10-14-2021

Contactless Technology: what we know and what we don't know

Benedict Lewis Abotsi

Joseph Budu

Elizabeth Yayra Tordzro

Edem Peace Ayimey

Contactless Technology: what we know and what we don't know

Authors

Benedict Lewis Abotsi, Joseph Budu, Elizabeth Yayra Tordzro and Peace Edem Ayimey.

Abstract

Purpose – With the rise in the use of touchless systems and new technologies, which are rapidly replacing traditional means of payment such as cash, contactless technology is getting popular. As a result, the purpose of this research is to look at the principal factors of contactless technologies, what we know and what we do not know about the technology.

Design/methodology/approach – The grounded theory approach for conducting literature reviews in information systems was used in this study. The goal of using this method was to arrive at a comprehensive and theoretical understanding of a field or topic. This article intends to provide a review that closes saturated areas and uncovers new areas about contactless technology.

Findings - In researching the impact of adopting cardless payment methods, awareness was identified as a critical component. Also, mindfulness, perceived ease of use, perceived usefulness, subjective norms, and attitude have a significant effect on contactless payment use. Considering the level of risks associated with the use of cardless systems, increasing consumer gains can help mitigate some of the dangers by motivating them to utilize the product regularly.

Practical implications – Industry professionals must develop contactless technology which is secured right from the start for consumers, even before implementation.

Keywords – Contactless technology, NFC mobile wallets, Perceive Usefulness (PU), Perceive Trust (PT), RFID, contactless cards.

Paper type Research paper

Introduction

Almost every type of business has been impacted by technological advancements (Kahveci & Okutmuş, 2017), and with the rapid growth of e-commerce, the introduction of new technologies like Near Field Communication (NFC), and the widespread use of mobile devices, has significantly altered how customers make purchases, resulting in a rise in the use of contactless payment (Flavian et al., 2020). Even though the transition to contactless payment systems was already underway before the COVID-19 outbreak and in ways that will last for years, the epidemic has hastened and increased the usage of contactless technologies (Jensen, 2021). The term "contactless technique" refers to contactless smart card technology in general (Sena et al., 2016). It exists in several formats, including contactless payment, NFC, and Radio Frequency Identification (RFID), among others. The term "contactless payment" is often used to describe the phenomenon of conducting safe consumer transactions at any merchant outlet using Point Of Sale (POS), NFC, and without a Personal Identification Number (PIN), such as via NFC-enabled equipment (Karjaluoto et al., 2019). Several factors influence people to use contactless technology, factors such as relative advantage, extrinsic motivation, work-fit, and outcome expectations (Islam et al., 2017), complexity and trialability (Apanasevic et al., 2016), and issues with trust and risks associated with the usage of such innovations (Hampshire, 2017). Contactless technologies are playing very vital roles in the era of global health challenges by enhancing social distancing guidelines, cardless payments, and others by promoting the advancement of technology (Shishah & Alhelaly, 2021). Consequently, the purpose of this paper is to take stock of existing research about contactless technology to uncover new areas for future research.

Methodology for the review

The grounded theory approach for conducting literature reviews in information systems (see Wolfswinkel et al., 2013) was used in this study. The goal of using this method was to arrive at a comprehensive and theoretical understanding of a field or topic. The method has five steps namely, defining, refining, searching, analysis, and presenting. First, during searching, the review's focus was established using key terms associated with contactless technology such as contactless payment, contactless card systems, RFID, NFC, contactless cards, fingerprint payment systems, motion sensors, contactless technology, and voice recognition. Second, during the searching stage, key terms were searched

in academic databases including Emerald, EBSCO HOST, Taylor and Francis, Wiley and Blackwell, Science Direct, and JSTOR. During the analysis stage, the abstracts from each downloaded article were checked after importing them to Mendeley, an electronic referencing manager which also helped to retrieve the articles' research objectives for three stages of coding i.e. open coding, axial coding, and selective coding. At the presenting stage, the analysis results were presented using the issues and conceptual approaches using the selective codes as the headings to structure the review write-up. The selective codes obtained from the analysis are the integration, security issues, impact, and design.

Issues and Evidence

In this section, we are presenting the dominant themes that were identified on contactless technology. The section will be divided into four using the selective codes from the analysis.

