Leveraging Smart Technology for User Experience Personalization – A Comparative Case Study of Innovative Payment Systems

Shari S.C. Shang[1], Lynn S.L. Chiu[2,*]

[1]National Chengchi University, Taiwan, sshang@nccu.edu.tw
[2]National Chengchi University, Taiwan, lynnchiu66@gmail.com

Abstract

Background: *This study seeks to understand how the attributes of smart technology (SMT) can be leveraged to enable personalized services and optimize unique user experiences to attract and retain customers. Based on Kang et al.'s (2020) study of SMT attributes and quality effects and Liang et al.'s (2006) study on personalized recommendation and user satisfaction, we constructed a SMT personalization model to analyze how the SMT attributes of smart functionality and smart content enable personalization in different ways and create unique customer experiences throughout the user journey.*

Method: *Two representative payment systems were selected to depict how they integrated the strengths of personalized smart functionalities and contents to innovate their business models, optimize user experiences, and sustain business growth.*

Results: *Based on the comparative analysis of the two payment cases, the functionality and content attributes of smart chips and omni-channel platforms were explored, and the tailored advisory and responsive support for customers both offline and online were validated.*

Conclusion: *The life-enriching service innovations provide valuable insights for leveraging SMT for personalization. It is hoped that the SMT personalization model can be extended to other types of SMT applications and can be used as a framework for designing innovative services.*

Keywords: Smart Technology, Personalization Service, User Experience, Digital Wallet, Smart Chip.

Introduction

Smart technologies (SMT) are technologies that are capable of monitoring environments by collecting data through sensors and analyzing the collected data to provide informational support (Foroudi et al., 2018; Zoughbi & Al-Nasrawi, 2014). This kind of technology is smarter than previous technology because it combines artificial intelligence and innovative technologies (e.g., the Internet of Things, soft robots, image and voice recognition, blockchain mechanisms, and unmanned vehicles) to offer new and valuable production possibilities and allow informational resources to be processed and integrated into new ways to create unprecedented smart services (Yang et al., 2021). The term "smart technology" originally came from the acronym for "Self-Monitoring, Analysis, and Reporting Technology" (Netlingo, The Internet Dictionary, n.d.), but it has since come to be used broadly to refer to all systems that allow for connected objects, such as smart cards, smartphones, smartwatches, or smart service platforms to interact with users and affect users' behaviors (Gallina, 2019).

Recent years industries have witnessed the emergence of physical products that are digitally networked with information systems to enable business interactions, particularly bundled with mobile devices. These connected products enable the co-creation of service innovations that provide elements of monitoring, optimization, remote control, and autonomous adaptation of products, and thereby profoundly transform service systems into smart service platforms (Barile & Polese, 2010; Beverungen et al., 2019). While smart service innovations can offer a customized experience via the user's adoption process, smart technology makes use of the connected data to track and analyze it to understand what improvements can be made to deliver better results and leads the processes and systems to become more efficient, optimizing the user experience and business innovation (Bowers et al., 2019).

Kang et al. (2020) used a rail-hailing system as an example to illustrate the attributes of smart technology that can control and monitor the environment and provide route management services and responsive support to users according to drivers' specific driving behaviors. Because of their analytical and cognitive system capabilities, these smart service systems can adapt to a constantly changing environment and provide customized services to individual customers and providers (Spohrer et al., 2017).

SMT involves a wide range of core technologies from chips to cloud technologies, and their particular design depends on how these core technologies are applied to design differentiated services to attract and satisfy customers. Several studies (e.g., Qureshi, 2020; Szczepański, M., 2019) have examined how smart technology applications create productivity gains and business growth across the economy. Most studies (e.g., Mckinsey & Company, 2019; Shen & Ball, 2009; Raufi et al., 2019; Bonaretti et al., 2020) on personalization aimed to highlight the effects of personalized communication and services. However, to date, there is a lack of understanding regarding how the unique attributes of SMT can be leveraged to deliver personalized service innovations and create unique user experiences. Based on Kang et al.'s (2020) study of SMT attributes and quality effects, as well as Liang et al.'s (2006) study on personalized recommendation and user satisfaction, an SMT personalization model is built to analyze how the attributes of SMT can be leveraged differently to develop personalized experiences and generate satisfying customer experience throughout the user journey.

Digital or Mobile Payment turbulence has become the most critical fintech innovation and has disrupted existing markets. Two innovative payment systems in Taiwan have been selected to examine how they integrate the strengths of personalized functionalities to innovate their business models and optimize satisfying user experiences to sustain business growth, using different approaches. The first selected payment case, Easy Card uses smart chips and Near-Field Communication (NFC) readers as the core SMT to deliver personalized services across physical borders. The second selected payment case, iPASS LINE Pay Money uses an applied digital wallet platform as the core SMT and creates personalized user experiences

across omni-channel service networks. They represent offline and online personalization approaches and provide insights that can be used to enhance the SMT personalization model. One of our major findings is that SMT attributes enable personalization in various way that improve user convenience physically and virtually with differentiated service innovations, life-enriching intimacy, and continuously developed ways to reward user loyalty.

Overview

Literature Review

Smart Technology

"Smart, connected products" have been made possible by vast improvements in processing power and device miniaturization, as well as by the network benefits of ubiquitous wireless connectivity (Porter & Heppelmann, 2014). The more advanced technology is embedded within consumer products, mobile devices, and common things, the more it becomes invisible and deeply interacts with users' daily experiences (Brugnoli, 2015).

Using a feature-based approach, Kang et al. (2020) categorized smart technology in two ways: smart functionality and smart contents. Smart functionality includes the attributes of monitoring and controlling to continuously and automatically collect data on users' activities and external interactions under the individual usage control function. Smart contents are related to advisory and responsive supports, mainly for a system to push messages, such as promotions and recommendations, to attract users while efficiently responding to users' requests for information and other demands. Both smart functionality and smart contents have led to system service quality enhancement, which, in turn, can influence users' adoption behaviors (Kang et al., 2020).

Service Personalization

In the online world, personalized services are becoming increasingly popular. This is because companies need to build models of individual users' goals, preferences, and knowledge and use these throughout each interaction with users to adapt their content to their users' preferences (Raufi et al., 2019). Personalization is defined as "a process of collecting and using personal information to uniquely tailor products, content, and services to an individual" (Tuzhilin, 2000). The process of providing customized information, presentation, and website structure based on the users' needs (Desai, 2016; Roberts & Zahay, 2012) has become a critical practice in customer services. Moreover, studies on retailing have identified both personalized services and mass customization as the key factors for developing satisfied customer experience (Levesque & Boeck, 2016).

The study of personalized content recommendation (Liang et al., 2006) explained that customized content service with interest-based personalization allows a company to tailor its product offers to better fit customer preferences and reduce information overload, thereby increasing user satisfaction. The personalization services have been utilized in individualized communication in e-commerce (Bonaretti et al., 2020), preference-based product displays (Dacko, 2017) with tailored promotional offers (Shende et al., 2017; Skinner, 2014), and guiding shoppers based on customer's in-store location (Bues et al., 2017; Inman & Nikolova, 2017). For digital products (e.g., new services and other online content providers), personalized service has become even more important in the omni-channel context because the integration of channels holds great potential in delivering more personalized customer experiences (Hänninen et al., 2019). It has been proofed that sellers using customization can charge more for their customized products (Dewan et al., 2000). While with online financial services, the customer experiences are increasingly explored via a seamless high-tech and

high-touch services. Personal transactions can be realized via different devices, including computers, tablets, mobile phones, without physical contact (Vekić et al., 2016).

Theoretical Foundation

In a recent study (Accenture, 2018), over 90% of consumers reported being more likely to shop with brands that recognize, remember, and provide relevant offers and recommendations to them. In the 2018 US Mobile Consumer Report, Vibes, a mobile marketing provider, released findings indicating that personalization is more important than ever: nearly 100% of their consumers reported saving content to their mobile wallet if it was tailored to them.

