity for organizations to engage with stakeholders, such as employees, customers, and suppliers, to add value to specific business activities.

> *"Our customers are connected to us in the accident reporting app. They can enter their bank details, and we can directly deposit their insurance claim. We don't have to enter [bank] details from our side…much faster and saves us time and money."* (Claims Processing Manager – INSURANCE)

The lead time of an innovation refers to the duration between the ideation of a project to the commercialization phase of a project [42]. Respondents highlighted how the lead time of such projects was short, with minimal time between ideation to product launch.

> *"Our mobile app development project was completed within a few weeks. Implementation of it did not take much time, but the approval process took some time."* (Sales Manager – MULTI)

More specifically, all technology integrations were relatively easy to develop, flexible, and easy to deploy. Such innate features of digital technologies enabled shortening of the lead time of organizational innovation.

> *"The mobile app we developed for the assessors was an idea that we got from the app we developed for claims processing. It is the same logic we used, so the implementation was quick in this project"* (CIO – INSURANCE).

As such, in all these projects, the focused, functional specificity of the projects did not interrupt the core business process. The respondents attributed the short lead time of the projects to (i) specific focus on IT projects, such as reaching out to customers for a particular product, (ii) availability of digital technologies for trialing purposes, and (iii) the perception that IT is no longer considered as complex.

4.4.2. Ad-Hoc and opportunistic innovations

As shown in the sample axial code 20 in Table 3, for the case organizations to survive in a dynamic environment, it was deemed necessary to engage in ad hoc and opportunistic innovations. The ever-changing market needs and the ability to sense customer needs dynamically were not promoted in the corporate strategies or in the IT blueprints. Furthermore, organizations highlighted the uncertainty and the rate of change in customer needs in a dynamic market. As such, they highlighted how difficult it is to maintain and manage innovation projects for more than 12 months.

> *"How can we prepare for 2-year plans? Technology and the market opportunities are changing so rapidly, and we don't want to play catch-up anymore."* (CIO – FARM)

Similarly, social media has provided companies with opportunities to understand market needs and develop new ideas that were previously unheard and unseen. Such developments have appeared only through the advancement of social media technologies as well as rapid application developments through mobile and cloud computing. For example, MULTI recognized the proliferation of social media and how customers embraced the functionalities of social media. As such, they decided to make use of the existing functionalities of social media for their benefit.

"The recipes in the mobile app can be shared by the customer through their social media account." (Sales Manager – MULTI)

All case organizations noted that global hypercompetitiveness and the advent of digital technologies have influenced the innovation strategies. In addition to the long-term corporate IT-centric strategy, case organizations were developing more ad hoc IT driven strategies, more as secondary strategies. For example, the CIO of INSURANCE stated that previously they were required to develop a 5-year strategy and stick to that plan. However, with the ever-changing customer needs and advancement of new technologies, market needs are changing drastically. As such, their IT and business strategies need to be evaluated constantly.

"It [SAP] is hard to shift [update] to attack the competition. We used to do that, but not anymore. We are in a different game altogether. We have to formulate flexible strategies…I mean they have to be ad hoc. We have to constantly monitor the environment and adjust the engagement strategy." (CIO – INSURANCE)

The initial derivation of the ad hoc strategy entailed bringing in appropriate digital technologies and aligning them with the corporate ES strategy, while sensing the market for potential threats and opportunities. When INSURANCE developed the claims processing app, they realized that integration of the mobile app with their ES would add value.

"We knew that we could capture a large market with this idea. The social media post created a light bulb moment. We already have mobile development expertise and ES expertise [through IT department] too, so we decided to go ahead with this idea." (Claims Processing Manager – INSURANCE)

4.4.3. Heterogenous innovation initiators

Related to the example axial code 14 in Table 3, in the digital era, organizations have cultivated an accessible, innovation-favoring ecosystem that consists of a range of external stakeholders. The innovation-favoring environment where organizations collaborate is a distributed, open, socio-technical environment [59]. For example, innovation initiators stem through digital technologies such as social and mobile platforms that have opened boundaries and created open architecture [11]. Traditionally, IT-enabled innovation in an organization is initiated by the CIO/IT department; however, with the accessibility of digital technologies, nontraditional innovation initiators and collaborators have become part of the innovation-favoring environment. For example, LOB managers (i.e., claims processing manager, farm manager, and sales manager in our case examples) who are non-IT managers initiate innovation at the department level. And at LOGI, when they introduced a mobile application for truck drivers, the CIO was not initially aware of it.

"*As soon as I got to know about the mobile app, I gave a call to the European regional manager. We [global IT department] loved this app and we wanted to introduce this to other regional offices as well.*" (CIO – LOGI)

With the proliferation of mobile technologies and cloud computing, not only the LOB managers, but also traditional end-users could interact with organizations directly. Feedback on products and services too, has become instant, quick, and avoids lengthy loops. The IT manager of INSURANCE explained how their claims processing department came up with the idea of a mobile app for claims processing via feedback received through their social media platform. Previously, obtaining customer feedback was challenging, time-consuming, and a costly task. However, with the advent of social media, customers can provide instant feedback on the products and services.

