

Mobile technology adoption among hotels: Managerial issues and opportunities

Spring H. Han^a, Jungwoo Lee^{b,*}, Bo Edvardsson^c, Rohit Verma^d

^a *Kyoto University, Graduate School of Management Kyoto Daigaku, Yoshida-Honmachi, Sakyo-ku, Kyoto-shi, Kyoto 606-8501, Japan*

^b *Yonsei University, Graduate School of Information, NMH 415, 50 Yonsei Ro, Sudaemun Gu, Seoul 03722, Republic of Korea*

^c *Karlstad University Karlstads, universitet 651 88, Karlstad, Sweden*

^d *Vin University, Vietnam Vinhomes Ocean Park, Gia Lam District, Hanoi, Viet Nam*

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ABSTRACT

Mobile technology in hotels is to provide innovative service solutions for both employees and customers, yet underexplored, and managerial and operational issues remain. This study aims at identifying those issues involved in adopting and implementing mobile technologies by a thematic analysis of focus group interviews of luxury hotel managers and executives. Eighteen managerial issues surfaced, leading to a mobile technology management framework consisting of six themes: strategic goal, customer management, operations management, process design, provider management, and infrastructure management. This mobile technology management framework provides guidelines for the successful adoption and implementation of mobile technologies in hotels. Implications are discussed with future research issues at the end.

1. Introduction

Mobile technology is significantly affecting the hospitality and tourism industry (Law, Chan, & Wang, 2018). Luxury hotels, so-called high-end hospitality, started inviting guests to use smartphone apps and tablets for greater convenience, customization, and personalization of their services. Numerous luxury hotel chains are now offering instant messaging services with a human concierge (Dieck, Jung, Kim, & Moon, 2017). Hotel guests can exchange instant messages using the hotel chat app with the hotel before, throughout, and after their stay via various online platforms (Anonymous, 2018). The messaging service enables staff to provide speedy responses and more personalized attention. The hospitality and tourism industries are trying to embrace mobile technology's full potential to create personalized consumer experiences, which constitute the building blocks of service excellence (Gibbs, Gretzel, & Saltzman, 2016). Mobile technologies are expected to foster a shift in how consumers interact with companies, transforming them from passive service recipients to real-time co-creators in a technology-enabled experience environment (Law et al., 2018; Sarmah, Kamboj, & Rahman, 2017).

Mobile technologies have advanced considerably over recent decades. These noble technologies provide functionalities and possibilities that had only been imagined, while the hotel industries' adoption is still in its nascent stage. Full-scale consideration for adoption is very recent (Anonymous, 2018; Dieck et al., 2017; Kucukusta, Heung, & Hui, 2014). Thus, there is a lack of understanding and adoption of mobile technology to extend a personal touch and foster value co-creation practices in hospitality services. As we are in the early stage of mobile technology adoption, making managerial decisions on adoption and further directing mobile technology's excellent practice are daunting tasks (Aye, 2018; Brida, Moreno-Izquierdo, & Zapata-Aguirre, 2016; Kaushik, Agrawal, & Rahman, 2015; Lee, Chen, & Su, 2017). This study's research question is as follows: What are the managerial issues involved in mobile technology adoption and use that managers face in the hospitality and tourism industry?

The luxury hotel context was selected for the study because few empirical studies have been performed, and plenty of opportunity for extending both the theoretical and practical literature, as they are leading the industry at the high end. In particular, we studied how luxury hotel managers perceive the managerial issues involved in

* Corresponding author.

E-mail addresses: han.hyunjeong.8r@kyoto-u.ac.jp (S.H. Han), jlee@yonsei.ac.kr (J. Lee), bo.edvardsson@kau.se (B. Edvardsson), rohit.v@vinuni.edu.vn (R. Verma).

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adopting mobile technologies, possibly inhibiting fast adoption. A series of focus groups were conducted with luxury hotel executives and managers. Based on these interviews, eighteen dimensions of managerial issues involved in adopting and using mobile technologies in the hotel industry were identified. These dimensions were again clustered into six broader themes.

The remainder of this paper is organized as follows. Section 2 provides a brief literature review on mobile technology adoption in hotels. Section 3 describes the materials and methods used in this study. Section 4 presents the process of coding and results in a derived managerial framework. Section 5 provides an in-depth discussion of the results, followed by Section 6, which presents the conclusions with the theoretical and practical implications, limitations, and future research directions.

2. Literature review: mobile technology adoption in hotels

Information and communication technology began to appear in the hospitality and tourism industry in the late 1950s. The computerized reservation systems developed by American Airlines is an early example. These computerized reservation systems helped reduce heavy manual operations and increase the productivity and efficiency of airlines' daily operations and other hospitality businesses, such as hotel- and tourism-related businesses (Buhalis, 1993). Since then, many digital technology applications have been reported unevenly across the hospitality and tourism industry (Law, Leung, Au, & Lee, 2013; Law, Leung, & Chan, 2019; O'Connor & Murphy, 2004).