Integration of contactless technology

Integration in this review seeks to explain how contactless technologies are added to existing business processes and also how we incorporate self-service technology into user activities. The articles about integration discussed issues about user acceptance and adoption. User acceptance is the demonstrable willingness within a group to employ information technology for the task it is designed to support. (Saghafian et al., 2021). Concerning user acceptance, the factors that users consider to accept contactless technology have been researched. Some of these factors include perceived usefulness, perceived danger, perceived ease of use, perceived trust, self-efficacy, and apparent risk (Ozturk, 2016).

Shin and Lee (2021) identified the parameters influencing user acceptance of NFC mobile wallets in both the Korean and US markets which are improved credibility and service smartness constructs. Moreover, personal innovativeness (PI) which is the tendency of an individual to attempt to use any new technology, and prior knowledge (prior information about contactless technology) are other variables that determine a user's decision to accept technology (Pal et al., 2015). Adoption is the decision to obtain and apply a new invention or idea. (Altadonna, 2020). In terms of adoption, factors that are considered from an organizational perspective in embracing new technology are organizational policies, organizational factors (eg. resources and specialization), data protection and privacy, technical organizational match, institutional environment (eg. pressure from Competitors, customers, and suppliers), return on investment, etc. (Ren, 2019). The considerations individuals do when deciding whether or not to embrace contactless technology are accessibility, motivation, ability to afford, nature of design, and prior knowledge (Charness & Boot, 2015).

As customers seek more comfortable, secured, and safer ways to transact, unlock, access transit, and interact with the world around them, contactless technology use is on the rise (Carthy and Olson, 2020). Consequently, consumers are more prepared to embrace and adopt in-store innovations to acquire better shopping experiences whereas retailers gain greater brand loyalty and superior and improved brand identity (Savastano et al., 2019). Cashless payments, according to Ozturk (2016), may be seen as a complicated technology, with consumers' knowledge and skills about their ability to utilize the technology influencing their acceptance. As a result, a greater knowledge of the factors influencing consumer adoption of cashless payments is required (Rahman et al., 2020). People are more willing to adopt new technologies if they believe they will help them perform their jobs more efficiently. Their decisions to use contactless technology are influenced by factors such as relative advantage, extrinsic motivation, work fit, and outcome expectations (Islam et al., 2017). Others include complexity (the degree to which new technology is thought to be difficult to implement), trialability (the extent to which an idea can be tested before being adopted), and observability (the level at which an innovation's consequences are evident to others) (Apanasevic et al., 2016). Consumers also regarded trust and risk components to be critical to the effective adoption of mobile payments. (Hampshire, 2017). To add more, contactless technology was a novel approach for others, who cited a lack of ideas about the technology as another reason for not using it for payments (Shishah & Alhelaly, 2021).

Security issues with Contactless technology

Contactless technology raises substantial risks and credibility issues (Hampshire, 2017). Studies about the security of contactless technology have looked at three main issues. The first issues deal with the risks associated with using contactless technology, the second issue elaborated on mitigating factors, and lastly the impact of risk on the adoption of contactless technology. When talking about forms of risks, we can look at eavesdropping (listening to a conversation illegally) as one of the most well-known security flaws affecting mobile gadgets (Alim Al Islam et al., 2017), cybersecurity, liquidity (how soon you can access your money when you need it), violation of data privacy and poor verification process, attacks on transaction processes in a variety of ways, (Huang et al., 2020), operational risk (sending money to an incorrect account due to a mistake by the user) (Lamb, 2015), risk of mobile wallet being spoofed (Warfare, 2021), spyware on your mobile device (Ahmad, 2021), etc.

Irrespective of the risks and challenges listed, Hampshire (2017) outlined they can be addressed if compelling customer benefits are established. Despite the risks, increasing consumer benefits can ease some of the risks by coercing them into continuous use. A service provider like Alipay has taken creative steps to improve client security by giving free insurance to

all users, which covers any losses incurred as a result of theft (Huang et al., 2020). Measures like encryption and tokenization are also used to hide payment card account numbers when users pay with a mobile wallet as means of securing cardless transactions (Lamb, 2015).

Users of contactless card systems can also choose to opt-out of quick transactions and defer their payment for up to 48 hours in Hong Kong and if the transaction is later discovered to be dubious, users can submit proof to the authorities in charge and have the transaction frozen within 48 hours. The public's trust in cardless technology has considerably increased as a result of customer-protection policies that were established in Hong Kong (Huang et al., 2020).