An information system that provides content or product information to meet the needs of a particular customer is called a recommendation system (Ansari et al., 2000; Bauer & Leake, 2002; Linden et al., 2003; Schafer et al.,1999). Amazon is another example of a brand that succeeds with personalization. The company uses customer data, including purchase history, to personalize offers and optimize transactions. In this case, Amazon uses journey-based personalization to provide alternate purchase options (AWS Machine Learning Blog, 2020). Personalization has become a competitive strength through which businesses can create curated experiences that drive consumer engagement and differentiation in the market.

With their sensor-based applications, smart technologies monitor users' movements and provide proper control over the services offered based on each individual user's activity. With accumulated information about user movements, patterns of user behavior are developed, and with automated control over different aspects of the services, they can be tailored and enhanced for individual customers. With the informational aspect of smart technology, service providers can offer advisory support to enable the desired content to be sent to different users based on the analysis of their situation and satisfy individuals' requests for content. This kind of personalization is designed so that in online customer services, the adjustment and modification of all aspects of customer interaction become a continual practice that meets an individual user's wants and needs (Wu et al., 2003). Digital adoption has accelerated rapidly over the past few years, and more and more customers are comfortable interacting with businesses via mobile applications. This gives businesses the opportunity to better understand their customers and offer them highly relevant offerings.

The user experience includes all aspects of the interactions between the end-user and the product, system, or service they use (Van Norman & Nelson, 2021). It includes a person's perceptions of its utility, ease of use, and efficiency. The field of user experience represents an expansion and extension of the field of usability that captures a holistic perspective on how a person feels about using a system. The focus of user experience is on pleasure and value, as well as on performance.

Recent advances in mobile, ubiquitous, social, and tangible computing technologies have moved service interaction into practically all areas of human activity. This has led to a shift away from a focus on usability and toward a much richer conception of user experience in which users' feelings, motivations, and values are given as much attention as efficiency, effectiveness, and subjective satisfaction.

Furthermore, the channels of interaction have expanded from offline, physical interaction with products and services to online interactions, consisting entirely of virtual touchpoints. The challenge is to create and optimize a seamless experience across multiple online, mobile, and in-store channels. This omni-channel customer experience continuously connects and integrates a variety of channels that have evolved along the customer journey and allow customers to pick up where they left off using one channel, continuing their experience on another (Alexander & Kent, 2020). The associated personalization contents reduce

4

information overload and provide gratifying information and a seamless content-driven process, which can positively enhance user experiences (Liang et al., 2006).

As depicted in Figure 1, we propose that SMT, with its smart functionality and smart contents, can enable the personalization of customer services and optimize user satisfaction through innovative user experiences.

Figure 1 - SMT Personalization Model
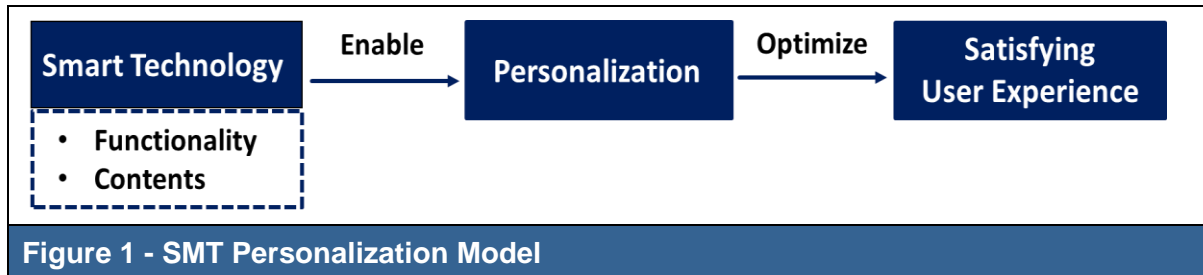
Research Methodology

Multiple Case Study

To understand how SMT attributes can enable a personalized experience, we performed a multiple-case analysis to provide a solid basis for analytical generalization (Eisenhardt, 1989) and conducted an explanatory study to gain insights into SMT applications in the selected cases.

Nowadays, consumers are increasingly using connected devices, smartphones, and digital wallets to pay and get paid, and new technologies and a growing number of players in the industry are transforming the payment experience. Consumers want a seamless payment experience when they shop and check out in face-to-face retail stores, make online payments through their preferred device, and even when ordering items online or picking them up in person. They are also searching for additional benefits, such as loyalty programs and other rewards (Ruggiero et al., 2017).

We purposely selected two distinct payment systems that adapt different forms of smart technology to support and deploy different streams of service personalization into the consumer's purchasing journey. As described in Table 1, the two cases represent two extreme situations in payment services. One payment system uses physical smart chips with NFC readers to design a personalized experience, and the other payment system applies an omni-digital wallet platform to virtually develop various personalized services to satisfy and retain customers.

Table 1 - The Two Representative Cases		
Studied Cases	**EasyCard**	**iPASS Line Pay Money**
Payment Business Scope	Offline transit payment in Taipei City MRT & bus; Extended to island-wide and overseas	Offline transit & Retailer payment; Digital wallet platform linked to e-commerce, LINE social media ecosystem, LINE Points, P2P money transfer and LINE Bank entrance
Usage Channels	Public transit Retail stores	Public transit & Retail stores Omni-channels
Smart Technology	Smart chips with NFC readers	Digital wallet platform
Smart Functionality	Offline data updates Real time stored value top-up	Real time data collections, monitoring & detections
Smart Contents	Low balance warning Notification	Context communication Recommendation systems
Personalization Services	Differentiation via customized card types	Web-based personalized recommendations with direct user interactions

Data Collection

To conduct an in-depth investigation of these payment disruptors, we conducted thorough interviews among different levels of interviewees with respective research subjects. Firsthand information regarding the business operations, smart technology supports, customer service process design, payment channel expansions, and partnership development were traced from the initial business development to the current situation. We then cross-validated our data with secondary statistical data from the Taiwan Financial Authorities issued by the Financial Supervisory Commission Banking Bureau and validated this information with pairs of press releases in which the President, business development executives, and operations director of each company were formally interviewed on the progress in the smart card business and digital wallets alliance. It is worth mentioning that one of the researchers is currently a department head of Payments at a global Fintech company. Moreover, this researcher has worked with both payment providers on different projects in recent years. The researcher's deep involvement in innovative payment services was invaluable in the explanation and interpretation of the case findings.

We also conducted individual in-depth interviews with users, the project leaders and senior managers in charge of payment ecosystem expansions, as well as the senior leaders from key supporting retail channels to cross-check the digital payment market trends. In Table 2, we summarized the fieldworks between year 2018 and 2020 which include interviewees, interview subjects, the number of interviews and duration of the interviews. All interviews were conducted using a combination of media in person, via chat messengers, and over the phone. The interviews were documented in extensive notes taken as they were conducted. These notes were then referenced during the data analyses. Appendix A contains the details of the related secondhand data as a backup to the firsthand interviews.

Table 2 - Summary of fieldworks				
Interview (2018-2020)	**Case1 EasyCard**	**Case2 iPASS LINE Pay Money**	**Interview Subjects**	**# of Interviews per Case Duration per Interview**
Interviewees & Subjects	President & Business Development	President, General Manager	· Business Strategies · Industry background	· 3~4 · 1-2 hours
	Project Managers	Project Manager Head of Retail	· Business Operations · Customer Service process	· 4~5 · 30-60 mins
	Technology Leaders	Technology Manager	· Data process · Data monitoring · System Design	· 2~3 · 20-60 mins
	Card Users	Digital Wallet Users	· User experience · Recurring usage · Rewards & Loyalty	· ~40 testers · Written comments

Data Analysis

We began with a "within-case analysis" for preliminary framework generation, followed by a "cross-case analysis" to look beyond the initial impressions and examine the evidence using multiple lenses (Eisenhardt, 1989). Following this principle, the case studies were analyzed based on the research framework depicted in Figure 1. We carefully examined the evidence regarding the SMT attributes of smart functionality and smart contents to explain the embedded personalization process design through the customer touchpoints during the shopping journey, as well as the related customer interactions and recurring usage until the point of total customer engagement. In one case, the payment system remained connected through a smart card and focused on continuous expansion of physical channels to ensure its high accessibility within their normal business model. In the other case, it proposed a strategic alliance with LINE Pay to leapfrog from the smart card to the digital wallet- a web-based omni-channel with a dynamic payment ecosystem.

