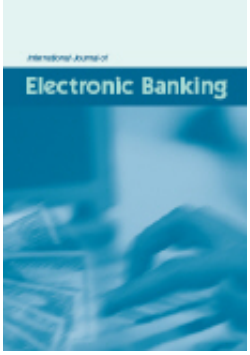


International Journal of Electronic Banking

ISSN online: 1753-5247 - ISSN print: 1753-5239
https://www.inderscience.com/ijebank

Impact of digitalisation on customer experience management in retail banking

Vyankatesh Adke, Priti Bakhshi, Muniza Askari

DOI: 10.1504/IJEBANK.2024.10062447

Article History:

Received:	25 June 2022
Last revised:	27 June 2022
Accepted:	18 June 2023
Published online:	22 February 2024

Impact of digitalisation on customer experience management in retail banking

Vyankatesh Adke*

Department of DBA,
SP Jain School of Global Management, Singapore
Email: Vyankatesh.ds20dba028@spjain.org
*Corresponding author

Priti Bakhshi

Department of DBA,
SP Jain School of Global Management,
Mumbai, India
Email: priti.bakhshi@spjain.org

Muniza Askari

Department of DBA,
SP Jain School of Global Management, Singapore
Email: Muniza.askari@spjain.org

Abstract: The rise of Fintech and Bigtech firms have significantly contributed to growth in financial services in Southeast Asia; being further boosted by open finance initiatives instituted by regulators. The main aim here is to offer integrated financial services by making customer experiences fully digital, frictionless, and anticipatory to customer needs, based on digital technologies such as cloud, 5G and artificial intelligence (AI) infusion. This is now challenging retail banks to embark on complex digital transformation journeys by balancing costs and accrued benefits. By analysing existing literature on advancements in digital technologies and the impact thereof on consumer behaviours and customer experience measures, the study presents key insights in the form of a conceptual framework on key factors to consider for improving customer experience that can help retail banks. The scope of the study is limited to Singapore and Indonesia, but the outcomes could be beneficial to adjacent markets in Southeast Asia.

Keywords: customer experience; retail banking; big data; cloud computing; digitalisation; artificial intelligence.

Reference to this paper should be made as follows: Adke, V., Bakhshi, P. and Askari, M. (2024) 'Impact of digitalisation on customer experience management in retail banking', *Int. J. Electronic Banking*, Vol. 4, No. 2, pp.154–167.

Biographical notes: Vyankatesh Adke is currently a student and researcher, SP Jain Global School of Management. He currently serves as the Director, Solutions Engineering, Avaya Asia Pacific. Previously, he received his MBA from Symbiosis Institute of Business Management, India.

Priti Bakhshi is currently an Associate Professor in Finance at SP Jain School of Global Management. She received her PhD, MBA (Financial Administration), MCom (Management and Taxation), MA (Economics), and NET qualified along with many International and National Certifications. She has over 25 years of experience in industry, academics, research, consultancy, and mentoring start-ups. She is an editor and reviewer of many ABDC category journals. ORCID ID: 0000-0002-3869-2810.

Muniza Askari is an economist with a background in decision sciences, focusing on applying economic theories to solve problems faced by managers and businesses. She incorporates new domains, particularly behavioural foundations, to help managers analyse complex business environments. Her academic journey began as a researcher at a development institute and led to a doctorate in behavioural economics and applied microeconomics at Sorbonne University. She currently works at SP Jain School of Global Management, collaborating with professors to bridge the gap between economic applications and managerial strategies.

This paper is a revised and expanded version of a paper entitled 'Impact of disruptive technologies on customer experience management in ASEAN: a review' presented at 2022 IEEE International Conference on Computing (ICOCO), Kota Kinabalu/Virtual, 14–16 November 2022.

1 Introduction

Customer experience management is a key focus of the banking sector, and effective management can lead to higher customer retention and lower churn rates, including increased potential for cross-sell/up-sell opportunities for overall growth.

Customer service measures such as net promotor score (NPS), customer satisfaction score (CSAT) and service quality (SERV) have been reviewed by researchers. The base constructs of these measures included factors such as first contact resolution (FCR), product price, service quality and brand loyalty. While still pertinent, these measures do not sufficiently account for qualitative factors attributed to customer segmentation and behavioural aspects across time dimensions.

Today's customers expect empathetic, predictive, and personalised experiences.

With personalisation, customers expect banking services to be tailored to their preferences, attitudes and circumstances based on the intent and purpose of their contact. Digitalisation trends affect most of the above factors.