In considering the impact of risks on the acceptance and use of contactless technology, customers' propensity to adopt cardless payment systems is influenced by their perception of risk. (Choe et al., 2021). Perceived risk focuses on two viewpoints: the likelihood of something occurring and the implications if that risk occurs (Hampshire, 2017). Customers who associated potential risk with buying, are unlikely to purchase for fear of losing vital personal details and suffering from fraudulent attacks. (Choe et al., 2021). However, the biggest reason for not using contactless payment technology for some people during the COVID-19 pandemic was payment security since they were not sure about the protection the service providers offered and they were also much concerned about data privacy (Shishah & Alhelaly, 2021).

Impact of contactless technology
In this section, we take a look at the effects or implications of contactless technology on users. Zhao et al (2019) examine the impact of monetary incentives on consumers' willingness to use near-field communication (NFC) in mobile payment. They used different kinds of incentives (discount and cashback), two sets of rewarding amounts, and different components of incentive campaign durations in an online experiment. It was detected that the introduction of financial incentives influenced intention to use NFC mobile payment positively; financial incentives influenced intention indirectly through perceived risk. For those in the low perceived risk group, various types, amounts, or promotion durations did not seem to influence them.

In considering the impact of using cardless payment systems which included mindfulness as a key factor in research, results showed that mindfulness, perceived ease of use, perceived usefulness, subjective norms, and attitude have a significant effect on contactless payment use by increasing the number of users of contactless card payments more than the traditional system of paying with cash (Flavian et al., 2020). Further, during the year of the covid-19 pandemic in Saudi Arabia, an online study

was conducted to investigate the effect of using contactless payment technology to determine if the use of cardless payment technology has increased since the commencement of the covid year or not. This was performed by comparing the frequency with which the technology was used before and after the outbreak began. Following the onset of the COVID-19 outbreak, it was discovered that the use of contactless payment technologies rose considerably (Shishah & Alhelaly, 2021).

Design of contactless technology

It is critical for firms in the travel sector to keep up with the newest travel technology trends (Rahimizhian & Irani, 2020). As a result, products can be purchased and paid for without the use of traditional currency. The technological advancements produced during this period are therefore appropriate for coping with the contactless age (Dubey et al., 2020). Technologies such as contactless door locks cannot be overlooked in such a period of social distancing. The research was done into contactless door locks design to help people who would like to have their own unique door lock devices that are quick, easy to use, and less expensive to have some peaceful mind (Tu, 2016). Tu (2016) eventually created a smart door lock with a non-contact pattern identification controller that can identify a small pattern that can be shown on mobile devices. The detected pattern is created utilizing a two-dimensional text and images technique that users' mobile devices can store. As a result, the established two-dimensional text and images cipher can be displayed when a key-owner approaches a door's control panel.

Most wearable devices with no screen read human movements and use biometric data to perform contactless payments or take calls. Designed based on personalized electrocardiogram biometric identification, these devices facilitate cashless transactions. Some also have their cashless feature based on the SECORA Connect NFC technology from Infineon Technologies AG, which allows smart wearables to securely store, choose, and use numerous credentials such as payment cards (Ahmad, 2021).

Problematisation and research gaps

The foregoing evidence of issues about contactless technologies suggests knowledge gaps for future research. First, all previous articles about contactless technology focused on user adoption (Abidin & Husin, 2020; Ozturk & Hancer, 2015) and acceptance theories and models (Lee & Jung, 2016; Nath & Varghese, 2020; Shin & Lee, 2021) and also impact theories (Camara, 2021; Flavian et al., 2020) on the technology. However, there is a lack of theoretical explanation about the implementation of contactless technology. These previous articles assumed certain factors such as Perceive Ease Of Use (PEOU), Perceive Usefulness (PU), Perceive Trust

(PT) that users of contactless technology will consider when adopting the technology without making any projections concerning the implementation of the technology. A new study is however required to unravel theories and real-life investigations into the implementation of contactless technology.