In addition, we conducted a cross-case analysis and addressed the similarities and differences in smart technology, personalization, and customer experience optimization, which represent the core research dimensions in the research framework of the SMT personalization model. The developed framework of the SMT personalization model addresses the attributes of the core smart technology, as well as the linked personalization within the services and the unique customer experience created in the two cases. These cases of innovative payment systems each represent a "revelatory case" (Eisenhardt & Graebner, 2007). Specifically, they reveal how the two payment disruptors enable different forms of SMT personalization to create and achieve their unique effects on customer experience optimization.

Case Study Results

As outlined in the methodology section above, the two payment systems, EasyCard and iPASS Line Pay Money, applied two types of SMT for payment services in Taiwan. While EasyCard is Taiwan's leading transport payment system, possessing the most modern smart card functionalities and dominating the physical reader market penetration in the past decades, iPASS Line Pay Money is a strategic alliance between iPASS and the Line Pay platform with a social-media-bundled digital wallet in the market.

Case I – EasyCard

EasyCard Corporation, established in 2000, is the first-mover of transport payment provision, and it remains in the leading position with a 90% market share of physical card readers among the four licensed electronic payment players in Taiwan. In its first decade of business, EasyCard started its fast "Tap & Go" mobility payment services in island-wide transportation businesses, including MRT, buses, taxis, U-bike, and the high-speed rail, which allowed it to rapidly gain a critical mass of users via daily usage. Moving into its second decade of business growth, EasyCard extended its services to include non-transport payment for retail businesses, lifestyle, and social welfare services, thus offering a broader range of benefits to customers. Now, generating both transport and non-transport revenues, EasyCard has created the world's most successful non-bank contactless e-payment schemes. At the beginning of its third decade, EasyCard continues to explore mobility and lifestyle schemes together with cross-boundary transactional services to provide more innovative advantages, even during the Covid-19 pandemic.
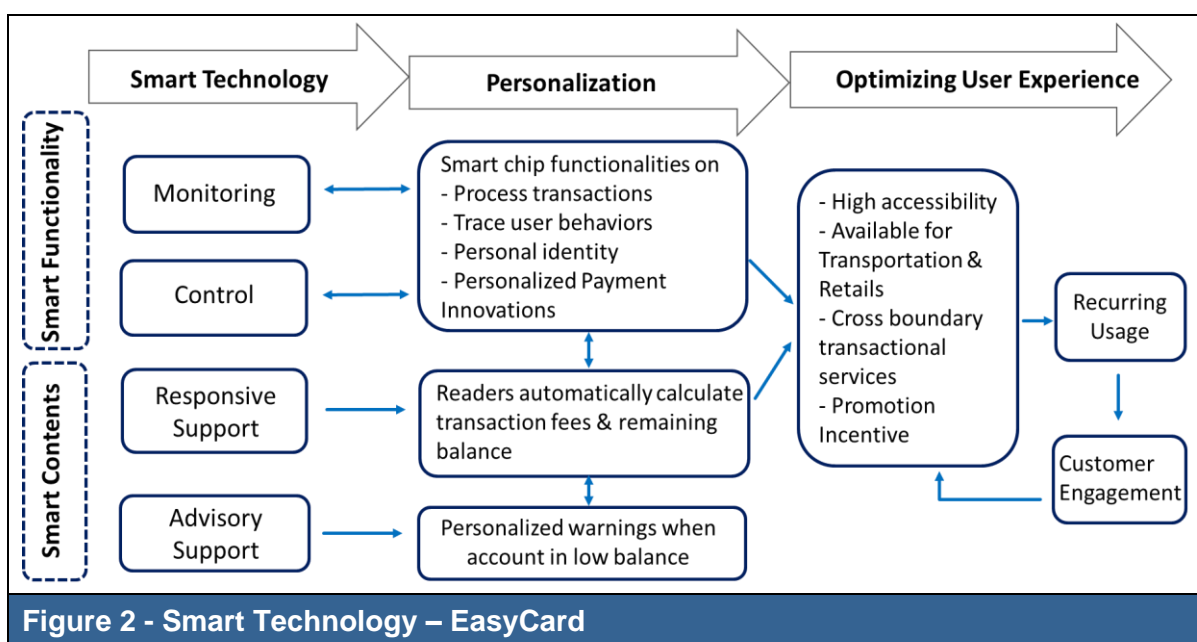

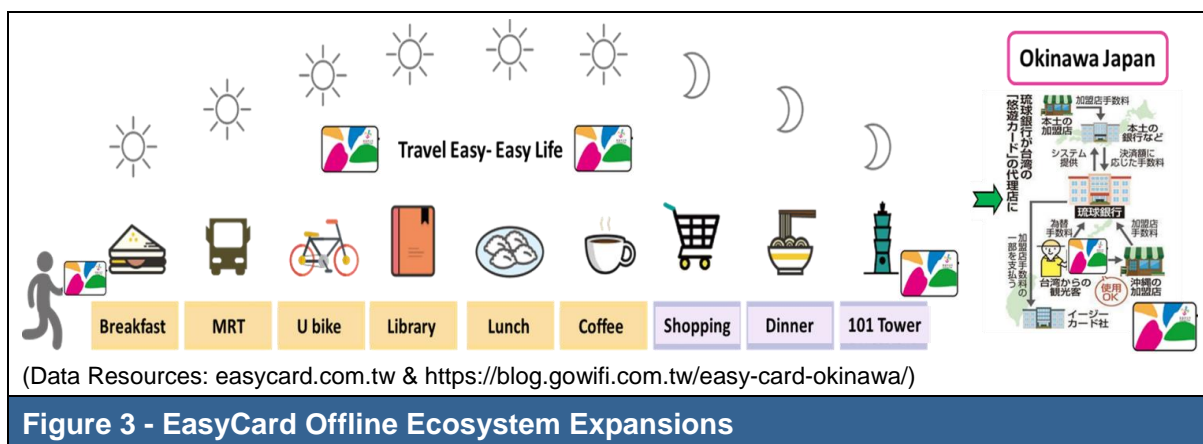**Figure 2 - Smart Technology – EasyCard**

In Figure 2, we use the SMT Personalization Model (Figure 1) as a framework for structuring EasyCard's business strategy and elaborating how it maps personalization process design to achieve customer involvement. With the support of monitoring, the smart chip performs process transactions and traces user behaviors to store personalized information for identification while also using the control functionality to provide service differentiation among the customized card types. A good example is the transport ticket fare payment process. In this case, the responsive attribute picks up the message when a user requests to make a payment and performs the calculation of the ticket fare depending on the travel distance together with "control" support to examine which customized card type is in usage for special discounts sponsored by social welfare benefits to conclude the final ticket price. After deducting the final ticket fare from the stored value of the card, the responsive attribute displays the final ticket fare and the remaining balance on the smart card. It can also respond with balance information when users make inquires anytime and anywhere. Last, the advisory support was leveraged on personalized warnings when the smart chip detected a low remaining balance. Besides the transport payment, the SMT personalization process can also be performed properly for non-transport payment processes when specific channel promotion discounts have been applied. The one-way responsive flow is triggered to supply the user-desired information when users physically tap the payment request on a reader.