Mobile technology has been looked into as a channel to enhance the customer experience as well as to increase the efficiency of backend operations. Especially after the advent of the mobile revolution led by the inauguration of the iPhone and iTunes around 2007, mobile technology began to draw hospitality and tourism businesses' attention. Mobile technology is not merely another platform for contact distribution (Feijóo, Maghiros, Abadie, & Gómez-Barroso, 2009). To view mobile technology as only transforming existing content into the mobile realm is practically neglecting some of its most promising aspects. Mobile technology differs from other existing technologies, such as fixed networks and stationary desktops, and provides new mobile services dimensions on top of traditional services (Sun, Law, Schuckert, Kucukusta, & Guillet, 2017). This entirely new dimension offered by mobility drives new strategic and operational opportunities for service firms (Kim, Connolly, & Blum, 2014; Rita, Oliveira, Estorninho, & Moro, 2018).

There have been efforts to categorize mobile technologies, mobile or wired networks, mobile Internet, and mobile devices. Additionally, mobile technology's soft sides, including mobile applications or widgets, enhance mobile services' experience, starting from organizing workflow on the move and ending with entertaining users (Gibbs et al., 2016; D. Wang, Xiang, Law, & Ki, 2016). The soft side of mobile technology represents a hotbed for continuously producing innovative solutions, especially in hospitality and tourism (Gerstheimer & Lupp, 2004; Kwon, Bae, & Blum, 2013; Nikou, Bouwman, & de Reuver, 2012).

Research topics related to smartphone applications began attracting attention in the marketing and managerial literature as one stream of mobile technology studies. This stream included research on branding (Bellman, Potter, Treleaven-Hassard, Robinson, & Varan, 2011), consumer adoption of mobile applications (Racherla, Furner, & Babb, 2012), and examinations of the effect of such applications on consumption values (Wang, Liao, & Yang, 2013) and customer-service jobs (Jeong, Lee, & Nagesvaran, 2016). Dube and Helkkula (2015) examined customers' use experiences in a smartphone application context, and the results showed that indirect use experiences play an essential role in the holistic customer experience. However, the role of mobile technology and its practices in the service ecosystem context still needs to be explored, as the application history is still young (Aye, 2018).

3. Materials and methods

To identify the managerial issues involved in adopting and using mobile technology in hospitality, we collaborated with the Luxury Hotel Association to conduct a series of focus group sessions in major cities across the United States. Although the choice of a single industry (service ecosystem) and single nation may limit generality, it also reduces potential problems when sampling firms from diverse industries (Han, Kim, & Srivastava, 1998; Kyriakopoulos & Moorman, 2004; Ordanini & Parasuraman, 2011).

Luxury hotels are generally considered a highly complicated service ecosystem wherein multiple services are provided simultaneously; thus, they can be evaluated on various criteria (Verma, Plaschka, & Louviere, 2002). Luxury hotels seek to offer personalized experiences, and their guests typically allow little room for error. Given the high customer expectations and the variety of services offered by luxury hotels (e.g., restaurants, rooms, spas, fitness centers), they are at the forefront of adopting innovative business practices, aiming to preemptively provide best-in-the-industry services with a new and robust appeal to markets (Haugland, Myrteit, & Nygaard, 2007). Luxury hotels contain the most complex configuration of services; that is, they are both "high-touch" (i.e., interpersonal) and "high-tech" (i.e., mediated by technology). Compared to mid-range hotels, top-scale properties compete more based on creativity and innovation than on price and location (Harris & Watkins, 1998; Ordanini & Parasuraman, 2011).

A series of focus group sessions were conducted with luxury hotel executives and managers. The focus group approach is a research method in which facilitators bring together a handful of people in a room to discuss and provide interactive feedback regarding a product, service, or concept. Focus group interviews replicate real-world settings in which people share their opinions by talking about their thoughts, feelings, perceptions, and opinions within a group. During this process, underlying feelings and thoughts are revealed much better than in one-on-one interviews, where people become introverted and protective. As this study intended to uncover underlying perceptions concerning challenges in adopting and using mobile technologies in their business settings, it was put forth that executives and managers might talk more freely when they were engaging and triggering each other's thought processes.

Two researchers conducted and participated in the series of focus group interviews within the Luxury Hotel Association events in 12 major cities across the United States. Participants were openly recruited from the managerial executives attending these events. As they were recruited voluntarily, the focus group size varied, but it was around ten on average. In most cases, the focus group activities were scheduled as an informal session within the event, and participants were provided snacks and a small gift. Personal information was not collected to promote free-floating discussion and issue raising. The participants were executives and general managers who had extensive management experience in the hospitality industry and were thus deeply familiar with today's hotel guests' wants and needs while also aware of their mobile technology practices.

As most executives were involved in other sessions and remotely dealing with their business operations, they were allowed to come and go freely, even during the focus group sessions. Thus, the numbers were not fixed, and they are not reported here in detail, nor are the demographics of participants. Overall, more than 200 executives participated at least in part in the focus group sessions. Some provided feedback by email afterward. Most interviews lasted about an hour.