"I remember we received a suggestion from a customer to introduce an application to view their claims related details. This was a simple suggestion they made on our social media site. We used this initial idea and developed it into a multi-functional mobile app" (IT Manager – INSURANCE)

4.5. The Process of integrating digital technologies to incumbent ES for innovation

In this section, we describe the process of integrating digital technologies with the incumbent ES. The integration process has the characteristics of innovation activities introduced by Utterback [84]. Considering the integration of incumbent ES and digital technologies, this process reflects the characteristics of a software development process as well [69]. Similar to innovation process or the software development process, the integration process starts with the ideation phase that focuses on the design or the concept of technology integration. During the prototyping and incubation phase, the integration solution is experimented upon and reviewed. Implementation and management are initiated once a stable prototype is developed. The following sections provide details of each of these phases.

4.5.1. Ideation

Many studies have highlighted the importance of being agile and responding to a dynamic business environment [13]. As evidenced in the case organizations (axial code example 14 in Table 3), ES and digital technology integration commenced through ideation of environmental opportunities, and threats scanned effectively through digital technologies. Furthermore, digital technologies played a significant role in accessing innovative ideas through new collaborators.

"Social media and mobile applications have provided us with new pathways to understand the market requirements." (Sales Manager - MULTI)

Furthermore, to sense opportunities, the cases used a range of contributors, including customers, suppliers, and employees. Similarly, the importance of applying and using external knowledge for software development [69] and innovation [83] has been highlighted in prior studies. Such connectedness with the internal or external collaborators was possible only because they already had access to digital technologies like social media, mobile, and cloud. This digital connectedness allowed the case organizations to augment and diversify their innovation initiators and to capture and perceive stakeholder requirements effectively.

"No matter what you say, thinking about what your customer wants is a difficult thing. We now have our customers telling us what they want, how they should be treated and what price they are prepared to pay…" (CIO - INSURANCE)

It is vital to understand that having an awareness of market opportunities and threats was an integral part of most of the organizations. However, even if they were aware of market opportunities, the IT staff was reluctant to exploit such opportunities through corporate ES. They perceived corporate ES to be rigid and any changes associated with ES to be expensive and time consuming. As such, most organizations did not actively seek innovation through their ES.

"SAP is like a ship, any move takes a very long time for planning, then consultants and finally getting to the implementation." (CIO - LOGI)

Accessibility to digital technologies allows innovative thinking and ideates innovation in the organization. The availability and the capabilities of digital technologies allow organizations to trial and test new technology integrations. In addition to drawing ideas from the features of digital technologies, the connectedness supported by digital technologies allows organizations to obtain innovative ideas from various stakeholders. And the convenience of using digital technologies allows participants to ideate their conceptions through technologies. Ideation is fortified by the consumerization of IT, in which the participants had

'experienced' a similar scenario that they were trying to implement. Here, the respondents had first-hand experience of the simplicity and capacity of digital technologies.

> *"We got inspirations from claims processing department app… we thought that same thing can be applied for assessor allocation as well."* (IT Manager - INSURANCE)

4.5.2. Prototyping and incubation

Furthermore, the cases reflect how the respondents nurtured and developed the prototypes of their technology integrations. Incubation and prototyping are considered mid-term innovation activities and resonate with Utterback [84]. The prototypes of new applications, adhering to the narrow and functional scope defined in the earlier phase, were developed specifically for a department. In most cases (as exemplified by axial code 13 in Table 3), the application was developed through the leadership of the LOB manager directly affected by the function.

> *"The [claims processing] app was our idea…we initiated it; we tested the first few versions…we guided them [IT staff] through the entire process."* (Claims Processing Manager – INSURANCE)

Technology prototypes were developed during the implementation and were fine-tuned with feedback received from all stakeholders. As such, the prototypes were very similar to the expected outcome.

> *"The development of assessors' mobile app was pretty easy. We pretty much had everything we needed. It was a matter of connecting with the right system with solid workflow."* (IT Manager – INSURANCE)

When developing technology prototypes, case organizations sought assistance from the IT department. The IT department assisted with testing the connectivity of the databases in the ES. Such specialization was required when testing whether the application was integrated to the ES for data consistency, standardization, and integration.

> *"It was not a challenge for us [testing the software]. We created 38 business scenarios, and we ran through each and every one with a few guys from the IT department."* (Claim Processing Manager – INSURANCE)

Incubation is the second mid-term component of the technology integration process. Incubation is concerned with the support given to a new initiative from the startup to navigate barriers and seek expansion. Typically, IT implementations do not follow such incubation periods. In general, pilot testing of a software development process shares some characteristics of an incubator [35]. However, in the case studies, the objective of the incubation phase was to enhance the initial technology assembly and support it until it is fully developed [35]. It was observed that organizations held their innovations at the LOB departments and IT departments, fostering the innovations and sustaining them until they were ready to withstand the pressures of the environment.