Throughout its business development journey, EasyCard has leveraged SMT attributes to develop the following personalization innovations for payment services:

1. Customized cards for different types of users: In addition to regular Adult Card users who pay standard ticket fares, EasyCard offers different card types, such as Student Cards, Elderly Cards, Citizen Cards, and the Monthly PASS. These different types of users assume social welfare benefits sponsored by the government through mobility payment usage.
2. Smart autoload: When the smart chip detects that a card has a low account balance, the system will trigger automatic online top-ups through the user's credit card, so the customer does not need to initiate the value-adding request.
3. Smart telecom synchronized SIM card: It combines a smart chip card with a telecom SIM card in a dual-function technology that enables a user's monthly phone bill to be paid automatically through EasyCard, or the user can use the smartphone interaction with the NFC reader to make both transport and non-transport payments.
4. Virtual EasyCard: This is a unique technology developed to allow the issue of virtual smart cards under mobile payment apps, such as Samsung Pay, and it can allow online credit cards to do top up a card upon the user's request with authentication through the mobile app. This can be done anytime and anywhere.

The offline-focused EasyCard usage scenarios are depicted in Figure 3 to further elaborate on how SMT personalization has been adapted through daily user experiences. Over the past two decades, EasyCard has developed a full landscape of penetration through partnerships with public transportation, such as MRT, U-bike, as well as public facility access, such as libraries, etc. It also provides non-transport payment options, such as in convenience stores and retail businesses to support dining, shopping, and even going on a city tour to enjoy the night view from Taipei 101 Tower, etc. The personalized EasyCard enables the user to experience a simple, fast, and convenient cashless payment society from day to night and will soon expand across national boundaries to Okinawa transportation and vending machines in Tokyo, which further emphasizes EasyCard's slogan of "Travel Easy-Easy Life."

(Data Resources: easycard.com.tw & https://blog.gowifi.com.tw/easy-card-okinawa/)

Figure 3 - EasyCard Offline Ecosystem Expansions

Smart chip technology bundled with personalized services has been widely adopted and used in the market. With the cashless convenience of the innovative balance autoload and online credit card top-up, together with continuous channel expansions of border-crossing payment ecosystems, EasyCard has optimized and circulated customers' recurring usage and engagement mainly through the user's physical, daily-life payment journey. As of May 2021, EasyCard has successfully issued 88 million cards, according to data from the Taiwan Banking Bureau, throughout Taiwan's population of 23 million people, and it has proven to be the most successful non-bank contactless e-payment scheme in the country.
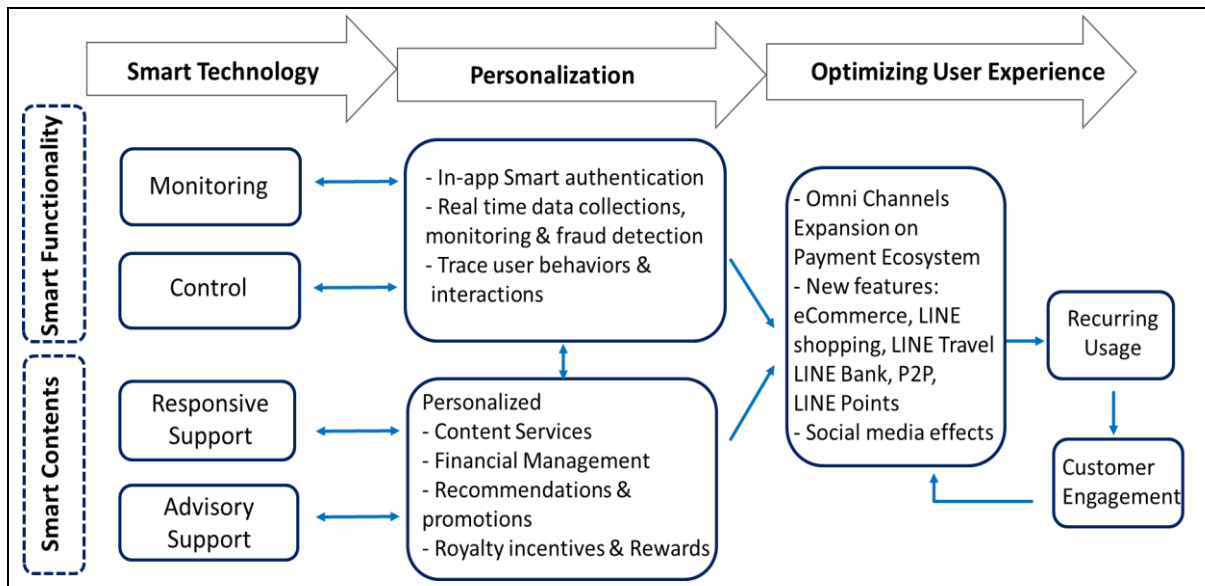
Case II – Digital Wallet

iPASS LINE Pay Money is mainly a mobile payment service, also called a virtual digital wallet, delivered on an omni-channel platform. The iPASS LINE Pay Money service was established in 2016, which is a combination of iPASS prepaid card and the LINE Pay digital wallet. The target market is the young generation (14 to 20 years old) who are not yet old enough to have a credit card. These youth are tech-savvy and fan users of digital payment and peer-to-peer (P2P) money transfer.

To illustrate the cash flow iPASS and LINE Pay Money, we depict in Figure 4 how the payment transaction process is structured through the virtual iPASS account issued on the digital wallet. For example, when a teenager, Brian, is to pay at a bubble tea shop, Brian registers a virtual iPASS account with LINE Pay Money. He is then required to bundle the wallet with his bank account in order to fulfill the value top-up in LINE Pay Money; therefore, Brian could scan the LINE Pay Money bar code or the QR code to conduct virtual transaction payments at the tea shop. In addition, Brian could make a P2P money transfer to his LINE friend Choco's LINE Pay Money account as well. The P2P process has been integrated with LINE, the social messenger platform used to create a fintech innovation, which enables Brian to simply click on the P2P function in the LINE Pay wallet, and then be redirected to LINE, the social platform to select the money transferee from his LINE friends list. The P2P operation is a seamless process and can be done in anytime and anywhere.

(Data resources: https://nico-invest.com/2020/06/02/line-pay-money/)

Figure 4 - Cash Flow- iPASS LINE Pay Money
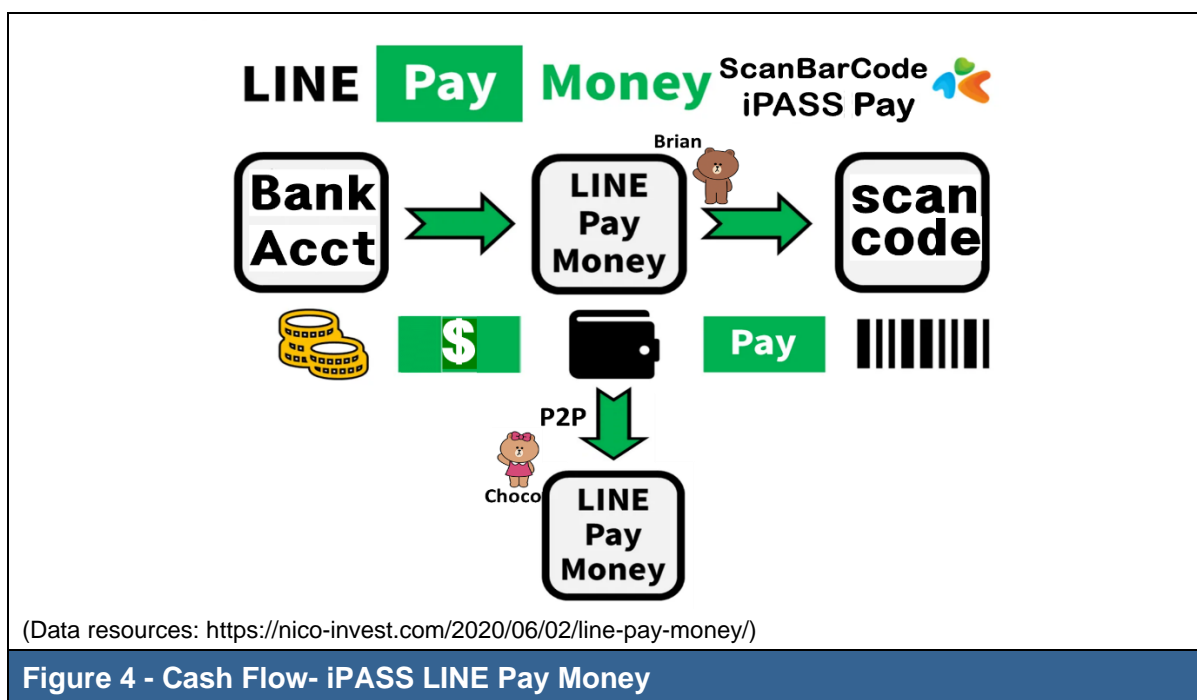
In Figure 5, we use the SMT Personalization Model as a framework to elaborate how the digital platform iPASS LINE Pay Money, embedded with personalization process design, serves customers through tailored interactions and how it pushes to engage customers in recurring payment processes.

