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RESEARCH ARTICLE

Bibliometric Analysis on Digital Payment Using Lens.org and Vosviewers: A Comparison of Research Between Malaysia and Poland

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Abstract

An unprecedented surge in digital payments has had a profound effect on the economic development of developing nations. This transition has enabled greater financial inclusion through the provision of banking services to populations that were previously marginalised. In addition, it has reduced reliance on physical currency, thereby improving security and transparency. This bibliometric analysis examines the research on digital payments in Malaysia and Poland, providing a comparative perspective on research patterns and contributions in these two countries. Furthermore, this study offers a comprehensive examination of the research environment in Malaysia and Poland, elucidating the distinct approaches, methodology, and areas of emphasis in each nation. These findings provide useful insights for those interested in championing digital payment initiatives, as well as contributing to a more robust and resilient digital payment framework. As digital payment ecosystems mature, their significance in altering the economic landscape of emerging countries is likely to become more evident in facilitating cross-border knowledge exchange and collaboration.

Keywords

digital payment, Malaysia, Poland, bibliometric analysis, VOSviewer

Open Peer Review

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Introduction

The global implementation of digital payment systems is of utmost importance, especially in the context of emerging nations since it significantly impacts their economic progress. Digital payment systems cover a diverse array of technologies and platforms, which include but are not limited to mobile wallets, internet banking, contactless cards, and peer-to-peer payment applications. The period after the COVID-19 pandemic has seen an incredible transition towards digital payment methods, resulting in numerous beneficial effects on the economic conditions of developing countries.

In Malaysia, the digital payment landscape is undergoing substantial transition, owing to the growing prevalence of e-wallets, which are redefining consumer behaviour. With expected increases in e-commerce, e-wallet transactions, and digital payment user base, it is clear that digitalization is not only a continuing trend, but one that is primed for major expansion (Khoon, 2023). Therefore, Malaysian businesses must respond to this transition in order to remain competitive. Further, the spike in e-commerce transactions, encompassing broad sectors such as fashion, groceries, and F&B services, is especially noteworthy, indicating the significant impact of e-wallets on online sales. The increasing shift to digital payments, specifically via e-wallets, represents a digital revolution in Malaysia. According to Statista (2023a), Malaysia has emerged as the second foremost nation in Southeast Asia in terms of the highest rate of adoption of cashless payment methods, where the leading e-wallet used are Touch 'n Go, Maybank (MAE), and GrabPay.

Similarly, Poland is notable for its significant technological advancements in Europe, particularly in the use of modern non-cash payment systems. The proportion of cash transactions in the country has been consistently decreasing on a yearly basis. In 2021, a majority of 64% of the population in Poland chose to use card payments as their preferred method of transaction, while a smaller proportion of 22% continued to rely on cash-based transactions, while in the year 2022, a total of 22 million individuals from Poland actively participated in online banking, whereas 19.3 million individuals made use of mobile applications for banking purposes (Statista, 2023b). These significant changes are due to the fast digitalization of payments, and it is projected that mobile payments would reach a value of US$ 26,893.9 million by the year 2025 (Borcuch, 2020). Despite the observed expansion, conventional payment methods such as cash and physical credit/debit cards continue to maintain their popularity, especially among student populations (Szumski, 2020). Nevertheless, the nation has made notable advancements in the implementation of contemporary payment modalities, emerging as the pioneer in the widespread acceptance of contactless payments and assuming a prominent role in the advancement of novel technological innovations (Świder, 2021). This observation implies the presence of a dynamic and changing payment ecosystem in Poland, characterized by the coexistence of both conventional and new techniques. The COVID-19 epidemic brought about a significant shift in the payments sector, characterized by a sudden and considerable increase in cashless transactions during periods of lockdown. Indeed, the electronic commerce industry had significant growth, which further contributed to the widespread adoption of electronic payment methods in Poland. Among the preferred digital payment methods in Poland are Blink, Pay-by-link, and payment by card (Statista, 2023b).