> *"The litmus test was the connection to SAP. An app could work on its own, in isolation, but it's different when you have SAP [their ES] system. This is where we truly realized the importance of having a single source of truth, the master data."* (LOGI – CIO)

Furthermore, the facilitation of incubators at the LOB levels also encouraged innovation at the grass-roots level. These incubators are responsible for nurturing and growing ideas consistent with their department's goals. Such incubators did not receive additional dedicated human resources to innovate and were not dedicated organizational units. Instead, they functioned with the existing employees of the department. However, each incubator received a small IT budget for capital purchases.

> *"We never had an IT budget for these kinds of things [implying innovation related activities] … it [the allocated budget] is not much, but it [the allocated budget] is enough for us to go and purchase some IT assets or services that are not available to us…"* (Sales Manager – MULTI)

For an incubator to be successful, it needs continuous in-flow of knowledge [35,65]. However, the incubation process was successful as LOBs collaborated with IT for their expertise to nurture the *new* technology integrations.

> *"We expanded the claims processing app by adding additional features like fuel stops. We tried these ideas to increase the usage of the app"* (IT Manager – INSURANCE)

Finally, the mid-term incubation and prototypes alluded to the importance of a federated IT governance structure that provides some degree of autonomy to the key LOBs. This demonstrates that prototyping and success of incubation rely heavily on the stability and the openness of the ES platform.

4.5.3. Implementation and management

Related to axial code examples 8 and 24, the case organizations also highlighted how they implement and manage innovation opportunities. All innovations considered were ideated using the integration of the incumbent ES and new digital technologies. First, described in the strategic management literature [20], strategy initiation involved the direct participation of stakeholders, including CIO/LOB managers, staff of the IT department, and members of the LOBs.

> *"It was a joint decision to have the app only released to the greater CBD. The claims processing showed some key points that led into this decision."* (CIO - INSURANCE)

However, possessing the technology itself did not provide a competitive advantage, as the competitors could easily copy the innovations without much difficulty. Yet, case organizations sought the first-mover advantage.

> *"We have to monitor the market. We can't have a timeline for the strategy. We know the competition is looking at us all the time. I mean it. So, we have to be vigilant about what they learn from us and that we won't get behind them."* (CIO - INSURANCE)

Partially due to case organizations' ambition to become the first and gain the first-mover advantage, all projects aimed to shorten the lead times of their innovations. Cases shortened the lead time from prototype to launch by developing prototypes created with a visual representation, matched to a flexible strategy and the requirements of the audience.

> *"When developing the digital signages, we trialed several data presentations. Our objective was to make it easy for the customer to identify and understand."* (CIO - MULTI)

The cases expected to receive immediate value. The ease of adoption and the rate of diffusion of digital technologies, combined with the stability of the ES, made the case for immediate value proposition even stronger. Compared to the traditional corporate IT initiatives, employees were *"happy to see the new ways of doing things"* (LOGI – CIO). Similarly, external stakeholders (i.e., external employees, suppliers, and customers) embraced new projects, as they did not require any additional training.

> *"There was no training required for the truck drivers…it was intuitive, small, and focused. There was no confusion of how a report should be run or where the data is…it was very simple to use."* (Retail Manager - LOGI).

Overall, each case organization remained positive in relation to the innovations developed using ES and digital technologies. Employees beyond the traditional senior managers or IT managers were eager to contribute to innovations, and collectively they managed to resolve issues or create opportunities relatively quickly. Not surprisingly, such positivity motivated the case organizations regarding the capabilities of

digital technologies. Similarly, contradicting established disgruntled views of ES, organizations developed a better understanding of the value of ES from both business and technological standpoints, increasing acceptance of ES.

> *"We finally understand why we have this large, centralized, costly, SAP system…In a way, I am glad we have that [SAP/ES]"* (Sales Manager – MULTI)

5. Technology orchestration – beyond simple integration

This research observed how contemporary organizations innovate by integrating digital technologies with their incumbent ES. The initial analyses suggested five key observations (See Sections 4.1 – 4.5). Therein, it was identified that the case organizations used multiple digital technologies, integrating with ES, trialing out innovative solutions that allowed them to respond to dynamic market conditions; developed IT solutions with a strong functional focus rather than taking a whole of business process view; were eager to engage with their innovation initiators, such as employees, customers, and/or suppliers directly rather than through the traditional approach of IT-department centric strategy; enhanced their services and added value to the existing business activities; included LOB managers from non-IT departments to promote new innovations using digital technologies; iteratively tested new technology solutions with multiple digital technologies, given the cost-effectiveness, trialability, and ease-of-use of digital technologies; designed technology solutions to deliver immediate outcomes. Contrary to previous reports [15], the innovation process observed herein was far from linear. While the process included the traditional phases of the innovation process—ideation, prototype creation, incubation, implementation, and management—integrating ES and digital technologies with their paradoxical roles produced a different innovation process. Overall, the study observations questioned the use of the typical term 'integration' as proposed in prior studies to capture the amalgamation of ES and digital technologies for organizational innovation. The term 'integration' overlooks the philosophical role of technologies and provides a myopic view of how technologies are connected using application programming interfaces (APIs), use of middleware, and data exchanges. Such a limited discussion is especially inadequate for understanding how modern digital technologies can provide value using the incumbent ES.