Cloud technology has changed the way data can be collected, analysed, and used at scale and on demand. That's why cloud-based customer relationship management (CRM) solutions like Salesforce, Microsoft Dynamics, and Oracle have greatly simplified how you can manage and leverage customer segmentation data efficiently and at scale.

At the heart of AI is the availability of data for processing and analysis, and the ubiquity of cloud technology has paved the way for AI-powered conversational automation services like chatbots and voicebots to provide self-help, easy answers to questions, and even decisions to some extent. It is now possible to predict customer intent based on big data. Cognitive services are now making the measurement of customer sentiment possible and take pre-emptive actions. The evolution of generative AI-based

models, led by Open AI's GPT, are ushering in new dimensions to conversational automation, exploring abilities to render reasoning and structure to virtual agent responses, in addition to content creation and various use cases are currently under evaluation (Ray, 2023). However, the efficacy of such capabilities is yet to be conclusively determined, and therefore the incorporation of such capabilities specifically in decision-making remains an evolving topic.

Digital customer service engagement channels such as live chat and e-mail have been adopted by retail banks since early 2010. However, the last five years have seen increased adoption of social media channels for customer service. Conversational messaging is becoming the new standard, while video banking is increasingly becoming an alternative to physical branches, in particular for relationship management services, after the COVID-19 pandemic (De et al., 2020).

The onset of Fintech and Bigtech firms has paved the way for the growth of digitised financial services.

The gross domestic product (GDP) for Singapore at current market prices grew by around 4% for the financial year 2022 and was around US$643 billion. Further, financial services accounted for about 14% of the nominal GDP (Department of Statistics, 2023). While overall growth in financial services remains cautious, the post COVID-19 era has seen rapid adoption of digital financial services, and this is expected to triple from $11 billion today to $38 billion by 2025 across ASEAN, stimulated digital innovations, artificial intelligence (AI) and open finance initiatives.

Indonesia is the leading driver of growth in the digital financial services space, which is expected to reach US$130 billion by 2025 driven by rapid growth in lending and payments (Setiawan et al., 2023). While regulatory authorities like Bank Indonesia (BI) and Otoritas Jasa Keuangan (OJK) are yet to formalise comprehensive guidelines for an integrated digital framework for banking and non-banking financial institutions they have already made positioning statements in support of open banking regimes in their master plans. As OJK granted licenses to 122 Fintech firms for payment solutions as of December 2020, while Bank Rakyat Indonesia (BRI), Maybank, and Bank Mandiri have already started giving API access to Fintech firms to evaluate integrated financial solutions

While digital technologies have significantly matured, it is still a challenge for banks to adopt them. This is due to structural challenges, distinct operational and process models, legacy IT frameworks, and skills gaps. There has been some progress in adopting digital channels of interaction, but the delivery of AI and cutting-edge applications is still in its infancy, where banks are weighing net business benefits and outcomes with applicable costs.

Through a comprehensive systematic literature review, this study attempts to analyse how disruptive digital technologies are influencing the key factors which constitute customer experience management. It also studies the challenges posed to the retail banking sector and explores the possibilities of how the sector will evolve.

2 Literature review

2.1 Literature selection approach

The study is primarily based on secondary sources of data.

The scope of the study is limited to the retail banking segment with a particular focus on Singapore and Indonesia. Due to the evolving nature of the topic, study references from other regions have also been considered.

2.2 Review perspective

The last decade has seen many advances in digital technologies, which have directly impacted how customers engage with retail banks. Essentially, this evolution in the context of customer banking touchpoints has been from physical (in-branch experience) to virtual. This has had a direct effect on the framework for customer experience management, and its measures. This study aims to examine three major themes namely digital engagement channels, the proliferation of cloud and the introduction of AI in the context of customer experience. The literature review is summarised across three key sections namely:

a Customer experience in the early years of digital adoption.

b Rise of cloud computing and AI.

c Emerging technologies-generative AI and metaverse.

d Progression in customer expectations and behaviours in the wake of digitalisation.

e Challenges faced by the retail banking sector.

2.2.1 Customer service management in the formative years of digitalisation

Early studies tried to introspect the paradigm of customer experience (CX) and the efficacy of CX management measures like CSAT and NPS by evaluating an alternative scale based on experience quality (Klaus, 2013; Garg et al., 2014). The studies challenged the contemporary perspective on customer satisfaction which was primarily based on product and service attributes and less on the customer's overall perception of the brand across all engagement cycles. They studied the impact of parameters like service quality, and usability (Tan et al., 2016). However, the studies were done at a time when customer engagement modes primarily constituted physical branches, call centres and internet banking. Advanced digital channels like messaging, social media and video were in very early stages of evolution and adoption, and as such were topics of research and insufficiently represented in the studies done.