4. Coding, analysis, and findings

The focus of the interviews was to identify and explore the challenges of adopting and implementing mobile technology in their businesses. Their discussions offered insights into challenges and practices involved in adopting mobile technology in the luxury hotel context. The focus

group interview transcripts revealed a rich lived experience and captured complex, detailed, and evolving descriptions of challenges that they were facing. To analyze the focus group discussions and provided information, we applied a thematic analysis technique. Various content analysis techniques can be used to analyze focus group interview results depending upon methodological assumptions of the investigator. The analysis method can be related to the epistemological questions, data, interview method, or scientific report writing (Czarniawska-Joerges, 2004; Heikkinen, Huttunen, Syrjälä, & Pesonen, 2012; Moen, 2006; Riessman, 1993). Thematic analysis is a qualitative research method that allows meanings expressed primarily in words and phrases in terms of thoughts, ideas, experiences, and emotions. It is designed to uncover the underlying implications of the transcripts. These meanings may potentially be clustered into themes. Compared to the grounded theory approach, thematic analysis is targeted at revealing the underlying themes. Thematic analysis is appropriate for this study, as it aims to cluster managerial issues into meaningful themes in adopting mobile technology in hotel businesses. As these executives were dealing with customer demands on a daily basis, the customers' perspectives are naturally reflected in the opinions and views expressed by them.

The thematic analysis consisted of a six-phase methodology (Braun & Clarke, 2006; Sage, 2019, 1) examining the data, (2) generating initial codes, (3) searching for themes, (4) reviewing themes, (5) defining and naming themes, and (6) producing the report. Two different researchers (those who facilitated the focus group sessions) generated initial codes after carefully reviewing all transcripts twice. The initial coding generated a list of initial issues based on keywords and short statements excerpted from the transcripts. We then applied focused coding for these issues to combine, subdivide, and eliminate coding categories as we looked for repeating ideas. In this session, one additional researcher provided unbiased aid for clustering and grouping. Three researchers conducted the thematic analysis session, which ultimately resulted in surfacing eighteen managerial issues from these transcripts. The eighteen issues with related keywords and excerpts are presented in Table 1.

While distinct in their own way, these issues seemed to have common characteristics and features; thus, they were subjected to further analysis to uncover themes. In order to analyze further, one more researcher was recruited and added. Together, four researchers conducted clustering exercises to identify the underlying themes. As a result, the eighteen issues were organized into six managerial themes: strategic goal, customer management, operations management, process design, provider management, and infrastructure management. The identified themes are pictorially presented in Fig. 1.

Practices are routines that actors enact to facilitate collaboration and make sense of other actors' resource-integrating activities in a specific social or business context. The introduction and use of mobile technology require that some business practices in hotels are changed, and new ways are to be developed. The six key themes identified may represent the focus areas of practice changes in hotels. It appears that customer experience enhancement is the prime strategic goal leading other themes. Executives and managers consider value for customers critical even in mobile technology practices, which includes personalized experiences and, at the same time, possibly co-creating business value taking advantage of mobile agility.

This strategic goal is supported by five themes dealing with various aspects of their management tasks: customer management, operations management, process design, provider management, and infrastructure management. These themes are described in detail below.

4.1. Strategic goal

Customer experience enhancement appears the prime strategic goal in adopting and implementing mobile technologies. This issue has surfaced as a topmost issue. Ideally, mobile technology provides high-tech support that augments the human touch integral to the luxury hotel industry. Given the importance of high-touch service in the luxury sector,

Table 1

An initial list of issues involved in adopting mobile technology in hotels.

Issues	Representative keywords
Customer experience enhancement	Lack of personalized service and interaction with guests Mobile technology applications cannot replace customizable personal services Uniform standardization enforced by mobile technology would not fit with our strategic orientation of personalized services for individuals Decreasing interaction between workers and guests leads to problems (e.g., silent food ordering) Losing real human touch in the hospitality business when the frequency of service encounters is decreased
User awareness of technology	Guests are not accustomed to advanced mobile technology Ease of usability for guests, including language issues Guests are generally interested not in implementing mobile technology but in other things that they want to do Co-creation is an excellent idea, but implementation is needed to overcome many hurdles on the business side It is difficult to get customers to actually act on service offerings implementing mobile technology
Privacy protection	Privacy of personal information cannot be guaranteed for business reasons sometimes Personal context information needs to be accessed for business reasons but not possible due to privacy The mismatch between business requirements and technology requirements in terms of privacy protection Much information can be collected via mobile technology practices but not possible due to privacy protection Customer footprint recording is intensive in the case of mobile technology
Staff training and learnability	Hospitality workers have diverse backgrounds and education levels Diversity of jobs and tasks requires different types of employees (housekeeping, janitorial service, security, concierge, managerial staff, etc.) Advanced technology in most cases requires training across these workers of different backgrounds Efficient training of staff is challenging due to the variety in jobs/age groups/education levels Hospitality operation is 24 h 7 days, and different groups come to work at different times
Accountability management	Lack of direct accountability for managing and maintaining mobile devices, apps, and related technologies Checking and monitoring via mobile technology is not as reliable as face-to-face monitoring, thus requiring dual-mode monitoring Additional tasks and jobs are emerging, such as technology monitoring and managing Business systems are becoming dual and overlapping
Service reliability	Technology sometimes crashes for unknown reasons Consistent execution of required business processes is occasionally interrupted Devising high-end services reflecting luxury demand is difficult, as demands are very diverse The variety of customer demands is too great to be reflected in mobile technology practices Mobile technology is offering additional channels, making management more complicated
Cost justification	Return-on-investment cannot be easily measured Cost for customized design with appropriate platforms is escalating over time Follow-up cost for changing technology is very high Customer responses to technology are very different from those proposed by technology providers Scope of budget estimation is much broader than other resources – hidden cost problems
Business tech fit	It is not easy to translate traditional hospitality offerings into concise mobile application practices Having various channels for the same service sounds nice, but many customers choose not to do things