As such, consistent with the themes discussed in Sections 4.1 – 4.5, attention was given to two fundamental questions that must be answered: (i) what is the innate nature of the ES and digital technologies in relation to organizational innovation?; and (ii) how can ES and digital technologies be purposefully combined? Overall, the study will develop answers to the research question "*how do organizations integrate their incumbent enterprise system with contemporary digital technologies, for attaining organizational innovation?*"

To understand this phenomenon through a deep philosophical lens, and to provide the boundary conditions necessary for deriving a theory, the instrumental orchestration theory introduced by Trouche [82] was applied. The instrumental orchestration theory (IOT) served as the theoretical sensitizing device, providing the necessary vocabulary, especially transmitting beyond the simple meaning of 'integration' to a holistic view of 'orchestration.'

5.1. Overview of orchestration

The IOT explains the roles of the instruments, the conductor, and the symphony and the changes to the symphony based on the reactions of the crowd. As described by Trouche [82], an orchestrator identifies and arranges musical instruments in an orchestra to create a beautiful symphony. In particular, IOT is sensitive to the innate role of each instrument, with each instrument having its unique place in the symphony while contributing to the overall assembly of music. The conductor commences with a starting tune for the symphony but often changes the tune, sensitive to the reactions of the crowd. Similarly, based on the tune, certain instruments will take precedence over others.

Drawing parallels with IOT, in an organization, the CIO, or the relevant LOB manager acts as the orchestrator who provides the initial roadmap (i.e., ideation, assembly of resources, implementation, and management), and assesses the initial value propositions of the innovation. As observed in the cases, the role of the technologies (i.e., instruments), the innovation initiators (i.e., conductor), the original assembly of technologies (i.e., symphony), the innovation (i.e., symphony/tune), and the changes to the original innovation based on stakeholder requirements (i.e., changing the symphony/tune based on the reactions of the crowd) are consistent with the theoretical concepts of IOT.

5.2. Instrumental genesis

Trouche describes 'instrumental genesis' as a process that represents the progressive integration, implementation, and management of an instrument or instruments for a specific purpose by an orchestrator. *Orchestration* is done by the *orchestrator*, in this study, the one who initiates and manages the assembly of the ES, and digital technologies is either the CIO or the LOB-manager. The orchestration and orchestrator work harmoniously to attain 'instrumental genesis.' Similarly, in this study the intended organizational innovation was attained through temporary assembly of the ES and digital technologies by the CIO or the LOB-manager. It is at this phase that the orchestrator identifies the scope of the innovation, with attention to the ad hoc nature and the functional focus of the project.

5.3. Instrumentation of ES and instrumentalization of digital technologies

The instrumental genesis concept can be described in two aspects, instrumentation and instrumentalization. According to Trouche [[82], p.290] instrumentation is "…the process by which the artefact prints its mark on the subject, i.e., the instrument allows the subject to develop an activity within some boundaries." Instrumentation can be explained through the restraints, enforcements, and abilities of an instrument. Moreover, the process of instrumentation "permanently conditions the actions" ([82], p.274) of the instrument considering its abilities and limitations. Similarly, when initiating organizational innovation using ES and digital technologies, the initiator assesses the stability, capabilities, restraints, and enforcements of the ES. Here ES acts as the dominant 'instrument' determining the scope of the innovation.

On the other hand, *instrumentalization* is when a tool is internalized and transforms the phenomenon. Here, the orchestrator observes the instrument's capabilities to inspire innovative ideas or develop the tune. In the context of this study, the innovation initiator draws inspirations from the capabilities of digital technologies. This view is consistent with Nambisan's [57] claim that operant technologies can 'trigger' innovation. As such, the role of digital technologies in the technological orchestration process concurs with the instrumentalization process of the instrumental orchestration theory.

5.4. Didactic configuration and exploitation modes

The study found that even when an initial assembly of the ES and digital technologies is derived, such an assembly is temporary and fluid and must be reconstructed when new, ad hoc, and opportunistic innovation targets are observed. The stable–dynamic combination of the engagement strategy can be explained through the didactic configuration and exploitation mode of the IOT [82]. According to Drijvers et al. [23], didactical configuration is the positioning or configuration of instruments involved in the process. In an orchestra, the conductor selects the musical instruments and positions them to create a beautiful symphony [23]. Similarly, didactical configurations concur with this

concept. Such arrangements need to be deployed before the symphony, and these arrangements are difficult to change during the symphony. In this instance, where ES and digital technologies are orchestrated for innovation, didactical configuration is the initial strategic arrangement of the orchestration process.

