# Chapter 1 Preparing for Accelerated Third Order Impacts of Digital Technology in Post Pandemic Service Industry: Steep Transformation and Metamorphosis



#### Jungwoo Lee and Spring H. Han

**Abstract** COVID-19 has expedited digital technology adoption in the service sector ever under severe constraints. However, if not suitably appropriated, this haste adoption of digital technology might have unintended adverse effects in the longer term. In this introductory chapter, a theory of third-order impacts of digital technology is introduced to explore the effects of digital technology adoption in the service sector organizations. The third-order changes will have more profound implications for future services beyond the simple digitalization of service routines. Although thirdorder changes may occur much later, preparation is critical because the first-order adoption and the second-order adaptation may form a basis for the third-order metamorphosis. We hope that this theoretical lens is useful in providing foresight for the changes in the nature of services in the post-pandemic. As an exemplary analysis, the first-, second-, and third-order changes are extracted from the six cases of service transformation presented in this volume, and contrasted with each other. Finally, a refined theory of third-order changes in the service sectors is proposed in relation to the evolution of digital technology, and its implications are discussed.

**Keywords** Third-order changes · Organizational transformation · COVID 19 · Post-pandemic · Organizational development · Information systems · Digital technology · Service industry · Metamorphosis

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## 1.1 Introduction

A novel coronavirus, first discovered in China in December 2019, led to a global pandemic in March 2020. The disease, called Corona Virus Disease (COVID), spreads among people through direct, indirect, or close contact with infected people through mouth and nose secretions (Kabadayi et al. 2020). Thus, strict measures such as border lockdowns, stay-at-home orders, travel restrictions, massive quarantines, enforced social distancing, contact tracing, and self-quarantines are enforced worldwide (Tian et al. 2020). These measures have been extremely harsh on business operations, especially the service sector, in which human contact is critical, has been hit the hardest. The situation is particularly dire in the hospitality sector. The global travel industry is facing reductions of more than 90% (Fernandes 2020). The impact seems to be vast and not yet predictable for the near and longer-term future of the service industries. All service operations are experiencing severely destructive effects on the nature of their businesses (Guzman et al. 2020).

In response to these challenges, service sector organizations have delved into a rapid adoption of technology-driven practices under severe time constraints (Carroll and Conboy 2020). In addition, this digital transformation is expected to escalate post-pandemic. People fear contact, and contactless services may become the new norm in all service aspects. Many potential changes may occur in the deep structure of services when using digital technology and applying severe alterations to service practices. In a certain sense, COVID-19 is bringing in an era of new normal digitalized services across industries, much earlier than anticipated.

The World Economic Forum identified 10 technology trends that are eminent in dealing with the COVID-19 pandemic, as listed below (Xiao and Fan 2020). Each of these technology trends contains digital and automation components. Moreover, most of these technologies aim to transform contact-based services into technology-mediated services. Human contact must be minimized (Fig. 1.1).

Digital technologies are opening up a whole new world of possibilities for services with deeper insights into customers, improving the service processes, optimizing the operations, and much more. However, the adoption of digital technology is complicated and usually meets with resistance and time-consuming adjustments. In the

**Fig. 1.1** The ten technology trends (Xiao and Fan 2020)

- (1) Online shopping and robot deliveries
- (2) Digital and contactless payments
- (3) Remote work
- (4) Distance learning
- (5) Telehealth
- (6) Online entertainment
- (7) Supply chain 4.0
- (8) 3D printing
- (9) Robotics and drones
- (10) 5G and ICT.

literature, it has been warned that an immature implementation of digital technology may trigger 'digital sclerosis' (Andersen et al. 2020). Such digital sclerosis might be characterized by a stiffening of the service processes, failing to respond to changes in demand, and lowering innovation possibilities once rigid digitalized systems freeze the service routines. To prevent long-term digital sclerosis, close observations and measurements of the impacts and evolution post-adoption, as well as a careful design, development, and implementation, are necessary in advance.