Subsequent years (2013–2018) saw a gradual infusion of advanced digital channels, particularly online and mobile banking intending to make access to services effortless. This was also a time when high-speed network connectivity (4G) and access technologies started maturing. Cloud computing started becoming mainstream across certain applications and API-ready loosely coupled software architectures as viable substitutes for legacy premise-based tightly coupled frameworks started to take root. Focus on offering consistency in customer experiences across different engagement channels, as 'omnichannel' started becoming a top priority for banks.

The impact of such advances on product attributes to drive innovations and on bank performance has been studied (Hasaka, 2019). Further, the impact of such advances in digital technologies and how this is affecting customer experience has been explored

(Komulainen and Makkonen, 2018), but they were primarily in the context of consumer transactions, not in the context of customer experience and brand recall.

2.2.2 AI, cloud computing and mobility

The 'as a service' concept enables enterprises to consume applications and services on a consumption basis, avoiding upfront, bulky capital expenditures and leveraging operating cost budgets instead.

In the late 1990s, providers such as Hotmail and Google began selling e-mail services. Amazon Web Services debuted its elastic cloud service (EC2) as a service in 2006, and since then, infrastructure as a service (IaaS) has taken root, allowing organisations to host their applications on the cloud.

Subsequently, the industry has seen transformations on two fronts: commercial, with enterprises transitioning to usage-based billing models and technological, where we are seeing a movement from client-server to platform virtualisation to cloud computing (Gill et al., 2019).

Cloud technology progress has seen seismic growth in recent years (2017-to-date). Three major variables can be assigned as follows.

To begin, microservices and container technology have transformed how software is packaged, distributed, and maintained (Kazanavicius and Mazeika, 2019). This has shifted the software development life cycle from monolithic, tightly connected to more agile, loosely coupled, allowing organisations to rapidly add new capabilities and reduce time to market.

Second, data modelling, or the way data can be consumed, stored, and processed, has changed. This has cleared the way for the study of any type of data stream, laying the groundwork for predictive analytics and actionable insights that can be used to personalise customer interactions based on contextual and segment characteristics (Lee and Lee, 2020).

Thirdly, the advent of serverless computing has bought several applications to address event-based, demand-driven and both planned and unplanned events at scale (Shafiei et al., 2022). These include one time password (OTP) generation modules to handle high traffic spikes, personalisation of offers, auto archival of data for compliance regulation, processing of auto-debit transactions, etc.

While AI and its evolution also took rapid strides during these formative years, the above developments in cloud technologies have had a direct impact on AI and its applications in enterprise applications

AI and its applications have had wide-reaching impacts, including trends like fraud detection and analysis, biometrics, knowledge management and electronic know your customer (e-KYC) applications (Bhattacharya and Sinha, 2022).

The influence of AI-based conversational chatbots on customer experience has been studied (Andrade and Tumelero, 2022) from the perspective of service personalisation. Usage of messaging channels like WeChat, Line, and Yalo as advanced versions of traditional chat, supporting conversation persistence, rich media, Augmented/Virtual Reality rendition and also transactions/payments have been studied (Wydymus, 2023). They are emerging as convenient alternatives to traditional banking channels. Robotic process automation (RPA) applications are emerging as efficient automation mechanisms for both front-office and back-office tasks, thereby improving overall efficiency and resolution time (Herm et al., 2022).

5G services have now been commercially launched in most ASEAN countries (Martinus, 2020). The quantity and quality of client contact possibilities will both rise with the introduction of 5G. It will help incumbent banks better combine offline and online client journeys, powered by low latency, high-speed networks, as well as enable banks and Fintech/Bigtech firms to offer digitised financial services to various groups, including those who live in rural areas, including innovations powered by AI, augment reality/virtual reality (AR/VR) and video collaboration (French et al., 2020).

Despite the developments across various areas of digital transformation as referenced above, their usability and effectiveness remain scanty due to several reasons. Trust and security are key elements as noted in recent studies (Manser Payne et al., 2018), especially in AI-enabled mobile banking and recommendation tools for investment portfolios. Another example is perceived cyber risks, particularly in chatbot-based payment transactions on messaging channels, resulting in reduced adoption and overall customer experience (Trivedi, 2019).

Finally, with cognitive AI, it is becoming possible to analyse and correlate customer behavioural patterns, which include attributes like customer sentiment, preferences when it comes to purchase patterns, lifestyles, etc. At the core of this is the availability of datasets across various sources, for example, CRM platforms, interaction parameters like voice and digital conversations which can be ingested in real-time, case management platforms, etc. An emerging trend is to make predictions on anticipated customer behaviour and actions based on such datasets using AI (Zhang et al., 2020). However, this is an evolving domain, where both maturity of the technology framework and their practical applications are still being assessed in the retail banking industry.