The exploitation modes, according to Drijvers et al. [[23], p.215], are "decisions on the way a task is introduced and is performed, on the possible roles of the instrument to be played, and on the schemes and techniques to be developed and established by the subjects." The exploitation modes are flexible and are adjusted in response to feedback. As described by Drijvers et al. [[23], p.215], the process of instrumental orchestration is "appropriate for a specific didactical context," "incidental," and "objective." In an orchestra, the exploitation mode partitions all instruments involved, directs the expected outcome (i.e., symphony) to arise, yet changes the composition based on the reactions of the crowd. In the study context, the exploitation mode explains the purposive orchestration of ES and digital technologies, considering the dynamic changes of the market. As such, Fig. 1 illustrates the process of progressive assembly, construction, and management of the ES and digital technologies for attaining organizational innovation. Table 4 presents the core themes derived through the analysis and how they corroborate with the key notions identified in the instrumental orchestration theory.

6. Conclusion and contributions

In this study we gathered data from four case organizations, observing 6 projects to analyze how organizations innovate using their incumbent ES and digital technologies. The study began with the premise of exploring the purported advantages ES-using organizations receive by integrating digital technologies with their incumbent ES. The advent of digital technologies has provided organizations with novel opportunities for innovation. However, for many organizations, with most of their daily operations executed through ES, it is a challenge to understand how two paradoxically different types of technologies could coexist, let alone provide organizational innovation. Our case study sample allowed the distillation of the answer to the research question "*how do organizations integrate their incumbent enterprise system with contemporary digital technologies, for attaining organizational innovation?*"

Overall, we conclude that the simplicity of the term 'integration' does not capture the true essence of the input, process, and output of the amalgamation of digital technologies and ES. As such, through a carefully constructed theoretical scaffolding, the study proposed the term 'orchestration' in place of the term integration. While the term "orchestration" is not new to the research community, being used in resource orchestration theory [72], this study provides important in-depth contextual details by incorporating the study objectives and context with the IOT [82].

Through our findings, the term "orchestration" in this research is defined as "*the iterative process followed by relevant stakeholders for initiating, planning, coordinating, assembling technologies considering their innate characteristics and combined value proposition, managing, refining the necessary elements of technologies and their assembly through situational awareness for attaining organizational innovation.*" In relation to the research question, this study has identified the innate philosophical characteristics of ES and digital technologies necessary for innovation. It also has demonstrated the nature of the organizational innovation obtained through the orchestration of ES and digital technologies, along with the overall process that organizations undergo in the orchestration of ES and digital technologies. The specific academic and practitioner contributions are stated below.

6.1. Academic contributions

This study furthers the understanding of how ES and digital technologies can be uniquely orchestrated to promote organizational innovation through several contributions. First, the study contributes to academia by providing a novel theoretical perspective related to organizational innovation through technology integration. We provide the preliminary theoretical ideology of a 'technology orchestration process,' specifically designed to understand the integration of incumbent ES and digital technologies, outlining its process, boundary conditions, stakeholders, and outcomes. In particular, we extend the understanding of technology integration and contributes to the resource orchestration