Bibliometric analysis is a widely utilized and rigorous approach for examining and evaluating substantial quantities of scientific information. It facilitates the analysis of the evolutionary intricacies within a particular discipline, while illuminating the nascent domains within this discipline. However, the utilization of this approach in the field of business research is relatively nascent and, in numerous cases, not fully developed (Donthu *et al.,* 2021). This approach has the capacity to discern prevailing research themes, temporal patterns, as well as prominent authors, institutions, and publications within domain of interest, such as digital payment. Clustering methodologies moreover have the capacity to unveil closely interconnected phrases, hence providing a nuanced comprehension of diverse facets pertaining to digital payment within the aforementioned pair of nations. Citation analysis is utilized as a method for evaluating the influence of prominent publications and identifying pivotal works that have had a substantial impact on subsequent study within the academic field. For example, Susanti and Reza (2023) conducted a study utilising bibliometric analysis to understand the change in consumer payment behaviour between 2019 to 2021. Similarly, a few other studies have also used similar approach to understand the changing trends in consumer spending patterns (Malik & Juardi, 2023; Rozali *et al.*, 2022; Sugu & Hussain, 2021). Indeed, bibliometric approaches possess the capacity to offer a thorough depiction of scholarly literature pertaining to the domain of digital payment in Malaysia and Poland.

Literature review

A digital payment, often known as an electronic payment, is the transfer of money from one payment account to another through the use of a digital device or channel. Digital payments can be categorized into three distinct types: somewhat digital, predominantly digital, or totally digital (Better Than Cash Alliance, 2023), and may encompass several methods, including, e-wallet, QR codes, mobile money, as well as payment instruments like debit, credit, and prepaid cards. The growing adoption of digital banking is driven by factors such as convenience, accessibility, and time-saving benefits for customers in managing their purchases and financial services (Kozak & Golnik, 2020b). Mobile-based digital payments enable the collection of important customer data, which facilitates analytics and market segmentation (Khaitan & Joshi, 2023). Companies that accept digital payments can utilize this information to strengthen client acquisition and retention strategies. Furthermore, consumer data insights enable targeted marketing and personalized offerings, allowing for a more successful and specialized strategy for engaging with the audience.

The popularity of digital payments has witnessed a significant rise owing to their inherent advantages in terms of ease, security, and efficiency. Moreover, the implementation of

digital payment systems can provide several benefits for firms, including enhanced financial performance, decreased instances of fraudulent activities, and the provision of instantaneous cash flow monitoring (Charpentier, 2023). It is imperative for firms to move to digital payment systems as it facilitates the acquisition and processing of information, hence aiding in the reduction of operational expenses (Kozak & Golnik, 2020a). Undoubtedly, an analysis of digital payment methods might yield valuable information into the factors that impede or facilitate the process of digitization. Gaining an understanding of various trends and practices will empower businesses to effectively address and reduce the digital payment divide that exists among nations.

Comprehending the parallels and distinctions in digital payment practice between Malaysia and Poland holds significance important in various fronts. It will provide a baseline understanding for effective policy formulation and financial inclusion strategies for policymakers. A comprehensive understanding of consumer digital payment behaviors in both countries facilitates international collaboration in the advancement of technology and offers businesses valuable insights that can be used to create user-centric experiences. Moreover, this comprehension is of utmost importance in order to predict impending challenges, promote economic growth, and ensure the resilience of global digital payment ecosystems. Examining digital payment trends across various markets might also yield valuable insights on the strategies and methodologies that can propel digitalization efforts and enhance business success and ultimately, improves the capacity to navigate complexities, foster innovation, and make valuable contributions to the continuous development of digital economies on a global scale.

Methods

The primary aim of this study is to investigate current trends in the growth of academic literature pertaining to digital payments using bibliometric analysis. It involves the evaluation of databases with a specific emphasis on indicators related with publications, such as authors, keywords, sources, geographical distributions, and others (Dabirian *et al.*, 2016). The primary data for this study was obtained from LENS.ORG, an open-source database. It is a comprehensive platform that aggregates data from various primary sources, incorporating important indicators from the original data sources to promote transparency and permit seamless interaction with other datasets. This strategy assures that the data used in the study is reliable and accessible (Van Eck & Waltman, 2010).