Second, existing studies have looked at security issues concerning the adoption and usage of contactless technology from three dimensions. These are the types of risks associated with contactless technology usage (Islam et al., 2017; Hampshire, 2017; Shishah & Alhelaly, 2021), the level of impact of the risks on consumers (Ahmad et al., 2018; Choe et al., 2021) and the mitigating factors (Choe et al., 2021; Hampshire, 2017). Arguably, no study has identified how to implement contactless technologies that are secured from an initial state. Existing studies document how contactless technologies are first implemented before the decision to secure the users from the potential risks (Teo et al., 2015; Thornton, 2015). Getting to know about theories, models, or conceptual frameworks about the implementation of contactless technology will broaden and enlighten future researchers who might want to close the knowledge gap and contribute to our understanding. User's confidence will be enhanced if they are aware of the fact that, the designers or developers of contactless technology considered securing their innovations before implementation and also understand the challenges and consequences they might encounter and the possible solutions and escape routes should they face fraudulent activities.

Third, most studies focus on risks after implementation (Kovács & David, 2016; Lemieux, 2018), future research could look into answering the question, "How can contactless technology be secured right from the start for consumers, even before implementation?". Third, despite the widespread use of cardless payment technology (Chen et al., 2021), other customers still choose to pay using credit cards or cash rather than embracing this innovation. (Esfahani & Ozturk, 2019). A study needs to be conducted therefore to identify the factors hindering the users of traditional credit cards and cash from adopting cardless transactions.

Fourth, TAM was created to define employee acceptance of contactless payments in the workplace meaning only in an organizational environment, and not to recognize individuals' acceptance of innovations (Slade et al., 2015). This assumption has a shortfall since users of contactless technology adopt the innovation even outside the organization most especially for private businesses. There is therefore the need to study consumer-level factors for adoption as well.

Summary and conclusions

This article intends to provide a review article that closes saturated areas and uncovers new areas about contactless technology. Based on these themes, most articles were centered on integration (user adoption and user acceptance) and security. Shin and Lee (2021) identified the parameters influencing user acceptance of NFC mobile wallets such as improved credibility and service smartness constructs, Ozturk (2016) outlined perceived usefulness, perceived danger, perceived ease of use, perceived trust, self-efficacy, and apparent risk as factors which influence user acceptance of contactless technology. Carthy and Olson (2020) also determined that NFC consumer satisfaction and use gain a better insight of user adoption familiarity with most users conceding to continue using NFC. Shoppers are happy to embrace in-store inventions for improved buying, while retailers are more loyal to brands and identity (Savastano et al., 2019). Considering security, data privacy (Huang et al., 2020), spyware on a mobile device (Ahmad, 2021), and eavesdropping (Alim Al Islam et al., 2017) were some of the risks identified while compelling benefits (Hampshire, 2017) and encryption of payment processes (Lamb, 2015) were some counteracting features.

References

Abidin, S. S. Z., & Husin, M. H. (2020). Improving accessibility and security on document management system: A Malaysian case study. *Applied Computing and Informatics*, *16*(1), 137–154. https://doi.org/10.1016/j.aci.2018.04.002

Ahmad, J., Larijani, H., Emmanuel, R., Mannion, M., & Javed, A. (2018). Occupancy detection in non-residential buildings – A survey and novel privacy preserved occupancy monitoring solution. *Applied Computing and Informatics*, *17*(2), 279–295. https://doi.org/10.1016/j.aci.2018.12.001

Ahmad, M. (2021). *Design blueprint of a screenless wearable for contactless payments*. https://www.edn.com/design-blueprint-of-a-screenless-wearable-for-contactless-payments/

Alim Al Islam, A. B. M., Chakraborty, T., Khan, T. A., Zoraf, M., & Hyder, C. S. (2017). Towards defending eavesdropping on NFC. *Journal of Network and Computer Applications*, *100*(April), 11–23. https://doi.org/10.1016/j.jnca.2017.10.013

Apanasevic, T., Markendahl, J., & Arvidsson, N. (2016). Stakeholders' expectations of mobile payment in retail: lessons from Sweden. *International Journal of Bank Marketing*, *34*(1), 37–61. https://doi.org/10.1108/IJBM-06-2014-0064

Bounie, D., & Camara, Y. (2020). Card-sales response to merchant contactless payment acceptance. *Journal of Banking and Finance*, *119*, 105938. https://doi.org/10.1016/j.jbankfin.2020.105938

Camara, Y. (2021). *Digital Payments and Business Resilience Evidence in the Time of COVID-19*. *May*. http://www.worldbank.org/prwp.