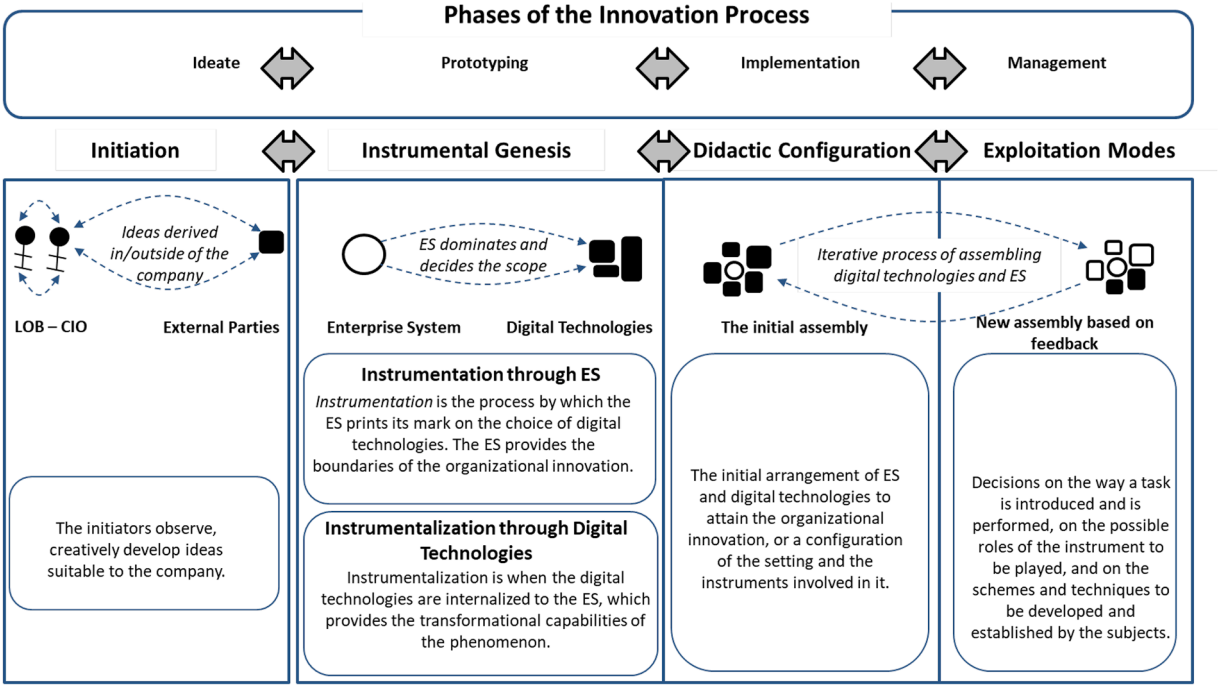

Fig. 1. Technology Orchestration Process of ES and Digital Technologies.

Table 4
The philosophical association of IOT with the orchestration of ES and digital technologies for attaining organizational innovation.

Key notions	Instrumental orchestration theory application	Application to the organization and its relationship with the derived themes	Sample Quotes
Symphony/Tune	A linear succession of musical tones, composed by a conductor, that the audience perceives as a single entity.	The organizational innovation aimed at or proposed (related to theme 4.4).	*"We can use one or more [technologies] for these innovations"* CIO – MULTI
Instruments	Instruments are technologies that organizations utilize for innovation. Instruments are diverse, each has its own capabilities and skills required for orchestration.	A collection of technologies such as the ES and digital technologies available for organizations. The technologies have different capabilities and require different skillsets to deploy them (related to theme 4.1).	*"It is nice to see that we don't have to do everything in SAP [ES] now. We have a collection…we have mobile and cloud…"* CIO – LOGI
Conductor	The orchestrator designs the tune, which will be delivered using one or more instruments.	CIO/IT staff and LOB Managers who actively participate in technological orchestration process (related to theme 4.4).	*"Sometimes we [CIO and IT staff] come up with new ideas and sometimes our department managers suggest new ideas. If the budget requirement is within the department managers' scale, they initiate these projects."* CIO – INSURANCE
Instrumental Genesis	The orchestration of the instruments, and orchestrator, work harmoniously to attain the symphony (i.e., outcomes). The orchestration of the instruments is partly done beforehand (pre-planned) and partly made ad-hoc using the instruments.	The recognition of the innate characteristics and the nature of the incumbent ES and digital technologies to the organization. The availability and accessibility of digital technologies will inspire innovation. In particular, the progressive assembly of incumbent ES and digital technologies (related to theme 4.2).	*"As the CIO I'm actively seeking opportunities to improve our business. We are well aware of the new technologies. …there is a very active process to invite new ideas…Sometimes there are some instances where we updated our technologies and arrangements to cater customer requirements."* CIO - INSURANCE
Instrumentation	The instruments allow the conductor to develop an activity with some limitations. The limitations refer to the constraints and enablement of an instrument.	*The role of the ES:* The role of the ES echoes with the instrumentation process. The ES acts as a platform enabling innovation. It provides standardized data and business rules across the organization. The ES scopes innovation through the integration of digital technologies. The application of digital technologies depends on the constraints and enablement of ES (related to theme 4.1).	*"…when the farmers enter the data, the incidents will be created in the SAP system. However, we had to work long hours trialing a few solutions with the SAP system"* CIO - FARM
Instrumentalization	Instrumentalization is when the tool is internalized and transforms the phenomenon. Here, the orchestrator observes the capabilities of the instrument to ideate innovative ideas.	*The role of digital technologies:* The role of digital technologies echoes with the instrumentalization process. Cost effective, easy-to-deploy, easy-to-use, technologies that can be deployed as standalone solutions as well as in combination with existing ES to provide innovation (related to theme 4.1).	*"Mobile allows us to create a BYOD culture. Our staff can login to the internal systems using their own mobiles."* Manager - INSURANCE
Assembly and Coordination	The systematic and intentional initiation, organization, and application of various instruments to deliver a musical experience. The orchestrator coordinates the symphony using original composition and new ad-hoc compositions.	Assembly refers to the initial arrangement of technologies to deliver innovation. Coordination refers to the continuous engagement between stakeholders to finetune the technology assembly (related to theme 4.5).	*"…wanted to make incident reporting efficient, we used mobile app to extend our SAP capabilities. We worked together with the IT department to make this a success"* Manager – FARM
Didactical configuration	Initial engagement strategy of the instruments. It also denotes to a configuration of the background and the instruments that are considered.	Refers to the set of actions that encompasses selecting suitable solution, outlining the technologies, selecting the area of focus, selecting the scope, and the relevant parties that need to collaborate (e.g., LOB managers, IT staff) (related to theme 4.2 and 4.4).	*"Assessors could use the same technology configuration for reaching out to the customers. The mobile app we developed for the assessors was an idea that we got from the app we developed for claims processing. It is the same logic we used, so the implementation was quick in this project"* (CIO - INSURANCE).
Exploitation mode	Constitutes assessments and choices of how an activity is introduced and conducted, identification of the instruments, the roles of the instrument, and the methods required to be implemented and established by the initiators.	Depending on the organizational needs, the technology configurations (i.e., orchestrations) are updated accordingly (related to theme 4.2, 4.3, and 4.4).	*"Initially we wanted the app to be just used for promoting our goods. But we thought social media integration will add value."* Manager – MULTI