2.2.3 Emerging technologies: generative AI and metaverse

2.2.3.1 Generative AI

The evolution of large language models (LLM) upon which chatgpt and other text-based generative AI applications are based is providing a new dimension to conversational automation and virtual agents (George et al., 2023). In the context of customer service, these include the ability to provide relevant and coherent responses that incorporate reasoning and detail to complex questions and enquiries. Applications in retail banking currently being explored include generative pre-trained transformers (GPT) trained responses to frequently asked questions (FAQ), human-assisted AI providing GPT-based knowledge recommendations and suggestions, and the ability to autogenerate conversation summaries. However, several challenges currently exist in GPT-based responses. These include occasional inaccuracies and biases on which the inherent data was trained, the complexity of the models, the speed of real-time responses, and the computing resources required. Furthermore, there are ethical considerations including aspects such as data security and privacy, cultural bias, accountability and regulatory compliance. As such, generative AI-based applications are still in the exploratory phase (Ray, 2023).

2.2.3.2 The metaverse

Applications of virtual and augmented reality have been prevalent in the consumer shopping space. The metaverse, a new phenomenon developing since 2021 takes these

concepts to a new level, where people can meet, engage, and collaborate virtually in an immersive environment. How the metaverse can be adopted in the enterprise banking domain is something that is a topic of imagination, and may take some time before ideas materialise and take form. There can be different dimensions to it, for example, platform, marketplace and commerce (Yang et al., 2022).

HSBC and JP Morgan Chase, in March 2022, announced their foray into the Metaverse space, using it as a platform for them to connect with customers and partners to market financial products (Dubey et al., 2022). New possibilities to engage with customers, offering immersive virtual engagements and new financial products are becoming possible, for example, the Onyx lounge launch by JP Morgan.

Siam Commercial Bank in Thailand has setup their virtual headquarters in Sandbox. The virtual assets include spaces for events and knowledge sharing, forums for business partners to collaborate on project activities and mechanisms to promote locally incubated non-fungible tokens (NFT's).

2.2.4 Progression of customer expectations and behaviours in the wake of advancement in disruptive technologies

The above summary details the evolution of customer engagement channels in the wake of advances in digital technologies such as cloud, big data, AI and emerging technologies such as chatgpt and metaverse. These disruptive technologies have also had a significant impact on consumer expectations from brands and their behaviour patterns.

Mobile banking enables customers to have instant access to products and services, including intuitive options for self-help through access to knowledge articles. Moreover, with the introduction of interactive virtual assistants, customers can now have always-on customer service at their disposal (Doherty and Curran, 2019).

Customers now expect consistency in service quality and experience across different touchpoints and engagement channels, whether physical, voice, digital or virtual (Hosseini et al., 2022). This is compelling retail banks to revisit customer journey designs and make engagements omnichannel (Gerea and Herskovic, 2022).

Customers also expect customer service to be 'always on' and efficient, and expect speedy responses to their enquiries. In particular, social media channels have become the primary source of expression of public discourse and expression, due to the impact they can have on brand values. From a point where customer service was perceived as being reactive, and disjointed across digital channels, customers now expect their engagements today to be empathetic, anticipatory, and personalised.

The employment of effective CX strategies to address these trends in customer expectations and corresponding measures is also a subject of review. These are in the context of analysing customer behaviour and feedback from a time dimension perspective, through customer journey analytics, and assessing overall brand association through customer lifetime value (Windasari et al., 2022).

2.2.5 Problems confronting the retail banking sector

Industry evolution trends such as consolidation of Fintech and retail banking have been observed (Lee et al., 2020). The digitisation of financial services, in particular in the context of payments, planning tools, investments and digital currencies has seen accelerated growth in the post COVID-19 era.

In addition to Fintech, the last few years have also seen the emergence of Bigtech firms (Facebook, Google, Amazon, Alibaba, etc.) with advanced technology and computing frameworks who are also attempting to make forays into the financial services in emerging markets (Asian Development Bank, 2023). However, the regulatory and operating frameworks for such firms are still in the exploratory phase (Bains et al., 2022).

Furthermore, the open finance initiatives taken by the Singapore government in 2019 (MAS, 2019) and Indonesia (OJK, 2020) which aim to consolidate banking, insurance and investment services leveraging the paradigms of open API are expected to completely transform the financial services industry, where the consumer can seamlessly access to credit, insurance and investment services across different providers and maximise their assets.