An extensive search was conducted on August 27, 2023, resulting in the extraction of 107 research titles that were specifically related to digital payment. Two different search strings were used to extract data for each country. The first search string ("digital payment" OR "digital payments" AND Malaysia) yielded 95 titles and the second string ("digital payment" OR "digital payments" AND Poland) extracted 12 titles. Next, the data cleaning procedure was conducted, leading to the removal of a total of 46 titles from 107 titles. Consequently, the remained 51 datasets for Malaysia, and 10 for Poland, were subsequently analyzed using VOSviewer.

VOSviewer (vosviewer.com) is a versatile and freely available software, developed for the purpose of generating and visualizing network relationships, and assessing the interconnectedness (Van Eck & Waltman, 2010) in bibliometric analysis. The software supports mapping citation data extracted from established databases (Williams, 2020). By integrating the LENS.ORG (https://www.lens.org) database and VOSviewer, this study enhances its methodological rigor and offers a unique perspective on the developments in digital payment systems within Malaysia and Poland.

Results and findings

The primary aim of this study is to investigate trends in the growth of academic literature pertaining to digital payments using bibliometric analysis. It involves the evaluation of databases with a specific emphasis on indicators related to publications.

Number of publications (by document and source type)

Upon conducting a comparative analysis of the number of publications on digital payment, it becomes apparent that Malaysia significantly outperforms Poland in this regard. As depicted in Table 1, Malaysia exhibits a notable aggregate of 51 articles, signifying a robust research output. In contrast, Poland exhibits a far lower number of publications, amounting to a just 10 titles. The observed disparity implies that Malaysia exhibits a far higher quantity of research papers, potentially indicating a more expansive and varied research community, greater levels of research financing, or broader study areas of interest. Acquiring comprehension of this disparity in the aggregate quantity of publications might provide useful insights about the research landscapes and priorities of these two nations. Both Malaysiaand Poland demonstrate a commendable dedication to scholarly research, as evidenced by their publication of numerous journal publications. In terms of scholarly contributions, Malaysia accounts for 71% of its total publications with 36 articles, whilst Poland represents 90% of its entire publications with 9 articles. These statistics serve to reinforce the significance of journal papers in the intellectual pursuits of both countries.

Number of publications by year

Subsequently, we proceed to examine the quantity of publications on an annual basis. Upon analyzing the tabulated data

Table 1. Number of Publications by document and source type.

Publication Type	Malaysia	Poland
Journal Article	36 (71%)	9 (90%)
Conference Proceedings	5 (10%)	-
Book Chapter	6 (12%)	-
Others	4 (7%)	1 (10%)
Total	51	10

depicting the aggregate quantity of publications in Malaysia and Poland over the years 2000 to 2023, several significant trends and discrepancies emerge. First and foremost, based on Table 2 it is apparent that both nations have witnessed a constant and growing trend in the volume of published works from the year 2000 to 2022. However, as of the third quarter of 2023, there has been a reduction in the number of publications for both countries. A discernible disparity is seen when examining the aggregate number of publications, with Malaysia constantly outperforming Poland.

In the context of Malaysia, the publication output, as measured by the quantity or number of titles, has a discernible pattern throughout the course of time. During the year 2002, a total of five titles were released, suggesting a very moderate level of productivity within that particular timeframe. Following this, between the years 2006 and 2019, a conspicuous dearth of publications was seen, indicating a period characterized by either inactivity or a deficiency in scholarly output. In the year 2020, there was a notable rise in publication activity, as seen by the release of 10 titles, signifying a renaissance in this domain. The aforementioned tendency persisted throughout the year 2021, exhibiting a consistent level of productivity with a total of ten publications. In the year 2022, there was a notable increase in the number of publications, totaling 17 titles. This surge indicates a considerable expansion in research and writing activities. Nevertheless, a marginal decline was observed in 2023, when the number of published titles amounted to nine. In general, the data exhibits fluctuations in publication production throughout time, characterized by intervals of limited or absent activity succeeded by periods of heightened productivity.