Despite the unplanned rapidness and abruptness of digital technology adoption in services during the pandemic, it is vital to observe and measure the changes incurred by these digital technologies on the nature of services. As an analytical framework for measuring the impacts of technology integration with services, a theory of three orders of effects of digital technology is presented here.

#### 1.2 Digital Technology Adoption: Three Orders of Effects

Business re-engineering has become very popular in 90s when digital technology had been rapidly advanced and adopted by businesses (Hammer 1990). However, this strategy of radical re-engineering is criticized as too radically dehumanizing the workplace, and contradicted by slow but incremental changes of organization using digital technology. This dichotomy of strategic thinking has been popular in 90's : radical re-engineering versus incremental improvement (Pereira and Aspinwall 1997). Since the advent of business re-engineering during the 1990s, both incremental and radical changes have contrasted within studies on organizational change and innovation as contrasting strategies for organizational change (Hill 1999). It can be traced back to studies on strategy in which they were described as gradual versus dramatic, or small-scale versus large-scale (Fox-Wolfgramm et al. 1998; Newman 2000; de la Sablonnière 2017; Berente et al. 2019; Lewis 2019; Watad 2019). These arguments are summarized in Table 1.1.

In general, these two approaches are considered as a choice of method, exclusive to one another. This dichotomy is used to compare and contrast two extreme approaches for organizational development and changes, and also used by many consultants. In most cases, they are presented as exclusive to each other. In some cases, these are portrayed as first- and second-order changes, though this naming implies sequence.

In another stream of organizational development studies, organizational changes incurred by interventions such as the adoption of new digital technologies are described as sequential stages: first-, second-, and subsequent third-order effects of changes induced by digital technology implementations (Bartunek and Michael 1994; Riasanow et al. 2018). This view is process-oriented in that it presents organizational development as moving from the first-, through the second-, and into the third-orders of changes, whenever organizations modify and develop themselves in response to environmental pressures and/or strategic needs. Links between this

Table 1.1 Two lypes	U UIGAIIIZAUUIIAI UAIISIU	IIIIation presented and	contraster III pitol contra	Summe inclaime		
	Berente et al. (2019)	Lewis (2019)	Watad (2019)	de la Sablonnière (2017)	Newman (2000)	Fox-Wolfgramm et al. (1998)
Incremental changes	Initial responses to an enterprise system implementation (first-order responses)	Incremental change that supports and strengthens the existing structures and competencies	Change that occurs within a system that remains unchanged	Incremental, beta, decline, gradual, small-scale change	Incremental and convergent changes helping firms maintain internal reliability	Changes that occur within the system itself
Radical changes	Responses over time to ongoing activity with enterprise system implementation (second-order responses)	Discontinuous change that poses a threat to the structures and capabilities	Change that alters the total system	Dramatic, gamma, abrupt, collapse, large-scale change	Transformational and radical changes at its core with strategic reorientation leading to an organizational metamorphosis	Changes in which the system itself changes
Context	Systems implementation	Technology change	Technology adoption	Social change	Institutional change	Institutional change

**Table 1.1** Two types of organizational transformation presented and contrasted in prior consulting literature

processual view of organizational development and digital technology implementations, however, have rarely been drawn, except in a few studies on work transformation with digital technology (Baptista et al. 2020) and digital system implementations (Riasanow et al. 2018).

In this stream, organizational development can be described as first-, second-, and third-order changes occurring in sequence using the concept of schemata developed in cognitive sciences (Bartunek and Moch 1987; Bartunek and Michael 1994) rather than two competing approaches of radical changes and incremental improvements. This theory can be found across various research disciplines, such as in the configuration of work (Baptista et al. 2020), family therapy (McDowell et al. 2019), classroom computing adoption (Makki et al. 2018), and digital transformation (Riasanow et al. 2018), among others. Representative research and theories regarding this three-orders of effects in different domains are selectively screened, summarized, and contrasted in Table 1.2.