In Malaysia, guidelines for open finance have been laid out by the central bank (Bank Negara Malaysia, 2018), as have been in the Philippines (Central Bank of Philippines, 2021) but adoptions of regulations and commercialisation are yet to materialise.

Despite these consolidation trends, traditional retail and commercial banks continue to constitute the bulk of the financial services GDP. These trends, however, pose serious challenges for retail banks to remain competitive and relevant in the wake of disruptive digital technologies. This is a complete digital transformation exercise requiring far-reaching changes in processes, skills, information technology (IT) transformation and the right balance of costs versus net returns. Challenges faced in the context of digital transformation in financial services have been studied (KPMG, 2019; Megargel et al., 2018). These include IT infrastructure, maturity to implement a new API-driven architecture, resource skill sets, overarching organisational strategy and alignment across departments, process gaps, and staffing. While AI applications in the context of process automation, credit scoring, fraud and biometrics and payments are being adopted, where and how retail banks can apply big data analytics, AI and emerging technologies to improve customer experience while managing operational efficiencies and costs have a significant bearing on technology readiness and digital maturity aspects.

In the context of cloud computing, there are considerations on personal data protection and privacy, in particular the processing, hosting, cross-border transfers and management of such datasets. Countries in ASEAN have diverse regulations thereby posting challenges to the adoption of cloud technologies (public cloud and private managed cloud). These considerations are in the areas of data residency laws, security and personal data protection.

Similar challenges are also seen in the retail banking industry in Indonesia. Another interesting observation in Indonesia is enterprise ‘culture’, implying enterprise attitude and approach to digital transformation, including empowering employees to use digital technology (Hie, 2019).

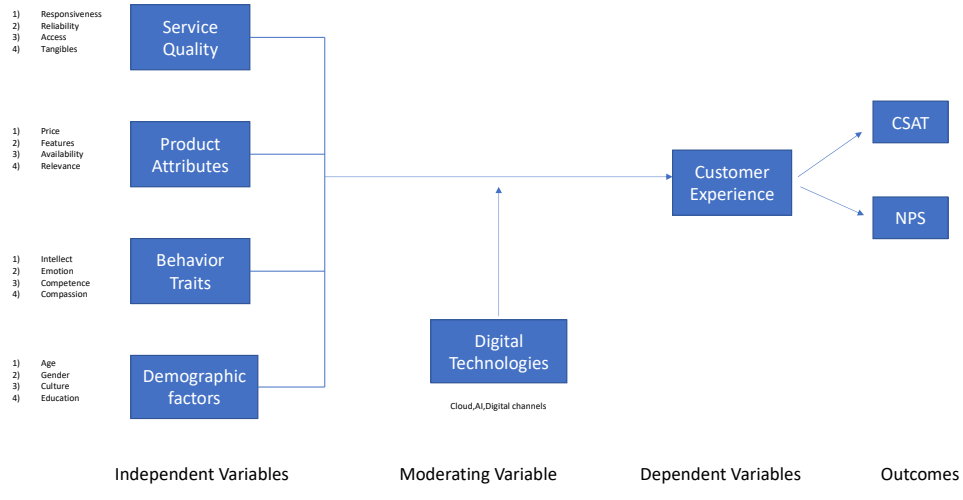
3 Discussion and conceptual framework

A thorough review of the literature suggests that while digitalisation in the context of retail banking has been studied, they have been in different contexts. The impact of disruptive technologies from commerce, regulation, security, and competitive standpoints has been assessed. CX and the efficacy of CX measures in the context of experience quality have been evaluated in the early stages. Further, advances in mobility, cloud and

AI have significantly influenced customer expectations and behaviour patterns, but progressive CX strategies to meet these expectations, particularly in the wake of emerging technologies such as generative AI and metaverse are still in exploratory stages and subject to limited reviews. Digital transformation challenges faced by incumbent banks to address the new reality of CX have been studied, but the recent themes of open finance where industry consolidation is imminent are yet to be sufficiently addressed.

As such, it is emerging that the key factors which affect customer experience (CX) need to be reviewed and the consequent impact on CX measures need to be reviewed. The study aims to study this correlation as explained by the following conceptual framework.

Figure 1 Proposed conceptual framework (see online version for colours)



3.1 Conceptual framework

An analysis of the literature reviewed above brings forward some interesting perspectives, particularly in the wake of digitalisation. As noted, during the early formative years, factors like service quality and product attributes played an important role in customer service. However as the proliferation of digital technologies grew, particularly in the areas of cloud, AI and big data, parameters like behavioural traits and demographic factors, which define qualitative aspects of an individual personality, started to have greater leverage on customer experience and overall brand recall. This has been possible due to disruptive technologies like AI and big data which have been able to provide mechanisms to analyse, synthesise and action such datasets. This in turn is questioning the overall efficacy of CX measures, and bringing about new challenges to CX management. The below conceptual framework indicates this relationship by identifying the independent, moderating and dependent variables. These elements are the key factors which are influencing customer experience.