In contrast, the publication output in Poland, as measured by the quantity or number of titles, has a rather stable trend from 2019 to 2023. Prior to the year 2019, a total of two publications were released, suggesting a somewhat limited level of productivity for that particular timeframe. From 2020 to 2021, there was a continuous annual count of two titles, indicating a sustained level of publication activity. Nevertheless, a marginal rise to three titles was observed in 2022, potentially indicating an expansion or broadening of scholarly or literary pursuits. In contrast, a discernible decline was observed in 2023 (as of quarter 3), as evidenced by the publication of only one title. It is worth mentioning that the inaugural publication took place in 2017, suggesting a comparatively recent commencement of the publication chronology. In general, the data underscores a period characterized by relative stability, with a marginal upswing observed in 2022, subsequently followed by a decline in 2023. These fluctuations in publishing output across the years are prominently demonstrated.

Table 2. Number of Publications by Year.

Year	Total Number of Publication	
	Malaysia	Poland
2000 – 2019	5	2
2020	10	2
2021	10	2
2022	17	3
2023	9	1

Most active source titles

This section highlights the journals that are favoured by scholars hailing from Malaysia and Poland. Based on Table 3, researchers from Malaysia have a significant inclination towards the "Journal of Financial Services Marketing," as seen by a frequency of 6. Furthermore, the user demonstrates a keen interest in two scholarly publications, namely the "International Journal of Academic Research in Business and Social Science" and "The Journal of Muamalat and Islamic Finance Research," with a frequency of 2 each. In contrast, researchers from Poland demonstrate a greater range of preferences. The journal "Proceedia Computer Science" is highly regarded, as seen by its frequency of occurrence, which is 2. In addition, the user demonstrates a keen interest in the "Central European Journal of Operations Research" and the "Journal of Banking and Financial Technology," with a frequency of occurrence of 1 for each publication.

When comparing the two groups of researchers, it is evident that Malaysian researchers exhibit a higher degree of focus, as a majority of them demonstrate a preference for a particular journal. On the other hand, Polish researchers exhibit a more diverse array of interests, dispersing their preferences among several academic periodicals without a prevailing preference. This observation underscores both shared characteristics, such as the inclination towards financial and academic research publications, as well as differences in the particular journals favoured by academics hailing from Malaysia and Poland.

Citation analysis

This section reports the results for most cited articles for Malaysia and Poland. The data offers valuable insights regarding the citation frequencies of particular article titles in Malaysia and Poland, facilitating a comparative analysis of citation patterns. Table 4 and Table 5 depicts for Malaysia and Poland respectively.

The dataset in Table 4 illustrates the citation frequency of individual article titles by Malaysian researchers, encompassing a total of 51 articles. The paper titled "The Research Trend of Security and Privacy in Digital Payment" has garnered significant attention in the academic community, as seen by its impressive citation count of 15. This high number of citations underscores the considerable influence and relevance

Table 3. **Three Most Active Publishing.**

Source title - Malaysia	Qty	Source title - Poland	Qty
Journal of Financial Services Marketing	6	Proceedia Computer Science	2
International Journal of Academic Research in Business and Social Science	2	Central European journal of operations Research	1
The Journal of Muamalat and Islamic Finance Research	2	Journal of Banking and Financial Technology	1

Table 4. **Most Cited Articles (Malaysia).**

No	Authors (Year)	Title Source	Journal	Freq
1	Sahi, A. M., Khalid, H., Abbas, A. F., Zedan, K., Khatib, S. F., & Al Amosh, H. (2022)	The Research Trend of Security and Privacy in Digital Payment	Informatics	15
2	Norulhuda Abdullah, Fauziah Redzuan, Nor Aziah Daud (2020)	E-wallet: factors influencing user acceptance towards cashless society in Malaysia among public universities	Indonesian Journal of Electrical Engineering and Computer	12
3	Vimala Balakrishnan, Pik Yin Lok, Hajar Abdul Rahim (2020)	A semi-supervised approach in detecting sentiment and emotion based on digital payment reviews	The Journal of Supercomputing	11
4	Al Barazanchi, Israa, Haider Rasheed Abdulshaheed, Zahraa A. Jaaz, Hassan Muwafaq Gheni, Yitong Niu, Hissah Almutairi, Elika Daghighi, Shihab A. Shawkat, and Saadaldeen Rashid Ahmed. (2022)	Blockchain: The Next Direction of Digital Payment in Drug Purchase.	In 2022 International Congress on Human-Computer Interaction, Optimization and Robotic Applications	9
5	Younas, Waqar, and K. Ramanathan Kalimuthu (2021).	Telecom microfinance banking versus commercial banking: a battle in the financial services sector	Journal of Financial Services Marketing	8