(continued on next page)

Table 1 (continued)

Issues	Representative keywords
Integrated design with a variety	themselves, especially in the luxury context For example, a wake-up call can be reserved by phone, mobile app, text to concierge, TV interface, mobile device in a room, etc. Mismatch and misalignment between the hospitality process and technology process
	Determining how to select and design content for mobile applications is complicated and confusing Different technology options are available, but it is complicated to identify the contextual conditions for other options Choosing technology is one thing while enforcing the use of technology is another No standard or best practices of what kind of mobile services in what type of context to what kind of customers can be identified easily
Integrated information monitoring	Monitoring information collected from mobile technology practices becomes an additional task to be handled Information needs to be integrated from different devices, such as room TV, mobile phones, and other Internet of Things-related devices Additional business processes need to be implemented on top of current business processes Additional tasks need to be allocated to hospitality-trained managers Hospitality businesses do not require detailed and delicate information collectible by mobile technologies
Complexity in operationalization	Reengineering and optimizing the hospitality processes to fit with mobile technology characteristics is not simple Determining which part of hospitality needs to be simplified by implementing mobile technology is not easy, as there is no standard or best practice A relatively short technology lifecycle may negatively impact the lifecycle of business processes
Tech support transition	Technology supports become unstable when their ownership is transferred, especially from ventures to big corporations Ownership of technology supporting firms frequently changes in a relatively short period The supporting mode of technology changes overnight, such as from onsite to remote support Remote technology support seems to be inefficient but is becoming the industry standard
Vendor selection	Tech companies are not guest-centric but technology-oriented The user-centered design concept is challenging actually to implement Technology experts do not understand the different demands in the hospitality and tourism industry Finding and selecting an appropriate technology vendor is not easy The invisibility of mobile technology makes assessment harder
Communication with tech provider	Communicating business requirements to technology providers are not easy Language barriers between hospitality and technology It is very difficult to pinpoint technological problems from a business perspective
Tech-to-tech compatibility	Lack of integration between platforms Integration of technology-based services at the backend requires more attention than anticipated New technology is not compatible with older implemented technologies Standards and protocols proposed by various providers are different and take time and effort to integrate
Speed and connectivity	New and attractive technology applications demand higher speed and constant connection Constant connection is required for some advanced mobile technology applications Luxury locations are mostly remote and barren, such as islands, coasts, and high mountains Necessary infrastructure to use and implement mobile

Table 1 (continued)

Issues	Representative keywords
Rapid tech development	technology is not evenly implemented across the business boundary The mobile network would not be enough to accommodate newly designed mobile technology applications
	Mobile technology changes very frequently and requires frequent updates of mobile devices and apps Asking guests to update their devices and apps is problematic and time-consuming Hard to reflect new technology development into an annual budgetary cycle Trend changes daily related to mobile interactions

however, we found that the quality of interaction with customers is currently questionable when it comes to mobile technology adoption. The challenges at this level depend upon the type of mobile technology in question and the level of application. For essential problem-solving technologies already used to catch customers’ attention and simplify bookings, managers are concerned about losing human-to-human interactions. They view the loss of human-to-human interactions as a threat to their ability to evolve as professionals in this industry. Moreover, with time, artificial intelligence can even overcome human intelligence, and that is where the guest will either feel awkward or simply too lazy or disconnected from what is happening.

These findings illustrate that service firms must continuously work to ensure that their mobile technology developments remain focused on their customers. Automation by mobile technology can help drive efficiency, but it should not replace authentic customer service, particularly at luxury hotels. This does not mean that technology has no place in luxury hotels. On the contrary, the focus group attendees noted that it is too much of a challenge to ask front-line staff to focus on customer service while simultaneously fulfilling guest requests through mobile technology. Above all, technology must be used to enhance the experience for guests. Moreover, most guests still want a personal touch from dedicated staff; mobile technology can improve this as long as it is used wisely.

4.2. Customer management

For the customer experience enhancement strategy to be effective, customers need to be managed accordingly. The two most important issues at this level are user awareness of mobile technology and privacy protection.

User awareness of mobile technology refers to voluntary and involuntary use of technology by the guests. Some guests willingly participate in co-creation, but others might reject it. For example, asking guests to download a smartphone application to access the facility is a daunting task for hospitality workers. In many cases, mobile users have limited storage space, and most people do not like downloading new applications. Thus, instructing hospitality guests on technology use and asking them to configure their devices would not be easy. Luxury hotel managers identify user awareness as one of the vital challenges in establishing mobile technology practices.

Privacy protection is another theme that surfaced as one of the customer-related challenges. Some guests are reluctant to install hotel apps, as they are worried about personal information leaks. It is crucial to protect guest privacy, but at the same time, it is essential to assure guests that their privacy is protected. However, this privacy protection is a double-edged sword. While it is vital to protect private information, this information is critical in enhancing customer experience in implementing mobile technologies. Without accessing personal information, it would be difficult to personalize and customize services for each guest. In this regard, hotels need to carefully deal with private information while demanding creative and innovative approaches.