Customer experience forms the dependent variable, measured by CSAT and NPS.

Digital technologies as outlined in Section (4) constitute the moderating variable. They can be applied to any independent variable, and control the strength of the relationship between the independent and dependent variables.

The conceptual nature is indicative and shows the independent, dependent and moderating constructs.

4 Contributions and implications for future research

The above conceptual framework has been developed based on an extensive literature review of the key factors that impact customer experience management, in the wake of advances in digital technologies, particularly in the areas of AI, cloud and digital engagement channels. The study highlights how customers now expect experiences to be proactive and anticipatory in nature, from being reactive and siloed. The study also details trends in financial services in ASEAN in terms of digitalisation, open finance and industry consolidation, and their impact on customer expectations and behaviours. It also reviews the challenges faced by retail banks to develop comprehensive CX strategies to meet customer expectations.

The key constructs in the conceptual framework provide valuable guidelines to retail banks on factors to consider while embarking on digital transformation journeys to improve customer experience.

These key constructs are postulated below in the form of propositions. They would aid future research to further substantiate the relationships between the constructs.

4.1 Service quality

Broadly, service quality refers to the ability of an enterprise to deliver services aligned with customer expectations. Some of the key determinants of service quality include responsiveness, communication, access, reliability and tangibility.

Proposition 1 How is the adoption of digitalisation impacting service quality and its impact on customer experience?

4.2 Product attributes

In the context of financial services, this relates to the product/service offerings across both traditional banking (loans, credit, deposits, etc.) and neo-banking frameworks (mobile wallets, cryptocurrencies, etc). Key product attributes include parameters like price, availability, features, and competitiveness.

Proposition 2 How is the adoption of digitalisation impacting product attributes and its impact on customer experience?

4.3 Behaviour traits

Customer engagements across different touchpoints with banks are characterised by their behavioural traits. Some of the key behaviour traits include intellect, emotion, compassion and competence.

Proposition 3 How is the adoption of digitalisation impacting personality traits and their outcomes on customer experience?

4.4 Demographic factors

Key demographic factors include characteristics of an individual such as age, gender, culture and education.

Proposition 4 How is the adoption of digitalisation impacting customer segmentation factors and its outcome on customer experience?

5 Limitations

The study takes into account secondary sources of data relying on published research articles related to the topic. It also includes statistical data published by government-authorised agencies, as well as articles published by renowned business consulting firms. Primary sources of data, and analysis thereof, were not conducted. The scope of the study is restricted to the retail banking sector, on customer experience management in ASEAN with a particular focus on Singapore and Indonesia. Liberties have been taken to substantiate the literature review to include research articles published in other geographies as the topic is still in its stages of evolution.

While the study frames propositions which will be useful for banking enterprises to evaluate the key factors affecting customer experience, future research would be needed to substantiate these propositions through qualitative/quantitative testing techniques.

References

Andrade, I.M.D. and Tumelero, C. (2022) 'Increasing customer service efficiency through artificial intelligence chatbot', *Revista de Gestao*, Vol. 29, No. 3, pp.238–251, https://doi.org/10.1108/REGE-07-2021-0120.

Asian Development Bank (2023) *Financial Digitalization and Its Implications for ASEAN+3 Regional Financial Stability* [online] https://www.adb.org/publications/financial-digitalization-asean3-financial-stability (accessed 15 April 2023).

Bains, P., Sugimoto, N. and Wilson, C. (2022) 'BigTech in financial services: regulatory approaches and architecture', in *FinTech Notes*, Vol. 2022, No. 2 [online] https://www.elibrary.imf.org/view/journals/063/2022/002/article-A001-en.xml (accessed 7 June 2023).

Bank Negara Malaysia (2018) *Publishing Open Data using Open API*, September, pp.1–12.

Bhattacharya, C. and Sinha, M. (2022) 'Role of artificial intelligence in banking for leveraging customer experience', *Australasian Accounting, Business and Finance Journal*, Vol. 16, No. 5, pp.89–105, https://doi.org/10.14453/aabfj.v16i5.07.

Central Bank of Philippines (2021) *Open finance framework for Philippines* [online] https://www.bsp.gov.ph/Regulations/Issuances/2021/1122.pdf (accessed 3 May 2023).