In the context of digital technology adoption, the first-order of change occurs when the digital systems are designed and simply implemented. In most cases, digital systems are developed reflecting current business processes. The virtual processes are designed as replicas of the physical processes. Calculative routines in these processes are handled by numerical machines, thus the business operations can be much faster with new digital systems (Riasanow et al. 2018). In this regard, the first-order changes includes routinization of calculative and numerical procedures such as comparison of receipts and bill of lading. In this regard, first-order changes effect selective parts of an organization, such as certain localized business processes (Bartunek and Jones 2017).

The second-order changes occur when users realize that digital systems can go beyond a simple digital routinization of tasks. Patterns of work change and evolve, reflecting the characteristics of digital technology. Unnecessary steps and procedures are removed or modified, thus affecting the entire organization with potential to change the core concepts of the business (Young et al. 2016; Riasanow et al. 2018). For example, after comparison of receipts and bill of lading are delegated to the machines, humans may take more responsibilities for different processes which was not handled by him/her. As digital technologies are more malleable and operate in real-time compared to technologies based on physics, the routines are more easily changeable. Thus, work processes are transformed, reflecting these characteristics that might or might not have been anticipated in the initial design digital systems.

The third-order changes occur when the potential and deep capabilities of these digital technologies are realized in practice beyond the current organizational schemata and structural constraints. The third-order changes involve developing capacities for changing schemata and structure (Bartunek and Moch 1987; Riasanow et al. 2018). With capabilities provided by advanced digital technology, the organizational schemata are modified rather freely on the fly as events occur and environmental conditions change. The digital technologies and the impact of changes go beyond the organizational and industrial boundaries, taking advantage of the synergistic aspect of the information. New business models may emerge with these third-order changes.

Table 1.2	Studies used the theory of	f three-order effects in va	rrious fields			
	Baptista et al. (2020)	McDowell et al. (2019)	Makki et al. (2018)	Riasanow et al. (2018)	Bartunek and Michael (1994)	Bartunek and Moch (1987)
1st order	(Convergent change) reinforce, enhance, and evolve existing practices and understandings of work in organizations	(First-order thinking) changes or solutions to problems that fit within existing relational frameworks	(First-order barrier) willingness to incorporate technological tools with limited computing resources	Incremental or convergent change	Incremental change involving behavioral adjustments within established beliefs set	Incremental changes occurring within particular schemata shared by members
2nd order	(Transforming work) shift organizational schemata and social dynamics, and modify patterns of work and interactions	(Second-order thinking) changes in the process level of relationships, for example, change in repetitive patterns and schemas	(Second-order barrier) attitudes and beliefs in predicting the effective integration of technology in classrooms	Transformational or radical change involving entire organization	Changes in the deep structure and shared schemata that generate meanings to activities	Modifications in the shared schemata themselves
3rd order	(Transforming the organization) emergence of entirely new schemata, reshaping views about the nature of work and corresponding organizational structures	(Third-order thinking) take a meta perspective considering systems of systems, that is, sets of alternatives between schemas	(Third-order barrier) dynamic creation of knowledge and practice confronted with ICT and associated affordances	Change that exceeds organizational boundaries affecting business model and value network	Changes transcending and transforming schemata	Development of the capacity of the client system to change the schemata as events require
Context	Digital/human configurations of work	Family therapy and relationship building	Classroom computing integration	Digital transformation	Organizational development	Organizational development

Chapters from 2 to 7 in this volume deal with actual cases of service transformation and possible metamorphosis incurred with the adoption of new technologies. The theory of three orders of effects is used in analyzing these cases. The results are summarized in Table 1.3. It should be noted that some analyses are based on the 'author's imaginative abduction, while most analyses are based on facts. Abductive inferences are italicized in the table.