Figure 5 - Smart Technology – Digital Wallet

Smart Functionality Personalization

The LINE Pay digital wallet is monitored and controlled through in-app authentication, such as PINs or biometric identification, with a real-time Internet connection for personalization initiation. This has been a critical control for payment security and accuracy in the prevention of potential fraud when the smartphone has been stolen or misused. Due to the real-time monitoring and control supports that are part of the smart functionality, user behaviors and user interactions with the digital wallet environment have been tracked and analyzed in more robust computations and have generated the feedback required for personalized content and recommendations to assist users when making shopping decisions.

The LINE Pay digital wallet has mastered the full ecosystem spanning offline transportation, i.e., LINE taxi and retail businesses, and online businesses, such as LINE Travel, LINE shopping, e-commerce with the mobile app, LINE Bank online banking, the rewards program LINE Points, and so on. Figure 6 outlines the "closing the distance" of the LINE ecosystem, in which a Fintech platform has been designed and controlled to embrace a robust ecosystem of third-party contributors for the focus on the 360-degree expansion strategy. This reveals more opportunities to enable both private customers and commercial customers to join as ecosystem actors online, offline, or via a mixed omni-channel to conduct any form of business activities by using the one-stop mobile app for the completion at the end of the check-out process.


(Data Resources: https://wiyafunworld.blogspot.com/2021/04/linebank.html)

Figure 6 - The Ecosystem of Digital Wallet

Smart Content Personalization

With the full span of the ecosystem, the smart content attribute of "advisory support" is playing a critical role as an orchestrator to coordinate and arrange proper recommendations and contents based on personalized needs. The connected and collaborative advisory agents behind the digital wallet interact efficiently and effectively to filter more precise digital recommendations to serve user's financial management needs, such as installments or personal loans, depending on the user's payment behaviors. Besides, the digital payment wallet has been expanded to connect to LINE Bank, which can offer more financial products beyond just payment, such as: online insurance. In addition, the advisory support promotes attractive rewards using specific promotion channels to reduce user's information overload and enhance users' engagement throughout their shopping journeys. The personalized advisory process embedded content has consistently improved marketing campaign efficiency and results for sellers, users and the platform providers.

The LINE Pay digital wallet also triggers trendy context-based transactions that require no direct interaction between the customer and the merchant (for example, Uber consumers paying for the service through the app instead of paying the driver directly). There are some other unique features of the LINE Pay digital wallet, such as the LINE Points reward program, in which especially young users can redeem points for emoticons or stickers and send them as gifts to their LINE messenger friends, as the image displayed in Figure 7. The feature can be easily operated in the digital wallet within a few seconds to engage in interesting and intimate social interactions with peers. The beneficial user experience for the youth is incremental on top of the regular loyalty usage, which offers point rebates and allows points to be redeemed for later purchases. The personalized content services of the LINE Pay digital wallet have significantly enhanced the recurring usage while simultaneously improving brand loyalty through the intimated touches among young users' profiles.

(Data Resources: https://linecorp.com/en/pr/news/en/2019/2666)
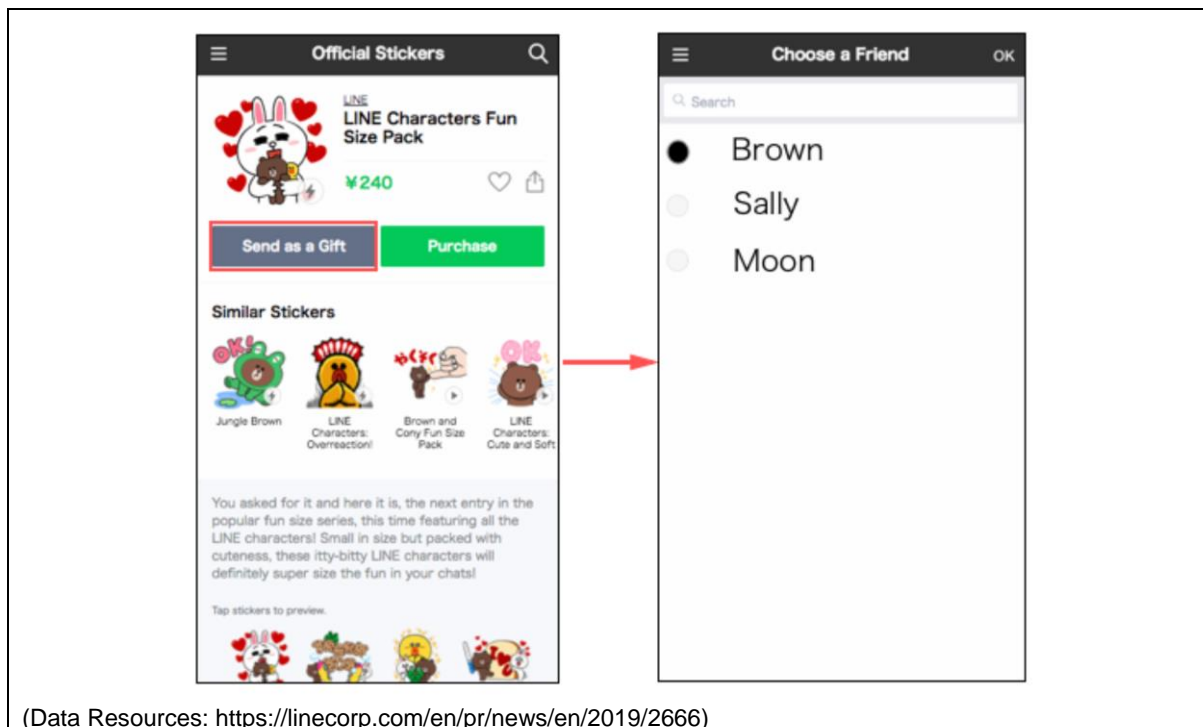
Figure 7 - Sending Stickers to LINE Friends

The iPASS LINE Pay Money provides services from offline-focused payment business to the virtual and omni-channel payment ecosystem, which is a two-sided platform enabling various transactions between consumers and commercial merchants. In addition, iPASS LINE Pay

Money leveraged LINE's existing social media user base to spur the adoption so that the platform holds the digital wallet leadership position in the Taiwanese market. As of May 2021, more than 8.4 million persons (or 1 in every 2.8 Taiwanese people) use the payment platform to transfer money to their peers and transact in-store, in-app, or online, with more than 240,000 Taiwan businesses. This represents a meaningful social network effect in which iPASS LINE Pay Money was able to acquire unlimited user profiles by geographic boundaries and a younger generation of users through the adoption of the digital wallet. In the new era of SMT personalization, iPASS LINE Pay Money has provided its customers with a more convenient and efficient online user experience, more intimate virtual interactions, and greater motivations to attract and retain more users on the service platform.