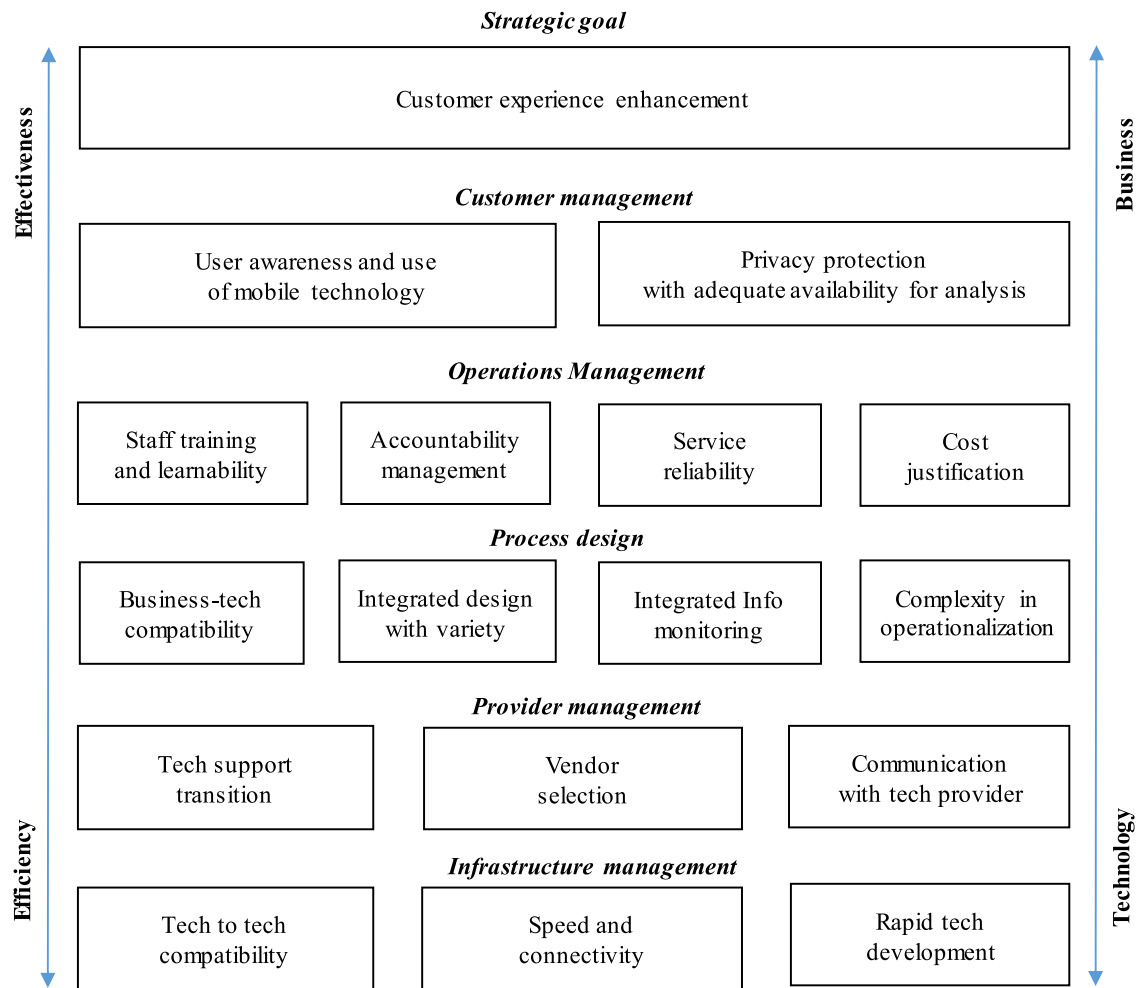


Fig. 1. Mobile technology adoption framework.

4.3. Operations management

The third level below customer management is operations management. Four issues are identified as critical here: staff training, accountability management, service reliability, and cost justification.

Staff training is essential to effectively enable and direct mobile technology practices to create favorable customer experiences. Training seems to be a logical starting point for an in-depth exploration of mobile technology practices that might be considered in a service-innovation context. Managers offer their staff online training, mainly using the Internet, and staff members should seek out up-to-date information to enhance their knowledge and proficiency in using technology. Consistent training and constant updates are crucial to ensure all employees are on the same page in implementing the newest technology and avoiding human errors. However, all this training requires extra time and effort for hotel employees who already face a substantial workload working on a 24-h shift cycle. One of the challenges here is that mobile technology may not be accessible to all. With hospitality workers' diverse demographic base, the variation in their abilities to use mobile technology is an issue for both hotel employees and customers. Some may not use mobile apps at all. Low skill levels or unwillingness to participate may cause hesitation and inconsistency in the use of mobile platforms.

Accountability management is related to the new tasks and responsibilities created when mobile technology is adopted, and new services are developed implementing the technology. Once the mobile network is set up with platforms and databases that accumulate the data

from mobile devices and disseminate information to these devices at the right moment, the status of data collection and dissemination need to be monitored and processed by employees. These are additional tasks for employees, thus requiring new kinds of jobs to be created. Responsibilities need to be allocated on top of current tasks, and accountability needs to be specified to sustain the intended level of effectiveness when adopting and implementing mobile technology.