De, R., Pandey, N. and Pal, A. (2020) 'Impact of digital surge during Covid-19 pandemic: a viewpoint on research and practice', *International Journal of Information and Learning Technology*, Vol. 55, pp.1–6, DOI: 10.1016/j.ijinfomgt.2020.102171.

Department of Statistics (2023) *Singapore GDP 2022,* Singapore Government.

Doherty, D. and Curran, K. (2019) 'Chatbots for online banking services', *Web Intelligence*, Vol. 17, No. 4, pp.327–342, https://doi.org/10.3233/WEB-190422.

Dubey, V., Mokashi, A., Pradhan, R., Gupta, P. and Walimbe, R. (2022) 'Metaverse and banking industry – 2023 the year of metaverse adoption', *Technium: Romanian Journal of Applied Sciences and Technology*, Vol. 4, No. 10, pp.62–73, https://doi.org/10.47577/technium.v4i10.7774.

French, A.M., Risius, M. and Shim, J.P. (2020) 'The interaction of virtual reality, blockchain, and 5g new radio: disrupting business and society', *Communications of the Association for Information Systems*, May, Vol. 46, pp.603–618, https://doi.org/10.17705/1CAIS.04625.

Garg, R., Rahman, Z. and Qureshi, M.N. (2014) 'Measuring customer experience in banks: scale development and validation', *Journal of Modelling in Management*, https://doi.org/10.1108/JM2-07-2012-0023.

George, A.S., George, A.H. and Martin, A. (2023) 'A review of ChatGPT AI's impact on several business sectors', *International Innovation Journal (PUIIJ)*, February, pp.9–23, https://doi.org/10.5281/zenodo.7644359.

Gerea, C. and Herskovic, V. (2022) 'Transitioning from multichannel to omnichannel customer-experience in service based companies challenges and coping strategies', *Journal of Theoretical and Applied Electronic Commerce Research*, pp.394–413, https://doi.org/10.3390/jtaer17020021.

Gill, S.S., Tuli, S., Xu, M., Singh, I., Singh, K.V., Lindsay, D., Tuli, S., Smirnova, D., Singh, M., Jain, U., Pervaiz, H., Sehgal, B., Kaila, S.S., Misra, S., Aslanpour, M.S., Mehta, H., Stankovski, V. and Garraghan, P. (2019) 'Transformative effects of IoT, blockchain and artificial intelligence on cloud computing: evolution, vision, trends and open challenges', *Internet of Things (Netherlands)*, October, Vol. 8, pp.1–30, https://doi.org/10.1016/j.iot.2019.100118.

Hasaka, K. (2019) *The Impact of Fintech Innovations and Financial Standards on Bank Performance : Evidence from Selected Commercial Banks in ASEAN*, Dissertations and Theses.

Herm, L.V., Janiesch, C., Helm, A., Imgrund, F., Hofmann, A. and Winkelmann, A. (2022) 'A framework for implementing robotic process automation projects', in *Information Systems and e-Business Management*, Vol. 21, No. 1, Springer Berlin Heidelberg, https://doi.org/10.1007/s10257-022-00553-8.

Hie, B.P. (2019) 'Impact of transforming organizational culture and digital transformation governance toward digital maturity in Indonesian bank', *International Review of Management and Marketing*, Vol. 9, No. 6, pp.51–57, https://doi.org/10.32479/irmm.8785.

Hosseini, M., Abdolvand, N. and Harandi, S.R. (2022) 'Two-dimensional analysis of customer behavior in traditional and electronic banking', *Digital Business*, Vol. 2, No. 2, p.100030, https://doi.org/10.1016/j.digbus.2022.100030.

Kazanavicius, J. and Mazeika, D. (2019) 'Migrating legacy software to microservices architecture', *2019 Open Conference of Electrical, Electronic and Information Sciences, EStream 2019 – Proceedings*, pp.1–5, https://doi.org/10.1109/eStream.2019.8732170.

Komulainen, H. and Makkonen, H. (2018) 'Customer experience in omni-channel banking services', *Journal of Financial Services Marketing*, https://doi.org/10.1057/s41264-018-0057-6.

KPMG (2019) *Challenges in CX Management in Retail Banking* [online] https://home.kpmg/sg/en/home/insights/2019/04/does-bankings-future-now-outweigh-its-past-fs.html (accessed 7 April 2022).

Lee, J., Wewege, L. and Thomsett, M.C. (2020) 'Disruptions and digital banking trends', in *Journal of Applied Finance & Banking*, Vol. 10, No. 6, pp.15–56, ISSN: 1792-6580

Lee, S.M. and Lee, D.H. (2020) 'Untact': a new customer service strategy in the digital age', *Service Business*, Vol. 14, No. 1, https://doi.org/10.1007/s11628-019-00408-2.