literature by extending the theoretical boundaries of resource orchestration theory. We introduce the amalgamation of resource orchestration theory together with instrumental orchestration theory to explore the intricacies of the technology orchestration process, including boundary conditions. The orchestration of incumbent ES and digital technologies reflects the nature of the software development process [69]. For example, similar to the orchestration process of the incumbent ES and digital technologies, the software development process starts with the ideation phase, conducts prototyping, then moves to implementation and management. We note that the orchestration process may deviate from the standard software development process, as incubation might not be a prominent step in the standard software development process. In addition, the initiators of such orchestration such as LOB managers is another factor contributing to these differences. Thus, although there are similarities, the orchestration process described in Fig. 1 has substantial differences from the traditional software development process in its initiators, direct and indirect stakeholders, and outcomes.

Second, this study demonstrates the innate nature and philosophical characteristics of ES and digital technologies relevant to the technology orchestration process. Here the role of a mature, stable ES reflects that of a vital platform that provides necessary data and information for organizational innovation. The digital technologies triggered innovation by extending the business functions to collaborate with the external and internal parties that previously did not have the accessibility. We have shown that an ES acts as a mature technology platform that enables orchestration of digital technologies. More specifically, our findings demonstrate how such diverse, diametrically opposing characterized

technologies can be synergistically combined to harness and facilitate innovation. Innovation in the onward and upward phase is supported by a stable ES platform. Such findings further confirm previous reports lauding the role of ES as a platform (e.g., [7,11,68]). To the extent that the ES is stable, the collection of appropriate digital technologies could be orchestrated with the ES platform to trigger innovation. The precise mechanisms through which such technologies are introduced to facilitate orchestration was explained through instrumental genesis and the processes of instrumentation and instrumentalization and aligned with the roles and characteristics of ES and digital technologies. This explanation extends the understanding of the 'generativity' of IT [53,77].

Third, the study highlights how the ES–digital technologies interaction provides a new perspective on the technological orchestration process with three key phases. Innovation through the orchestration of ES and digital technologies offers a new avenue for technology-led innovation. As opposed to innovating the entire business process, these organizations focus on innovating a specific function of a business process. The outcomes of these orchestrations are immediate, and the lead time for the orchestration is comparatively short. Using the IOT, we demonstrate how technological orchestration of ES and digital technologies can be explained through the configuration and management of technologies. The study extends the current understanding of technological orchestration by further identifying precise mechanisms, the activities in each phase of the orchestration process. Furthermore, the application of the IOT to innovation and the information systems discipline is an extension of the theory to a new context. The availability and the accessibility of digital technologies necessitate reevaluating their role and how they can be used for attaining innovation in organizations.

The findings of this study highlight that organizations are already assessing the introduction of novel, diverse, innovation initiator roles of IT for innovation. For example, with the use of these new technologies, organizations have access to a larger external network to aid innovation. Grass-roots innovations initiated at the LOB-level are known to be facilitated by the IT department/CIO. For example, Gartner emphasized the need for a designated technology adviser for each functional department [9]. Writing in the *Harvard Business Review*, Brinker and McLellan [[9], p.83] highlighted how the chief marketing technologist (CMT) at Kimberly-Clark enabled innovation using new technologies. This new role allowed Kimberly-Clark to create a vision for the marketing department and allowed for experimentation to promote innovation. Our findings concur, and provide evidence for the emergence of the innovative role of the LOB managers in initiating technology-led innovation.

The study also identified characteristics of the technological orchestration attained through ES and digital technologies, highlighting that the orchestration of ES and digital technologies will benefit from flexible, perhaps federated IT governance structures. Such discussions concur with Teece and Pisano [81], who emphasized the value of reconfiguring an organization's asset structure to survive in a rapidly changing environment. Such federated structures empower innovation using ES and digital technologies in an organization. In addition, our findings expand understanding of the nature and the characteristics of innovation and contribute to the extant innovation literature [15,79,83,86].