Service reliability has to do with activities, processes, and systems being up and running as promised, safely and securely. In short, it is essential to ensure the mobile technology works at all times up to the specifications for both customers and employees. The responding luxury hotel managers noted that some apps are still in their infancy, although they are aimed for valuable outcomes. It was also noted that sudden technology crashes still occur. Other points included that the customer demands regarding mobile technology practices, once in place, are so diverse that it is challenging to reflect all of them accurately. It always comes down to guest expectations that all their requests and services will be guaranteed and delivered faster. Then, no matter how good the IT team is, there is usually a breakdown of either the system or communication somewhere, which then causes more guest dissatisfaction.

Cost justification relates to two critical points; one is the changeability of mobile technology applications. They are always subject to pressure for change. Compared to other technological artifacts, such as buildings and automobiles, mobile technology components frequently need field changes. As these can be changed more easily, users think they are infinitely malleable, causing the maintenance cost to escalate

continually. The other is invisibility. It is not very easy to measure how much it costs to build mobile technology applications. Depending upon the quality, the cost differences are very high, and a high cost does not guarantee high quality.

4.4. Process design

When it comes to mobile technology adoption, the business processes are to be embedded in the technology, and the technology design needs to reflect the business requirements. Four issues are identified as critical in terms of process design: business technology fit, integrated design with variety, integrated information monitoring, and complexity in operationalization.

Business technology fit refers to the fit between hospitality business processes and the characteristics of mobile application practices. Misalignment of mobile processes with business processes may cause the business operations inefficient and ineffective. It would be difficult for the physical processes to be ported because mobile technology characteristics, which focuses on information, are somewhat different from those of the physical processes. The process needs to be matched with the usability and the affordances of mobile technology to make users comfortable. Moreover, as mobile technology is a relatively lean technology, business processes need to be streamlined. The human touch-based hospitality and tourism services need spontaneous responses and a wide variety of reactions, which would be very difficult to reflect in the mobile technology design. Executives and managers are very concerned about the appropriate design services using mobile technology from this perspective.

Integrated design with variety relates to the affordances possibly provided by mobile technology to hospitality service offerings. The translation of hospitality offerings into concise mobile application designs is perceived as a rather daunting task. As mobile technology, in general, is very lean in terms of flexibility and adaptability, a single application would not easily accommodate the complex variety of customer needs and expectations. The affordances provided by mobile technology would not be rich enough to handle the various types of customers' needs.

Integrated information monitoring is an additional task incurred when mobile technology is adopted. Generally, mobile technology practices in business include not only one piece of technology but also complicated and interconnected sets of technology that accommodate multiple information flows. It requires dealing with numerous sources of information in terms of many devices and various servers and services. By definition, information is synergetic, meaning that its value exponentially increases when converged with other information. Information from these multiple sources and multiple channels should be monitored in an integrated manner in order for it to benefit businesses. Although this process can be automated, extra efforts are required to monitor and process such integrated information.

Complexity in operationalization refers to the complexity involved in business reengineering when mobile technology is adopted. Reengineering and optimizing the hospitality processes to fit with mobile technology characteristics is not simple. It requires complex decision-making processes to determine which part of hospitality business processes can be simplified using mobile technology. Hospitality business processes need to be decomposed for mobile technology adoption and, at the same time, technologically seamlessly integrated. Finding new business processes using mobile technology is not easy. There are no standards or best practices yet, and the hotel business involves various stakeholders in integrated business processes comprising different handovers and parallel operations. Also, as mobile technology may have a relatively short technology lifecycle, this complexity may exacerbate as mobile applications have a relatively short technology life cycle for various reasons.

4.5. Provider management

Three issues are identified as technology provider management: tech support transitions, vendor selection, and communication with tech providers.

Tech support transitions are related to the fact that mergers and acquisitions frequently occur in mobile technology businesses. As the mobile industry is still relatively new, many technology services are handled by startup ventures, but larger corporations sometimes buy these startups. The agility, which is very high when the technology is initially adopted, dissipates when the technical support is transferred to larger corporations in which bureaucratic processes are in place. Thus, there is a switch from onsite agile technology support to remote heavy technology support. As mobile services need to be tendered, they may become quickly outdated and obsolete with bureaucratic, technical support.

Tech vendor selection refers to the difficulty involved in selecting technology vendors. Most mobile technology providers are competing based on the freshness of ideas, as they are young ventures. However, the assessment cannot be solely based on the ideas, as the sustainability of the business processes that they are helping to build is also important. In many cases, these young ventures offer brilliant ideas but do not excel at identifying customer needs. Thus, finding and selecting an appropriate technology vendor is not an easy task for various mobile technology practices.

Communication with tech providers is quite challenging for various reasons. Technology companies and techies are not always end-user oriented nor customer-centric. Technology people speak their language and do not speak the hotel business languages most of the times. Mobile technology adoption for hotels is mainly for improving efficiency by having a broad scope, including customers' behaviors to achieve service effectiveness. However, it is not always easy to communicate the business need in technological terms. Tech providers are more interested in technologically advanced issues than hotel specific matters.