MAS (2019) *Open Banking Policy for Singapore* [online] https://www.mas.gov.sg/news/media-releases/2019/mas-to-issue-up-to-five-digital-bank-licences (accessed 4 May 2022).

Manser Payne, E., Peltier, J.W. and Barger, V.A. (2018) 'Mobile banking and AI-enabled mobile banking: the differential effects of technological and non-technological factors on digital natives' perceptions and behavior', *Journal of Research in Interactive Marketing*, https://doi.org/10.1108/JRIM-07-2018-0087.

Martinus, M. (2020) *The Intricacies of 5G Development in Southeast Asia*, ISEAS Yusof Ishak Institute, Vol. 130, pp.1–9 [online] http://hdl.handle.net/11540/12821 (accessed 5 May 2022).

Megargel, A., Shankararaman, V.C., Fan, T.P. and Fan Ping-Ching, T. (2018) 'SOA maturity influence on digital banking transformation', *Journal of Banking Technology*, Vol. 2, No. 2, pp.1–27.

OJK (2020) *Digital Finance Innovation*, Indonesia Financial Service Authority (OJK) [online] https://www.digifin.org/digital-finance-innovation (accessed 5 May 2022).

Ray, P.P. (2023) 'ChatGPT: a comprehensive review on background, applications, key challenges, bias, ethics, limitations and future scope', *Internet of Things and Cyber-Physical Systems*, April, Vol. 3, pp.121–154, https://doi.org/10.1016/j.iotcps.2023.04.003.

Setiawan, B., Phan, T.D., Medina, J., Wieriks, M., Nathan, R.J. and Fekete-Farkas, M. (2023) 'Quest for financial inclusion via digital financial services (Fintech) during COVID-19 pandemic: case study of women in Indonesia', *Journal of Financial Services Marketing*, https://doi.org/10.1057/s41264-023-00217-9.

Shafiei, H., Khonsari, A. and Mousavi, P. (2022) 'Serverless computing: a survey of opportunities, challenges, and applications', *ACM Computing Surveys*, Vol. 54, No. 11s, pp.1–32, https://doi.org/10.1145/3510611

Tan, L.H., Chew, B.C. and Hamid, S.R. (2016) 'Relationship between service quality and customer satisfaction: a study of Malaysian banking industry', *International Journal of Productivity and Quality Management*, Vol. 19, No. 1, pp.38–50, https://doi.org/10.1504/IJPQM.2016.078008.

Trivedi, J. (2019) 'Examining the customer experience of using banking chatbots and its impact on brand love: the moderating role of perceived risk', *Journal of Internet Commerce*, https://doi.org/10.1080/15332861.2019.1567188.

Windasari, N.A., Kusumawati, N., Larasati, N. and Amelia, R.P. (2022) 'Digital-only banking experience: insights from Gen Y and Gen Z', *Journal of Innovation and Knowledge*, Vol. 7, No. 2, p.100170, https://doi.org/10.1016/j.jik.2022.100170.

Wydymus, K. (2023) *Modern Approach to E-Commerce in China based on Wechat as an Example of an All-In-One 'Super App' (Współczesne podejście do E-commerce w Chinach oparte na aplikacji WeChat jako przykład All-In-One 'Super Aplikacji')*, Vol. 17, No. 1, 145–169.

Yang, Q., Zhao, Y., Huang, H., Xiong, Z., Kang, J. and Zheng, Z. (2022) *Fusing Blockchain and AI with Metaverse: A Survey* [online] http://arxiv.org/abs/2201.03201 (accessed 14 July 2022).

Zhang, X., Agarwal, S., Choy, R., Wong, K.J., Lim, L., Lee, Y.Y. and Lu, J.J. (2020) 'Personalized digital customer services for consumer banking call centre using neural networks', *Proceedings of the International Joint Conference on Neural Networks*, https://doi.org/10.1109/IJCNN48605.2020.9206709.

Definitions

- Customer experience: customer experience, or CX, is the perception of a customer about a business, or its brand. It is a result of every interaction between the customer and the business.
- Retail banking: it is a way for customers to manage their monetary assets, have access to credit, and securely deposit their money.
- Big data: it is a way to manage datasets that are too large or complex to be dealt with through traditional data processing software.

- Cloud computing: it is the on-demand delivery of IT resources to an end-user or a business on a consumption basis.
- Artificial intelligence or AI: it is an endeavour to emulate or simulate human intelligence in machines.
- Digitalisation: it implies the use of digital technologies to create value.