Discussion

Based on the comparative analysis of the two cases, a few findings regarding SMT personalization are listed below. These findings enhance the contents of the SMT personalization experience model and provide practical points for leveraging smart technology to promote the sustained growth of customer relationships.

SMT Attribute-Enabled Personalization

In the two payment cases, we observed two types of smart technology: physical smart chips and a virtual network. The core attributes of these two types of SMT can be leveraged with different forms of personalization. When smart chips are applied, the size of data storage and the data processing method can affect the personalization capability. First, the functionality of monitoring is limited because the storage size of a chip restricts the amount of data that can be collected; therefore, only the user's transactions are traced. This could be explained in line with Kang et al.'s study (2020) that the functionality quality is positively related to the service quality. Second, the function of controls on chips can enable customized user interaction with different chip readers. Third, since most of the chip data were batch-processed due to economic concern, only simple and critical information about the user account can be collected. Therefore, personalized communication, such as account balance, is provided locally. Whereas responsive supports, such as automatic top-ups, are to be completed with third parties via cloud. Last, the advisory support was leveraged mainly with personalized warnings when the smart chip detected unaccepted situations of the user. Based on the case study of smart chip applications, it is found that the process capacity of the smart chips can affect the functionality and contents of the service personalization; the more the physical service implementation of the SMT, the better the convenience the user experiences.

Comparatively, when smart technology is applied in a virtual network, a large amount of diversified data can be collected, verified, and processed in real-time. As stated by Line Pay's CEO, "LINE Pay is one of our important strategic businesses in LINE's aim to become the world's leading 'smart portal' - a one-stop mobile platform that enables people to connect seamlessly to all the information, services, products, and people in their lives" (The Asian Banker, 2019). The payment system on social platform can store and verify all digital commerce activities with specific identity, which provides tightened control of the personalized services. On the other hand, data analytics can enable responsive support in services such as: Internet banking and money transfers. This is also found by Vekić et al. (2016) that it is particularly accepted by millennials to receive personal notes and do coupon redemptions. With a rules-based software system, collaborative advisory support is revealed in precise marketing, reducing customers' information overload (Liang et al., 2006) and increasing cross-sale opportunities. Vekić et al. (2016) stated that high-tech and high-touch personalization would capture opportunities across all customer segments. On this kind of virtual platform, multiple business alliances can be established which formed a social ecosystem where personalized communications, services and promotions can be delivered collaboratively.

Based on the case study of the virtual SMT, it is found that the analytical capability of a virtual platform can enable diversified functionality and personalized contents; the more the ecosystem services on the virtual SMT, the better the personalized experiences are.

Lastly, these two kinds of SMT personalization may be suitable for different customer segments and create a different kind of value for the target customers. For users who rely heavily on carrying cards for a living, personalized physical services are appropriate, while for the mobile-native generation, personalized and socialized virtual services are more accepted.

Creating a Personalized User Experience

Payment service providers ultimately create or redesign personalization processes to enhance the level of customer engagement, reduce costs, increase cross-sales, and drive higher customer satisfaction and loyalty. The present study indicated that the different streams of SMT personalization processes could deliver different dimensions of the customer experience.

- **Physical and Virtual Convenience:** For the Smart Card, the high accessibility through offline transport and retail reader penetration in domestic and cross-border expansion to overseas markets have provided the most physical convenience for daily usage in Figure 3. However, the tech-savvy consumer may deem the digital wallet more convenient for managing their day-to-day financial life, including online P2P transfers of petty cash to friends within the social platform in Figure 4.

- **Service Differentiation:** With the Smart Card, users enjoy promotional discounts, incentives, and/or service differentiation by simply using customized card types, such as the Concessionaire Card, the Student Card, or Ault Cards in Figure 8. Comparatively, digital wallet users greatly appreciate the web-based personalized recommendations, reduced information overload, and filters that provide more precise marketing information. This confirmed research findings by Dewan et al. (2000) that the tailored contents upon customer's interests allow sellers to offer more precise marketing on their customized products and apply different pricing strategy when necessary.

Figure 8 - Customized Easy Card types

- **Life-Enriching Intimacy:** Smart Cards provide customized service differentiation for transport fares, especially for the elderly, students, and youth. Smart Cards with government-sponsored resources also often provide special social welfare benefits to promote their usage, which generates intimacy in social interactions from the user psychology perspective. On the other extreme, digital wallet users also enjoy intimate and intellectual services, such as personal reminders of financial management, recommendations of interested products, and peers' ability to easily send stickers to friends in Figure 7. or transfer money after a meal gathering with unlimited social sharing on the common platform in Figure 4.

- **Rewarding Loyalty:** According to the 2018 US Mobile Consumer Report, 61% of respondents subscribed to mobile messaging because of incentives or coupons, while 55% subscribed because of loyalty reward points. We have observed that user loyalty was enhanced by the personalized rewards, which constantly motivate users to make recurring purchases. These rewarding promotions were delivered through different forms of user experience enhancement, such as the Smart Card's constant promotion of discount incentives through its usages in convenience stores. The digital coupons and reward points mechanisms have further retained customers with the use of digital wallets.

Strategic Expansion Online and Offline

The business expansion strategies of SMT-enabled personalization are different online and offline. Innovations in offline personalization pertain primarily to physical interactions with users. Companies tend to focus on the expansion of the off-line system installation from domestic to international channels. For digital wallets, an online innovation strategy tends to focus on providing various types of value creation in new services. The virtual platform enables dynamic virtual services in personal transactions, incentives, advices, and interactions that allow users to explore broader dimensions of the shopping experience (Alexander & Kent, 2020).

Conclusion

Based on Kang et al.'s (2020) study of SMT attributes and quality effects and Liang et al.'s (2006) study of personalization and satisfaction, we constructed an SMT personalization model to illustrate that the attributes of SMT can enable personalized services of all kinds and create optimized user experiences throughout the user journey. Using insights from the two payment cases, the functionality and content attributes of smart chips and virtual platforms-which enable both offline and online personalization- were explored. These innovative physical and virtual user experiences provide valuable insights for leveraging SMT for personalization and enhancing the SMT personalization model.

It is worth noting that the design of both online and offline personalized experiences is intended to fit the needs of different target groups. For users who commute and shop in physical stores, offline transactions can be monitored and controlled, and responsive supports can be designed to facilitate smooth transactions. For digital natives, tailored online advisory support and social bonding are the most effective ways to create personalized services.

It is hoped that the SMT personalization model can be used as a framework for designing personalization services and be further extended to other types of smart technology applications. For example, with the rise of mobile medicine and the development of sensing and wearable devices, personalized health monitoring, control, responsive support, and recommendation services could be developed rapidly and adopted widely in the healthcare industry. By actively recording physiological parameters and tracking users' metabolic statuses (Lu et al., 2020), these intelligent devices not only assist people in pursuing a healthier lifestyle but also provide a constant stream of healthcare data through the cloud for more effective disease diagnosis and treatment.

Smart technologies are still in the development stage, and applications of smart technologies are varied and dynamically progressing. The four attributes of SMT can trigger various kinds of personalization development in service innovations and communications and provide users with life-enriching user experiences, both physically and virtually.

References

Accenture. (2018). Making It Personal- Pulse Check 2018 Moving from Communication to Conversation.

Alexander, B. & Kent, A. (2020). Change in technology-enabled omnichannel customer experiences in-store. *Journal of Retailing and Consumer Services, 65*, 102338.

Ansari, A., Essegaier, S., & Kohli, R. (2000). Internet recommendation systems. *Journal of Marketing Research, 37*(3), 363-375.