Carthy, S. and Olson, B. (2020). *Consumers Embracing the Convenience and Security of NFC Contactless Technology*. https://www.businesswire.com/news/home/20201028005744/en/Consumers-Embracing-the-Convenience-and-Security-of-NFC-Contactless-Technology

Chao, S.-L., & Lin, Y.-L. (2017). Gate automation system evaluation. *Maritime Business Review*, *2*(1), 21–35. https://doi.org/10.1108/mabr-09-2016-0022

Chen, C. C. B., Chen, H., & Wang, Y. C. (2021). Cash, credit card, or mobile? Examining customer payment preferences at chain restaurants in Taiwan. *Journal of Foodservice Business Research*, *00*(00), 1–20. https://doi.org/10.1080/15378020.2021.1934251

Chiu, I. H. Y. (2017). A new era in fintech payment innovations? A perspective from the institutions and regulation of payment

systems. In *Law, Innovation and Technology* (Vol. 9, Issue 2). Taylor & Francis. https://doi.org/10.1080/17579961.2017.1377912

Choe, J. Y. (Jacey), Kim, J. J., & Hwang, J. (2021). Perceived risks from drone food delivery services before and after COVID-19. *International Journal of Contemporary Hospitality Management*, *33*(4), 1276–1296. https://doi.org/10.1108/IJCHM-08-2020-0839

Dragović, N., Stankov, U., & Vasiljević, Đ. (2018). Contactless Technology as a Factor of Tourism Industry Development - A Review of Current Practices and Future Directions. *Economic Themes*, *56*(2), 179–202. https://doi.org/10.2478/ethemes-2018-0011

Dubey, V., Sonar, R., & Mohanty, A. (2020). FinTech, RegTech and Contactless Payments Through the Lens of COVID 19 Times. *International Journal of Advanced Science and Technology*, *29*(6), 3727–3734. https://www.researchgate.net/profile/Vivek_Dubey6/publication/342663514_FinTech_RegTech_and_Contactless_Payments_Through_the_Lens_of_COVID_19_Times/links/5eff39fd92851c52d6139503/FinTech-RegTech-and-Contactless-Payments-Through-the-Lens-of-COVID-19-Times.

Esfahani, S. S., & Bulent Ozturk, A. (2019). The influence of individual differences on NFC-based mobile payment adoption in the restaurant industry. *Journal of Hospitality and Tourism Technology*, *10*(2), 219–232. https://doi.org/10.1108/JHTT-01-2018-0009

Façanha, A. R., Carneiro Araújo, M. C., Viana, W., & Sánchez, J. (2019). Design and evaluation of mobile sensing technologies for identifying medicines by people with visual disabilities. *International Journal of Pervasive Computing and Communications*, *15*(3–4), 121–143. https://doi.org/10.1108/IJPCC-02-2019-0006

Flavian, C., Guinaliu, M., & Lu, Y. (2020). Mobile payments adoption – introducing mindfulness to better understand consumer behavior. *International Journal of Bank Marketing*, *38*(7), 1575–1599. https://doi.org/10.1108/IJBM-01-2020-0039

Fu, H. P., Chang, T. H., Lin, A., Du, Z. J., & Hsu, K. Y. (2015). Key factors for the adoption of RFID in the logistics industry in Taiwan. *International Journal of Logistics Management*, *26*(1), 61–81. https://doi.org/10.1108/IJLM-09-2012-0091

Gupta, K., & Arora, N. (2019). *Investigating consumer intention to accept mobile payment systems through unified theory of*

acceptance model An Indian perspective. 2016. https://doi.org/10.1108/SAJBS-03-2019-0037

Hampshire, C. (2017). A mixed methods empirical exploration of UK consumer perceptions of trust, risk and usefulness of mobile payments. *International Journal of Bank Marketing*, *35*(3), 354–369. https://doi.org/10.1108/IJBM-08-2016-0105

Han, H., Park, A., Chung, N., & Lee, K. J. (2016). A near field communication adoption and its impact on Expo visitors' behavior. *International Journal of Information Management*, *36*(6), 1328–1339. https://doi.org/10.1016/j.ijinfomgt.2016.04.003

Huang, R. H., Sze, C., Cheung, W., Meng, C., & Wang, L. (2020). *The Risks of Mobile Payment and Regulatory Responses : A Hong Kong Perspective* •. *00*, 1–19. https://doi.org/10.1017/als.2019.30