Changes	1st order	2nd order	3rd order
Chapter 2 (Reshaping the education services)	Convert to recorded online courses and interactive online course	Adopt a new learning management system and artificial intelligence	Implement observe, orient, decide, and apply <i>novel</i> loop for teaching and services
Chapter 3 (Rethinking higher education post-COVID)	Convert to a different form of online delivery	Respond to emerging challenges in online education and devise new ways of managing students	Deal with new financial challenges, changing priorities, and new ways of managing resources
Chapter 4 (Value co-creation in health care services)	Adopting a digitally mediated healthcare service ecosystem	Deal with newfangled actor engagement and integrate digitally mediated resources	Deal with newly emerging tensions such as structural changes and power shifts
Chapter 5 (Technology perception changes in health care services)	Adopt an electronic medical record system in an intensive care unit	Use the dynamic capability to mediate technology perceptions leading to productivity	Invigorate the dynamic capability leading to the productivity irrespective of technology perceptions
Chapter 6 (The digital trajectory of professional advisors)	Accelerate digital advisory system change wherein many intertwined processes are involved	Effectively break down barriers to change, such as culture, competencies, and sense of urgency	Rethink business models and service delivery to become more aligned with the new normal.
Chapter 7 (Livestream yoga experience)	Adopt a live stream experience of yoga where the instructor play their own livestream yoga	Change the fixed place, one-on-one business model, into online business <i>models enabling</i> <i>the widened search of</i> <i>yoga instructors</i>	Advance into the 'yoga practice of the future'

Table 1.3 Three orders of effects of digital technology adoption manifested in chapter cases

# 1.3 Three Orders of Effects of Digital Technology in Services: Cases in Chapters 2 Through 7

# 1.3.1 Discussions: Three-Orders of Effects of Digital Technology on Services

Services and services industries are undergoing tremendous changes. These changes are happening in the ultimate deep structure of services. Not only routines of services but also the meanings and goals of services are changing. In some cases, services may be aided by multiple layers of digital technologies, combining algorithmic as well as routinizing features (Lee and Moon 2018). In other cases, technologies may digitally automate tasks eliminating human intervention.

It can be even called the metamorphosis of services. New breed of services that could not be imagined are burgeoning flourishly, such as Uber and AirBnB. Uber is transforming the nature of rental car services and taxi services. Uber is shaking the ground of hotel businesses. Services based on the concept of sharing may prevail over services based on concentrated capital. Beyond simpler transformation of service routines by digitalization and digital augmentation, the services seems to be metamorphing themselves into new ones with the aid of digital technology.

It is the digital technologies that are fundamentally changing the way many services are being operated and delivered (Beirão et al. 2017; Subramony et al. 2018). The nature of services are indeed changing faster with maturing of digital technologies. These changes incurred and induced by digital technology are being exacerbated with fast advance of technologies themselves.

Today's digital technology such as cloud computing, Internet of Things, social media, mobile computing, and bigdata analytics were not available at least a decade ago (Lee 2015). The platforms of data and information that anybody can access and use were not available at all a decade ago. This continentalization of information makes it easy for people to build digital services by integrating and linking data and information from different sources (Lee 2016). Digital services can be conceptualized and implemented in a matter of hours and days rather than of months and years.

Now, with forced rapid adoption of digital technology in services, this trend is accelerating even more (Ryu and Lee 2018; Buhalis et al. 2019). As digital technologies are hastily adopted, the service organizations did not have sufficient time to think about and digest the possible second- and third-order impacts of digital technology in their services (ISS Group 2020).

Thus, service organizations have to think seriously about the third-order effects of their current actions and, if necessary, change the course of actions as the nature of services may change beyond the initially imagined (Lewis 2019). These changes might be critically important in sustaining the competitive edge of their businesses (Morais-Storz et al. 2018). These complex effects need to be interrogated in order to gain a deeper and clearer understanding of how digital technologies are changing the services, whose work is being changed and metamorphed. These third-order



Fig. 1.2 Convergent, re-engineered and dynamic services as three-order of effects

metamorphoses might be the source of enhanced competitive advantages in the future (Aimé et al. 2019). We need to go beyond the first-order effects of digital technology, and consider the second-, and the third-order effects to remain competitive.