4.6. Infrastructure management

Three issues are identified in infrastructure management: tech-to-tech compatibility, speed and compatibility, and rapid technology development.

Tech-to-tech compatibility enables actors to integrate a wide range of resources, including mobile technologies, both within and across system boundaries. The challenge of integrating new technology with existing legacy systems is a longstanding issue for luxury hotels and the hospitality industry generally. The development of mobile technology has not smoothed issues surrounding this practice. Integrating old or existing operating systems and new mobile technology may not be a simple task. In addition to simple compatibility matters, the gap includes investment and the employees' and customers' learning ability. A reliable mobile technology solution should support integration with traditional hospitality technologies and other mobile technology implementation.

Speed and connectivity are closely related to reliability since guests expect prompt reactions at any time they need. Searching for information using smart devices is now the first option. From there, customers take action to book or schedule on the device using the Internet connection. As a result, hotels need to provide immediate updates and send instant feedback. For instance, a hotel guest can make a dinner reservation at the hotel restaurant using their smartphone through the hotel provided applications without ever calling the restaurant. The restaurant receives the request and reserves a table, then the guest is informed of the reservation completion. All actions can be completed using a mobile device. Some properties are in remote locations; therefore, securing sufficient and reliable broadband might be challenging. Additionally, poor-quality and inconsistent satellite Internet would be problematic. High-speed Internet and a reliable connection should be a high priority for hotels to collaborate smoothly with customers and

employees in real-time.

Rapid technology development refers to the difficulty involved in dealing with fast-changing mobile technologies. Changes in business processes and business models need to follow these technological advances. Rapid technological change, coupled with extensive restructuring, leads to the association of technology with distress. The rapid development of mobile technology leads to frequent updates and replacements, which most employees and customers are very reluctant to perform. Also, some advances require the overhaul of services put into place very recently.

5. Discussion

In this study, a series of focus group interviews were conducted against luxury hotel managers and executives. The content of these focus group interviews was subjected to thematic analysis. A six-layer management framework of managerial issues involved in adopting mobile technology in hotels is developed from the thematic analysis. The critical goal when adopting mobile technology was to enhance the customer experience. Even if not all customers are very interested in using the latest technology, it was noted that businesses must introduce and adopt up-to-date technology to survive against the competition. Customer experience enhancement was the top strategic goal along with the accompanying managerial issues involved in supporting business activities.

Given the proliferation of smartphones and mobile devices, we argue that service firms in general, and in luxury hotels in particular, will continue to extend their use of mobile technologies to support managers, employees, and customers. Indeed, one could almost identify mobile apps as actors, facilitating the integration of resources during value co-creation. Mobile technology works in a setting where multiple actors - including customers, employees, managers, partners, and suppliers - might be present and engaged simultaneously. These different actors also have a wide range of knowledge and skills in using mobile technology devices. With the advent of these new technologies comes a wide range of managerial issues as decision-makers struggle to keep up with the latest technology that their users want and are willing to use and, at the same time, make sure that the business is profitable. We take notice of the essential matter of maintaining a balance between service efficiency and effectiveness in the context of mobile technology services while always maintaining the human touch.

The goal of the hotel business in adopting mobile technology is to provide the best experience to customers. For hotels to manage productivity and efficiency, they need concrete guidelines for understanding and projecting the effects of their prioritizing and arranging both inputs and outputs. Strategic and operational decisions based on assessment and organization of inputs will improve effectiveness, and proper organization of outcomes leads to greater efficiency. Therefore, the present research emphasizes mobile technology as a crucial resource to manage the tradeoff between service efficiency and effectiveness. Our critical theoretical idea linking these two phenomena is that mobile technology is integral to the service exchange in the service ecosystem and must be considered an extension of high-touch, meaning that technology practices are essential to mutual value creation through the service exchange.

6. Conclusion

The luxury hotel industry sees mobile technology's adoption as more of an opportunity than a threat, despite the managerial issues highlighted in this study. The widespread use of mobile technology practices in service firms allows the rich experience to be accumulated in organizational and economic applications. Mobile technologies enable access to resources and collaboration with other actors in the process of co-creating value in more efficient and effective ways and with a positive influence on customer experience and company success. Here, we

emphasize the need for service managers to pay special attention to customer co-presence because its impact on service experience is contingent on various factors, including some within the managers' control.

Customers and employees play a vital role in value co-creation through mobile technology practices, again within management control and support identified in this study. Actors share goals and meanings, both individually and collectively. These practices increase confidence in the creation of shared meanings among actors and leverage actors' competencies. Here, the biggest challenge while implementing the technologies is to create more time for individualized service and face-to-face interactions, which can provide customers with personal touch and communication to maximize favorable customer experiences.

This study mainly focused on managers' perceptions concerning adopting mobile technology for providing benefits to both employees and customers. As most of the existing work was conceptual, our findings theoretically contribute to a scholarly understanding of practice-based issue identification informing the development of technology solutions for hotels. Our study opens up many avenues for future studies. There is a need for further empirical research studies exploring the customers' points of view in mobile technology practices and comparing perceptions of employees and customers. We would also encourage further investigation of the three phenomena that inform the adoption of mobile technology: service efficiency, service effectiveness, and service productivity.