6.2. Practical contributions

The study provides several contributions for practitioners. The derivation of the process for orchestrating ES and digital technologies provides insights to help organizations manage their technologies to facilitate innovation. For example, we highlight that it is equally important to focus on inward-looking business processes as on external activities to compete in a dynamic market.

Our findings show how the orchestration of corporate technologies such as ES and digital technologies can promote innovation in an organization. The technology orchestration process provides know-how and guidelines for practitioners to initiate technological orchestration using ES and digital technologies. The technological orchestration process will be valuable to practitioners in conceptualizing the 'essentials' of contemporary IT, the 'roles' of each technology, the 'management approach,' as well as the 'nature' of IT-led innovations.

Practitioners will be pleased to see that the study challenges the orthodox practitioner viewpoint of plateauing ES value, instead demonstrating the value creation potential of ES. The IT managers now have a guiding framework for understanding the role of the ES in guiding, scoping, and enabling digital technology integrations to provide innovation to the organization.

While the capabilities of digital technologies are abundantly visible to practitioners, this study provides a practical, philosophically rich, yet accessible framework for step-by-step guidelines on how digital technologies should be integrated to ES for attaining organizational innovation.

For IT managers, the study provides empirical evidence demonstrating why attaining stability is more important than the newness of the platform. Developed using the notions of data integrity, data quality, information transparency, and know-how, the study has revealed that ES stability is critical for any innovation, and that novelty of the platform typically attained through costly software upgrades plays a secondary role after stability.

The findings highlight the future of IT functions in an ES-centric organization. The study especially supports the emerging, transformative role of the LOB managers in promoting innovation using digital technologies. This idea concurs with Brinker and McLellan [9], who emphasized the need to introduce the role of the IT head at the marketing department of Kimberly-Clark. In the contemporary digital era, digital technologies are transforming the role of middle-managers in functional units into agents of innovation. As such, it is necessary that IT governance structures be relaxed and made flexible for initiating technology-led innovations by the LOBs. It is important for IT managers to understand the transition of power in initiating and managing IT innovation. With the consumerization of IT, the IT managers can specifically draw on the advantages to source innovative ideas not only from the IT staff or LOB staff, but also beyond the organizational boundary and promote new collaborations for innovation. Further, the study can benefit senior managers by explicating the mechanism of encouraging employees to participate in corporate strategy.

For traditional software development teams, while somewhat similar to agile methods, the technology orchestration process provides a novel, technology-centric, detailed, and specific approach for integrating digital technologies into incumbent ES. As such, the orchestration approach proposed herein is markedly different from the traditional software development methods, such as the waterfall method.

6.3. Limitations and future research opportunities

This study has several limitations. First, we used only a qualitative approach to explore the orchestration of ES and digital technologies. A quantitative study could be conducted to confirm the findings of this qualitative study. While the study included four case organizations and 6 projects, the findings can be limited by its focus on those specific organizational types and industries. When evaluating the study findings, it is important to consider the nature of the organizations and the technologies used in the study. When considering the ES, we limited our sample to incorporate established ES providers, such as SAP and AS/400, and such limitations need to be considered when replicating the study findings.

Several areas of future study can be suggested to strengthen our present findings. First, as discussed above, by using a quantitative study researchers can further their understanding of the ES–digital technologies orchestration process, allowing generalization of the technology orchestration process. Second, future studies can focus on understanding

the characteristics and the nature of the process of technological orchestration, as further research is required to generalize the findings. Third, future studies can build on the findings of this study, as well as on the operand and operant technology roles introduced by Nambisan [57], to further understanding of the role of technologies for attaining innovation.

CRediT authorship contribution statement

Sachithra Lokuge: Writing – review & editing, Writing – original draft, Validation, Methodology, Formal analysis, Data curation, Conceptualization. **Darshana Sedera:** Writing – review & editing, Writing – original draft, Validation, Methodology, Formal analysis, Data curation, Conceptualization. **Varun Grover:** Writing – original draft, Methodology, Conceptualization. **Suprateek Sarker:** Writing – original draft, Methodology, Conceptualization.

APPENDIX A. Case Study Interview Protocol

Sample interview questions for CIOs and LOB Managers

N.B: The questions below were modified appropriately for each interviewee depending on their availability. A set of high-level questions are provided below.

1. Explain the technology landscape, technologies, and their use.
2. Explain the nature of the current market.
3. Explain your responsibilities/ strategies you followed to manage the market conditions.
4. Describe the objectives, outcomes, and the nature of these strategies/projects.
5. Describe the characteristics of the technologies you selected for these projects and explain the reason for selecting them.
6. Explain the steps/activities you followed in implementing these projects.
7. Explain the process you followed when initiating the projects.
8. What were the success factors, and the pain points you faced during the lifecycle of these projects?
9. Explain the governance principles/structures followed in these projects?
10. Explain the risks you identified in these projects.

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