Jensen, D. (2021). *Contactless Technology: A New Normal That Will Outlast the Pandemic*. https://sk-perspectives.com/posts/contactless-technology-a-new-normal-that-will-outlast-the-pandemic

Kahveci, A., & Okutmuş, E. (2017). A Qualitative Research on Medical Tourism Potential of Alanya/Turkey in the Concept of International Service Trade. *Economic Themes*, *55*(3), 437–450. https://doi.org/10.1515/ethemes-2017-0024

Karjaluoto, H., Shaikh, A. A., & Leppäniemi, M. (2019). *Examining consumers ' usage intention of contactless payment systems*. https://doi.org/10.1108/IJBM-04-2019-0155

Kovács, L., & David, S. (2016). Fraud risk in electronic payment transactions. *Journal of Money Laundering Control*, *19*(2), 148–157. https://doi.org/10.1108/JMLC-09-2015-0039

Lai, P. C. (2017). *THE LITERATURE REVIEW OF TECHNOLOGY ADOPTION MODELS AND THEORIES FOR THE NOVELTY TECHNOLOGY*. *14*(1), 21–38. https://doi.org/10.4301/S1807-17752017000100002

Lee, S., & Jung, K. (2016). A meta-analysis of determinants of RFID adoption around the world. *Asia Pacific Journal of Innovation and Entrepreneurship*, *10*(1), 67–90. https://doi.org/10.1108/apjie-12-2016-010

Lemieux, F. (2018). *Cyber Threats , Intelligence Operations , and Mass Surveillance*. https://doi.org/10.1108/978-1-78769-171-120181007

Lim, W. M., Teh, P. L., Ahmed, P. K., Cheong, S. N., Ling, H. C., & Yap, W. J. (2018). Going keyless for a seamless experience: Insights from

a unified hotel access control system. *International Journal of Hospitality Management*, *75*(June 2017), 105–115. https://doi.org/10.1016/j.ijhm.2018.03.014

Lin, W. R., Lin, C. Y., & Ding, Y. H. (2020). Factors affecting the behavioral intention to adopt mobile payment: An empirical study in Taiwan. *Mathematics*, *8*(10), 1–19. https://doi.org/10.3390/math8101851

Liu, C., & Yang, J. (2021). How hotels adjust technology-based strategy to respond to COVID-19 and gain competitive productivity (CP): strategic management process and dynamic capabilities. *International Journal of Contemporary Hospitality Management*. https://doi.org/10.1108/IJCHM-10-2020-1143

Liu, W., Ji, R., & Nian, C. P. (2020). *Identifying the Types and Impact of Service Provider ' s Responses to Online Negative Reviews in the Sharing Economy : Evidence from B & Bs in China*. 8–10.

Ozturk, A. B., & Hancer, M. (2015). The Effects of Demographics and Past Experience on RFID Technology Acceptance in the Hospitality Industry. *International Journal of Hospitality and Tourism Administration*, *16*(3), 275–289. https://doi.org/10.1080/15256480.2015.1054756

Puriwat, W., & Tripopsakul, S. (2021). Explaining an adoption and continuance intention to use contactless payment technologies: During the covid-19 pandemic. *Emerging Science Journal*, *5*(1), 85–95. https://doi.org/10.28991/esj-2021-01260

Rahimizhian, S., & Irani, F. (2020). Contactless hospitality in a post-Covid-19 world. *International Hospitality Review*, *ahead-of-p*(ahead-of-print). https://doi.org/10.1108/ihr-08-2020-0041

Rahman, M. H., & Islam, M. S. (2019). Implementation of RFID in university libraries of Bangladesh. *Global Knowledge, Memory and Communication*, *68*(1–2), 112–124. https://doi.org/10.1108/GKMC-06-2018-0053

Rahman, M., Ismail, I., & Bahri, S. (2020). Analysing consumer adoption of cashless payment in Malaysia. *Digital Business*, *1*(1), 100004. https://doi.org/10.1016/j.digbus.2021.100004

Raman, P., & Aashish, K. (2021). To continue or not to continue: a structural analysis of antecedents of mobile payment systems in India. *International Journal of Bank Marketing*, *39*(2), 242–271. https://doi.org/10.1108/IJBM-04-2020-0167

Ren, M. (2019). Why technology adoption succeeds or fails: an exploration from the perspective of intra-organizational legitimacy.