Credit author statement

Hyunjeong "Spring" Han framed the research design and participated in the thematic analysis. Jungwoo Lee conducted mobile technology literature review, participated in the thematic analysis, and contributed to the framework development. Bo Edvardsson performed the content and thematic analysis. Rohit Verma and Bo Edvardsson carried out the focus groups interviews. All co-authors contributed to the final version of the manuscript.

CRedit authorship contribution statement

Spring H. Han: Conceptualization, Methodology, Investigation, Writing - original draft, Writing - review & editing, Project administration. **Jungwoo Lee:** Methodology, Formal analysis, Validation, Writing - review & editing. **Bo Edvardsson:** Methodology, Investigation, Writing - original draft. **Rohit Verma:** Methodology, Investigation, Writing - original draft, Supervision.

Declarations of interest

None.

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Hyunjeong Spring Han is an associate professor of Marketing in the Graduate School of Management at Kyoto University, Japan. Her current research interests include technology adaptation in services, customer emotions and experience management, and the marketing of long-lived service companies. Han has published research papers in various journals including *Cornell Hospitality Quarterly*, *Service Science*, *International Journal of Tourism Science and CHR reports*, and she has also received research and teaching related awards; Industry relevance award 2017 from Cornell University, Best paper award from 2014 TOSOK International Tourism Conference, Best paper award for the year 2012 from Cornell Hospitality Quarterly, and Educational innovation award from National Research University HSE in 2014.



Jungwoo Lee is the Director of Center for Work Science, and a Professor of Smart Technology Management at Graduate School of Information, Yonsei University in Seoul, Republic of Korea. Before arriving at Yonsei, Jungwoo was a faculty member at University of Nevada Las Vegas, and a lecturer at Georgia State University. He holds a Ph.D. in computer information systems from Georgia State University, USA. He served as the newscaster for a morning news program at Maeil Broadcasting Network in Korea. He also serves in the Government Digitalization Committee of Korea. He was a visiting scientist at Samsung Economic Research Institute, Korea, Muenster University, Germany and Hitotsubashi University, Japan. Jungwoo's current research interests include the changing nature of work by information and communication technologies, particularly in contexts where individual and team level work routines are being changed for creating and sharing knowledge. Specific current research focuses are on and around individual and collaborative job crafting, roles of AI at work, digital gestures in virtual communications, and collaboration overloading in knowledge work. In the early days of government digitalization, Jungwoo has published a developmental model of digital government, providing a theoretical basis for numerous international indices for e-government development. With subsequent external services related to government digitalization, Jungwoo is decorated in 2017 with the Presidential Honor in Republic of Korea. Aside from academic responsibilities, he had been served as CIO and University Librarian of Yonsei University.



Bo Edvardsson is Professor of Business Administration and former Vice Rector at Karlstad University, Sweden. Bo is the founder of CTF-Service Research Centre at Karlstad University. Bo is also Professor two at Inland Norway University of Applied Sciences. In 2008, he received the RESER Award "Commendation for lifetime achievement to scholarship" by The European Association for Service Research and in 2004 The AMA Career Contributions to the Services Discipline Award. In 2013 Edvardsson was appointed Honorary Distinguished Professor of Service Management, EGADA Business School, Mexico. In 2009 Bo Edvardsson was awarded Honorary Doctorate, Swedish School of Economics and Business Administration, Hanken. Bo is the former editor of *Journal of Service Management*. His research includes new service development and innovation, servitization in manufacturing, complaints management and service recovery, service-dominant logic and ecosystems transformation. His journal papers have received several awards and most recently in 2016 best article in *Journal of Service Research* special issue on Transformative Service Research. Bo Edvardsson Google Scholar citations in January 2019 shows that Bo has over 15,000 citations.



Rohit Verma is the Singapore Tourism Board Distinguished Professor in Asian Hospitality Management at the School of Hotel Administration (SHA), and Professor in Operations, Technology and Information Management area. He is currently on leave to serve as the Founding Provost of VIN University in Hanoi, Vietnam. Verma has published over 75 articles in prestigious academic journals and has also written numerous reports for the industry audience. He regularly presents his research, participates in invited panel discussions, and delivers keynote addresses at major industry and academic conferences around the world. He is co-author of the Operations and Supply Chain Management for the 21st Century textbook, and co-editor of Cornell School of Hotel Administration on Hospitality: Cutting Edge Thinking and Practice, a professional reference book that includes works of several of his colleagues at Cornell. Verma has received several research and teaching awards, including "Lifetime Achievement Award" from Production and Operations Management Society's College of Service Operations; several "Industry Relevance" awards from Cornell Center for Hospitality Research; "Masters' Core Class Teaching Award" from Cornell School of Hotel Administration; "Skinner Award For Early Career Research Accomplishments" from Production and Operations Management Society; "Spirit of Inquiry Award", the highest honor for scholarly activities within DePaul University; and Professional Service Award from the David Eccles School of Business, University of Utah. His research articles have received "Jack Meredith Best Paper Award" from Journal of Operations Management and "The Most Influential Service Operations Paper Award" from Production and Operations Management journal.