AWS Machine Learning Blog (2020). *Optimizing your engagement marketing with personalized recommendations using Amazon Personalize and Braze.* AWS. https://aws.amazon.com/tw/blogs/machine-learning/optimizing-your-engagement-marketing-with-personalized-recommendations-using-amazon-personalize-and-braze/

Barile, S. & Polese, F. (2010). Smart service systems and viable service systems: Applying systems theory to service science. *Service Science, 2*(1/2), 21-40.

Bauer, T., & Leake, D. (2002). Using document access sequences to recommend customized information. *IEEE Intelligent Systems, 17*(6), 27-33.

Beverungen, D., Müller, O., Matzner, M., Mendling J., & Brocke, J. (2019). Conceptualizing smart service systems. *Electron Markets, 29*(12), 7-18.

Bonaretti, D., Bartosiak, M., Lui, T.-W., Piccoli, G., & Marchesani, D. (2020). "What can I(S) do for you?": How technology enables service providers to elicit customers' preferences and deliver personalized service. *Information & Management, 57*(6), 103346.

Bowers, K., Hariri, R.H., & Fredericks, E.M. (2019). Uncertainty in big data analytics: Survey, opportunities, and challenges. *Journal of Big Data, 6*(1), 44.

Brugnoli, G. (2015). *Designing Smart Experiences.* Medium. https://medium.com/@lowresolution

Bues, M., Steiner, M., Stafflage, M., & Krafft, M. (2017). How mobile in-store advertising influences purchase intention: Value drivers and mediating effects from a consumer perspective. *Psychology & Marketing, 34*(2), 157-174.

Dacko, S. G. (2017). Enabling smart retail settings via mobile augmented reality shopping apps. *Technological Forecasting and Social Change, 124*, 243-256.

Desai, D. (2016). A study of personalization effect on users' satisfaction with E-commerce websites: Journal of Management & Research. *Sankalpa, 6*(2), 51-62.

Dewan, R., Jing, B., & Seidmann, A. (2000). Adoption of Internet-based product customization and pricing strategies. *Journal of Management Information Systems, 17*(2), 9-28.

Eisenhardt, K. & Graebner, M. (2007). Theory building from cases: Opportunities and challenges. *Academy of Management Journal, 50*(1), 25-32.

Eisenhardt, K. (1989). Building theories from case study research. *Academy of Management Review, 14*(4), 532-550.

Foroudi, P., Gupta, S., Sivarajah, U., & Broderick, A. (2018). Investigating the effects of smart technology on customer dynamics and customer experience. *Computers in Human Behavior, 80*, 271-282.

Gallina S. (2019). *Essentials for Your Digital Strategy: Smart Personalization.* Perficient. https://blogs.perficient.com/2019/02/06/essentials-for-your-digital-strategy-smart-personalization/

16

Hänninen M., Mitronen L., & Kwan, S. K. (2019). Multi-sided marketplaces and the transformation of retail: A service systems perspective. *Journal of Retailing and Consumer Services, 49*, 380-388.

Inman, J. J., & Nikolova, H. (2017). Shopper-facing retail technology: A retailer adoption decision framework incorporating shopper attitudes and privacy concerns. *Journal of Retailing, 93*(1), 7-28.

Kang, L., Jiang, Q., Peng, C.H., Sia, C. L., & Liang, T.P. (2020). Managing change with the support of smart technology: A field investigation of ride-hailing services. *Journal of the Association for Information Systems, 21*(6), 1594-1620

Levesque, N., & Boeck, H. (2016). Proximity marketing as an enabler of mass customization and personalization in a customer service experience. In Bellemare J., Carrier S., Nielsen K., Piller F. (Eds.), *Managing complexity* (pp. 405-420). Springer, Cham.

Liang, T. P., Lai, H. J., & Ku, Y.C. (2006). Personalized content recommendation and user satisfaction: Theoretical synthesis and empirical findings. *Journal of Management Information Systems, 23*(3), 45-70

Linden, G., Smith, B., & York, J. (2003). Amazon.com recommendations: Item-to-item collaborative filtering. *IEEE Intelligent Systems, 7*(1), 76-80.

Lu, L., Zhang, J., Xie, Y., Gao, F., Xu, S., Wu, X., & Ye, Z. (2020). Wearable health devices in health care: Narrative systematic review. *JMIR mHealth and uHealth*, *8*(11), 1-15.

McKinsey & Company. (2019). *Article of the future of personalization—and how to get ready for it.* McKinsey & Company. https://www.mckinsey.com/business-functions/marketing-and-sales/our-insights/the-future-of-personalization-and-how-to-get-ready-for-it

Netlingo. (n.d.) The Internet Dictionary: Every Texting Abbreviation & Online Acronym You'll Ever Need to Know. https://www.netlingo.com/acronyms.php

Porter, M. E., & Heppelmann, J. E. (2014). How smart, connected products are transforming competition. *Harvard Business Review, 92*(11), 64-88.

Qureshi, Z. (2020). *Technology and the future of growth: Challenges of change.* Brookings. https://www.brookings.edu/blog/up-front/2020/02/25/technology-and-the-future-of-growth-challenges-of-change/

Raufi, B., Ismaili, F., Ajdari, J., & Zenuni, X. (2019). Web personalization issues in big data and Semantic Web: Challenges and opportunities. *Turkish Journal of Electrical Engineering & Computer Sciences*, *27*(4), 2379-2394.

Roberts, M. L., & Zahay, D. (2012). *Internet Marketing: Integrating Online and Offline Strategies.* Cengage Learning.

Ruggiero, G., Frassinetti, F., Coello, Y., Rapuano, M., Di Cola, A. S., & Iachini, T. (2017). The effect of facial expressions on peripersonal and interpersonal spaces. *Psychological Research, 81*(6), 1232-1240.

Schafer, J.B., Konstan, J., & Riedl, J. (1999). Recommender systems in e-commerce. In *Proceedings of the 1st ACM conference on Electronic commerce.* New York: ACM Press.

Shen, A., & Ball, D. (2009). Is personalization of services always a good thing? Exploring the role of technology-mediated personalization (TMP) in service relationships. *Journal of Services Marketing, 23*(2), 80-92.

Shende, P., Mehendarge, S., Chougule, S., Kulkarni, P., & Hatwar, U. (2017). Innovative ideas to improve shopping mall experience over E-commerce websites using beacon technology and data mining algorithms. In *2017 International Conference on Circuit, Power and Computing Technologies (ICCPCT).*

Skinner G. (2014). Towards an adaptive model to personalise open learning environments using learning styles. In *2014 Proceedings of International Conference on Information, Communication Technology and System (ICTS).*

Spohrer, J., Siddike, M. A. K., & Kohda, Y. (2017). Rebuilding evolution: A service science perspective. In *Proceedings of the 50th Hawaii International Conference on System Sciences (HICSS).*

Szczepański, M. (2019). Economic impacts of artificial intelligence (AI)., *European Parliamentary Research Service (PE 637.967).*

The Asian Banker. (2019). *LINE Pay's Ko: "We aim to be part of a world's leading smart portal".* The Asian Banker. https://www.theasianbanker.com/updates-and-articles/line-pay%E2%80%99s-ko:-%E2%80%9Cwe-aim-being-part-of-becoming-the-worlds-leading-smart-portal%E2%80%9D

Tuzhilin, A. (2000). Report on the KDD2000 panel personalization and data mining: Exploring the synergies. *ACM SIGKDD Explorations Newsletter, 2*(2), 115-116.

Van Norman, E. R., & Nelson, P. M. (2021). An evaluation of the use of seasonal goal lines to improve the accuracy of curriculum-based measurement of reading decision rule recommendations. *Assessment for Effective Intervention, 46*(3), 167-177.