Journal of Chinese Sociology, *6*(1). https://doi.org/10.1186/s40711-019-0109-x

Saghafian, M., Laumann, K., & Skogstad, M. R. (2021). Stagewise Overview of Issues Influencing Organizational Technology Adoption and Use. *Frontiers in Psychology*, *12*. https://doi.org/10.3389/fpsyg.2021.630145

Savastano, M., Bellini, F., D'Ascenzo, F., & De Marco, M. (2019). Technology adoption for the integration of online–offline purchasing: Omnichannel strategies in the retail environment. *International Journal of Retail and Distribution Management*, *47*(5), 474–492. https://doi.org/10.1108/IJRDM-12-2018-0270

Sena, R. De, Naomi, S., & Fernando, D. (2016). Intention of adoption of mobile payment : An analysis in the light of the Unified Theory of Acceptance and Use of Technology (UTAUT) Intention of adoption of mobile payment : An analysis in the light of the Unified Theory of Acceptance and Use of Techno. *RAI Revista de Administração e Inovação*, *13*(3), 221–230. https://doi.org/10.1016/j.rai.2016.06.003

Sevim, U., & Eyuboğlu, K. (2017). Determinants of Contactless Credit Cards Acceptance in Turkey. *International Journal of Management Economics and Business*, *13*(2), 0–0. https://doi.org/10.17130/ijmeb.2017228687

Shin, H., & Kang, J. (n.d.). *Reducing perceived health risk to attract hotel customers in the COVID-19 pandemic era : Focused on technology innovation for social distancing and cleanliness.*

Shin, S., & Lee, W.-J. (2021). Factors affecting user acceptance for NFC mobile wallets in the U.S. and Korea. *Innovation & Management Review*, *ahead-of-p*(ahead-of-print). https://doi.org/10.1108/inmr-02-2020-0018

Srivastava, C., Goli, M., & Vandana, V. (2021). Adoption of Contactless Payments during Covid 19 Pandemic An Integration of Protection Motivation Theory (PMT) and Unified Theory of Acceptance and Use of Technology (UTAUT). *Academy of Marketing Studies Journal*, *25*(1), 2678. https://www.abacademies.org/abstract/adoption-of-contactless-payments-during-covid-19-pandemic-an-integration-of-protection-motivation-theory-pmt-and-unified-9970.html

Teo, A., Tan, G. W., & Hew, T. (2015). *The effects of convenience and speed in m-payment. 115*(2), 311–331. https://doi.org/10.1108/IMDS-08-2014-0231

Thornton, B. M. (2015). *Apple Pay and EMV Security. February.*

Tu, J. F. (2016). A contactless doors lock which controlled by portable devices. *Engineering Computations (Swansea, Wales)*, *33*(6), 1631–1641. https://doi.org/10.1108/EC-08-2015-0234

https://doi.org/10.1049/iet-cds.2015.0023

Vannucci, V., & Pantano, E. (2020). Digital or human touchpoints? Insights from consumer-facing in-store services. *Information Technology and People*, *33*(1), 296–310. https://doi.org/10.1108/ITP-02-2018-0113

Wang, H., Yu, R., Pan, R., Liu, M., Huang, Q., & Yang, J. (2021). Fast tag identification for mobile RFID robots in manufacturing environments. *Assembly Automation*, *3*, 292–301. https://doi.org/10.1108/AA-11-2020-0182

Wang, Y. M., & Lin, W. C. (2019). Understanding consumer intention to pay by contactless credit cards in Taiwan. *International Journal of Mobile Communications*, *17*(1), 1–23. https://doi.org/10.1504/IJMC.2019.096507

Warfare, C. (2021). *New Payment Methods and Insufficiencies in their Regulatory Scheme*. *7*(2), 101–146.

Wolfswinkel, J. F., Furtmueller, E., & Wilderom, C. P. M. (2013). Using grounded theory as a method for rigorously reviewing literature. *European Journal of Information Systems*, *22*(1), 45–55. https://doi.org/10.1057/ejis.2011.51

Zakonnik, Ł., Czerwonka, P., & Zajdel, R. (2018). Contactless payments in Poland - advantages and disadvantages based on surveys of a selected group of users over the years 2011-2018. *SHS Web of Conferences*, *57*, 01033. https://doi.org/10.1051/shsconf/20185701033