Here, reflecting upon the cases analyses results applying the theory of three-order effects (Bartunek and Moch 1987; Baptista et al. 2020) to the service industry, the three-order of effects with digital technology adoption in services are presented as: convergent services (first-order), re-engineered services (second-order) and dynamic services (third-order). Details are presented in the text below along with the Fig. 1.2.

#### 1.3.2 First-Order Effect: Convergent Services

The first-order effect is the direct application of digital technology designed to support existing service routines. Or even for newly developed services, the initial design of digital technology for supporting this new service would be designed as following imaginary operational processes which will usually redesigned later reflecting the actual behavior of users and operators. Thus, it is most likely the replication of physical service processes into virtual ones. As the digital technology here converges with the target service routines, it is named convergent services.

A case of food delivery service will be used in exemplifying these three-order effects. The first-order effects of digital technology on food delivery service would be developing an App for customers to order from the menu along with an App for restaurant owners to receive and confirm the orders. This should be platform-based on which restaurant owners and customers are exchanging their order related information. This is the first-order change incurred in restaurant businesses when food delivery services are being implemented: installation of order-delivery apps on mobile phones of restaurant owners as well as of customers.

#### 1.3.3 Second-Order Effect: Re-engineered Services

The second-order change is the modification of current service processes reflecting the characteristics of digital technology. As digital technology is instantaneous and information, by definition, are synergistic, the service processes are re-engineered taking advantage of the digital technology. However, the organizational schemata is still being maintained. Changes are occurring the current organizational schemata.

The second-order effects occurred in the running example was the integration of order-delivery App with the point of sale (POS) terminal in the restaurant. Once the standalone Apps were installed on the restaurant owners' personal computers and/or cell-phones, owners begun to find that they have to re-input order details to the POS terminal transferring all the order-related information from the App. As food orders increase, these tasks are becoming cumbersome and unmanageable. Thus, they have re-engineered the food ordering process by integrating the App orders with POS terminal. The food ordering process of a restaurant is reengineered around new breed of POS terminals to which ordering Apps are connected. The POS terminal automatically rings in the orders from the Apps. It is the second-order effects of adopting the food-delivery Apps on restaurant businesses.

## 1.3.4 Third-Order Effect: Dynamic Services

The third-order changes incurred by digital technology in services involve developing the capability that the services can dynamically reconfigure themselves. With the intelligence capability provided by digital technology, the advantage of speedy information flow, and the synergistic nature of information, existing services are re-conceptualized from the bottom giving birth to new types of services.

The third-order effect of our running example would be the development of the shared kitchen services. As food-delivery demands grow, restaurants may begin to realize that they need to have localized kitchens that deliver warm foods to neighbors on time. Thus, several restaurants with high delivery demands may develop a shared kitchen in densely populated area where their chefs can cook and deliver warm food on time. Shared kitchens may come up with different business models such as sharing supply chains or customer bases. This may become a new business model with dynamic reconfiguration capability.

The third-order effects are most significant changes in the nature of services, henceforth the term, metamorphosis. As these third-order changes are beyond the current organizational schemata, it is not easy to imagine the actual shape of the third-order changes, but new services invented and evolved recently may provide some insights on what is going to happen. Sharing economy type services seem to be examples of these third-order changes of services using digital technology.

## 1.4 Conclusion

This chapter presents a theory of three orders of effects in adopting digital technologies. Using this theory, cases in the chapters of this volume have been analyzed. Based on these analyses, the three order of effects are extended into the service sector. For services, the first-order effects are defined as the convergent services, the second-order as the re-engineered services and the third-order as the dynamic services.

This theory makes greater sense at this time of advanced digital technology applied forcefully in pandemic situation. We may begin to see the extensive emergence of the third-order metamorphosis of services very soon, exacerbating the trend started earlier. Unless services are adapting to these third-order changes, their service businesses may soon lose the competitive edge.

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