Vekić, A., Orošnjak, M., & Ćosić, M. (2016). Use of banking machines in the payment system of the Republic of Serbia as a personalization model for banking services. In *International Conference on Mass Customization and Personalization in Central Europe MCP-CE.*

Wu, D., Im, I., Tremaine, M., Instone, K., & Turoff, M. (2003). A framework for classifying personalization scheme used on e-commerce Websites. In *36th Annual Hawaii International Conference on System Sciences.*

Yang X., Wang R., Tang C., Luo L., & Mo, X. (2021). Emotional design for smart product-service system: A case study on smart beds. *Journal of Cleaner Production, 298*, 1-12.

Zoughbi, S. & Al-Nasrawi, S. (2014). Regional development getting smarter with ICT. In *Encyclopedia of Information Science and Technology* (Third Edition) (pp. 6525-6533), IGI Global Editors: Mehdi Khosrow-Pour.

Appendix A.

A-1

Data/Excertpts/Quotations/Sources	Themes
Rename from "LINE Pay iPASS" to "LINE Pay Money" '- In order to go cross boarder Globalization Service, LINE Pay announces that "LINE Pay iPASS" is to rename as "LINE Pay Money" for simply and easy to accept by domestic and global user as LINE Pay set a new globlization strategy to allow user to exlore the seamless user experience via cross boarder payment service starting from Japan, Korea and Thailand, etc. '- "Taiwan's mobile payment business are continuing in growth, it's been under a great joint promotions from the Government, Corporates, Merchants, and users supports. In facing the competion, LINE Pay has been outperforming this year in over 50% growth on both users of 7.3 millions and merchants of 164K, and expects the coninuous growth through the globalization service expansion to customer engagement." (John Ding , LINE Pay Taiwan General Manager, December 3, 2019) https://www.i-pass.com.tw/News/Detail/101598	- Service Globalization - Customer Engagement
In the survey conducted by Market Intelligence & Consulting Institute, MIC, '-Top mobile pay usages in 2019 are: 「Line Pay (59.6%)」、「JKO Pay (40.7%)」、「PX Pay (32.6%)」、「Taiwan Pay (27.3%)」、「Apple Pay (25.3%)」&「FamiPay (25.3%)」. In the survey, it shows the LINE Pay users are using LINE Pay for both online and offline payment in general. while other PAYS would be focused on its sole membership channel i.e. PX Pay and FamiPay etc. - Usage by Age 46-55 grows the most for 77.6%; Except for age 26-35 ranked as No. 2, all other user segments shows No. 1 in the survey by using LINE Pay. - Active users in recent 3 months grows from 57.3% in 2018 to 69.4% in 2019. Among that, Age 18-25 represents 82.7% and Age 26-35 represents 70.9%, are the top 2 active usage segments. These data have shows the very strong adoption of mobile payment in the young segments. 2019 Mobile Payment Survey, MIC Market Intelligence & Consulting Institute https://mic.iii.org.tw/news.aspx?id=551	- Top 1 LINE Pay - Omni channels - User Profiles - Young segments as Top active users
- LINE Shopping」has become Taiwan's No. 2 Shopping redirect platform since launch in just 2 years, it represents 24.1% of consumers will be directly through 「LINE Shopping」through other online merchants for shopping searching while 77% of the consumers might be still used to get directly through eCommerce giants of PChome & MoMo represents. - This is because of LINE Shopping is more Real time and Strong Rewards (LINE Points issuing and redemptions) for recurring usage https://www.bnext.com.tw/article/57343/ecommerce-linepay-surpass-cash-back	- eCommerce - LINE Shopping - Top 2 Online Entrace - Real Time - Rewards LINE Points - Recurring Usage
The most powerful product feature of LINE Pay Money 「P2P」&「Stored Values」 LINE Pay Money has been back and supported to do P2P money transfer among LINE messenger media platform. When chatting through LINE messenger, users could real time transfer petty cash to their LINE friends for split payment or money transfer in anytime and anywhere. This is the major reason that LINE Pay Money P2P business is significantly suceeding other Pay i.e. JKO Pay https://www.bnext.com.tw/article/62735/digital-payment-2021-march	- P2P Money Transfer - Social media effects

A-2

Data/Excertpts/Quotations/Sources	Themes
LINE Shopping is an independent APP, and LINE Company has heavily invested to strengthen its product competitivities such as to add the push notices on product pricing discounts or pricing tracking (i.e. LINE shopping passport) etc. It's been under the observation if the user would appreciate the APP upgrade and save these push information into the digital wallet. If the change has cused positive user experience, LINE may consider to chip into an new business model. https://techwriter.medium.com/%E5%9D%90%E6%93%812100%E8%90%AC%E7%94%A8%E6%88%B6line%E5%9C%A8%E5%8F%B0%E6%95%B8%E4%BD%8D%E5%BB%A3%E5%91%8A%E5%B8%82%E4%BD%94%E5%8F%AF%E8%83%BD%E9%82%84%E4%B8%8D%E5%88%B0%E4%B8%80%E6%88%90-83f607c3a9e7	- User Experience tracking - Recommendation upgrade - Businese model fine tuning
"CTBCLINE Pay cards have been launched in the third year, it has aggressively built the Rewards points ecosystem, integrated the redemption points mechanism through online and offline usage scenarios, it has set a seamless process and convenient digital payment user experience. This has demonstrated how CTBCinvests the multi-dimension digital financial service and as a leading to further enhance Taiwan's mobile payment penetration and business growth." (James Chen, CTBCBank President, quoted in ChinaTimes, January 16, 2019) https://www.chinatimes.com/newspapers/20190116000331-260205?chdtv	- Rewards LINE Points - Digital user experience - Alliance - Ecosystem
Taiwan sees surge in mobile payments amid COVID-19. Mobile payments in Taiwan totaled NT$120.9 billion (US$4.18 billion) in the first seven months in 2020, representing a 156 percent jump year-on-year, as people turn to contactless payments during the coronavirus. The five most-used mobile payment methods are credit cards, debit cards, electronic tickets such as EasyCards, online to offline (O2O), and mobile points-of-sale (mPOS), according to the Financial Supervisory Commission's Banking Bureau. (Financial Supervisory Commission's Banking Bureau, quoted in Taiwan News, October 2, 2020) https://www.taiwannews.com.tw/en/news/4021897	- EasyCard - O2O - Omni channels - mPOS - Customers Experience - Ecosystems
LINE Pay Taiwan General Manager believed that there's a large segment would like to use mobile payment but did not posess credit cards. Therefore, LINE Pay is aiming to invest on iPASS for obtaining the licensing of providing digital payment to those who did not posess credit card. This is the major reason LINE Pay needs to invest in iPASS. (John Ding, LINE Pay Taiwan General Manager, quoted in Business Next, September 4, 2018) https://www.bnext.com.tw/article/50458/what-line-pay-get-from-ipass-investment	- Strategic Alliance - Young segments

20

About the Authors

Dr. Shari, S.C. Shang is a Professor in the Department of Management Information Systems at National Chengchi University in Taiwan. Her professional expertise includes Service Innovation, Corporate Transformation, and Strategic Information Technology Management. Dr. Shang received her PhD degree in Information Systems from the University of Melbourne in Australia. Her research has been published in the Information Systems Journal, Information and Management, Communications of the ACM, and Computers in Human Behavior. Before undertaking academic study in Australia, Dr. Shang has worked as a Consulting Manager in global companies such as IBM, KPMG and AICPA both in the United States and Asia Pacific Region.

Dr. Lynn, S.L. Chiu is currently a DBA candidate in the Department of Management Information Systems at National Chengchi University in Taiwan. She received her Master of Accounting at University of Southern California, U.S. in 1992 and became an U.S. Certified Public Accountant in 1995. She is a professional leader of fintech payment at Samsung and global financial institutions at American Express, Standard Chartered Bank, and CTBC Bank for over 20 years.