Table 5. **Most Cited Articles (Poland).**

No	Authors (Year)	Title Source	Journal	Freq
1	Karol Bartkiewicz, Antonín Černoch, Grzegorz Chimczak, Karel Lemr, Adam Miranowicz & Franco Nori (2017)	Experimental quantum forgery of quantum optical money	npj Quantum Information	35
2	Anna Dewalska-Opitek, Katarzyna Bilińska, & Marek Cierpiał-Wolan (2022)	The Application of the Soft Modeling Method to Evaluate Changes in Customer Behavior towards e-Commerce in the Time of the Global COVID-19 Pandemic	Risks	1
3	Oskar Szumski (2022)	Comparative analyses of digital payment methods from the pre and post COVID-19 perspective.	Procedia computer Science	1
4	Marcin Suder, Tomasz Wójtowicz, Rafał Kusa, & Henryk Gurgul (2022)	Challenges for ATM management in times of market variability caused by the COVID-19 pandemic crisis	Central European Journal of Operations Research	1

of the article within the topic of security and privacy in digital payment. The article titled "E-wallet: Factors Influencing User Acceptance Towards Cashless Society in Malaysia Among Public Universities" has garnered 12 citations, indicating its importance in shaping user behaviour about cashless transactions within the academic sphere. Moreover, the research paper titled "A Semi-Supervised Approach in Detecting Sentiment and Emotion Based on Digital Payment Reviews" has garnered 11 citations, indicating a significant level of attention towards sentiment analysis in the context of digital payment. The titles "Blockchain: The Next Direction of Digital Payment in Drug Purchase" and "Telecom Microfinance Banking Versus Commercial Banking: A Battle in the Financial Services Sector" have been referenced 9 and 8 times, respectively. These citations indicate the significance of these titles in the discourse surrounding the future of digital payment and the financial services sector. In general, the data highlights the significance and applicability of these papers within the field of digital payment research in Malaysia. The varying citation rates suggest varying degrees of scholarly interest.

In contrast, Table 5 presents the frequency of citations garnered by the most highly referenced works authored by Polish researchers, encompassing a total of 10 titles under consideration. The study titled "Experimental Quantum Forgery of Quantum Optical Money" has garnered considerable attention in the academic community, as evidenced by its notable 35 citations, highlighting its significant effect. In contrast, the remaining titles, namely "The Application of the Soft Modeling Method to Evaluate Changes in Customer Behavior Towards E-Commerce in the Time of the Global COVID-19 Pandemic," "Comparative Analyses of Digital Payment Methods from the Pre and Post COVID-19 Perspective," and "Challenges for ATM Management in Times of Market Variability Caused by the COVID-19 Pandemic Crisis," were cited only once. The primary article that has received the highest number of citations pertains to the topic of experimental quantum forgeries. The remaining titles of the articles seem to revolve on the examination of the effects of the COVID-19 pandemic on customer behaviour, digital payment systems, and ATM management, in that order. In general, the data suggests that the referenced publications exhibit differing degrees of influence, with one title notably surpassing the others in terms of scholarly engagement.

In summary, there are significant differences in the frequency of citations for research articles on digital payment in Malaysia and Poland. In the context of Malaysia, there exists a variation in citation rates among different titles, wherein one particular article distinguishes itself by accumulating a total of 15 citations. The research environment in Malaysia exhibits a wide range of areas of interest, encompassing security, acceptance of e-wallets, sentiment analysis, blockchain technology, and the financial services sector. In Poland, there exists a notable discrepancy in citation frequencies, particularly evident in the case of an essay on experimental quantum counterfeiting which has received a significant number of 35 citations, surpassing the attention received by other scholarly works. Each of the other papers, which examine the influence of COVID-19 on customer behavior, conduct comparative assessments of digital payment methods, and discuss the issues faced in ATM administration during the pandemic, received a citation count of only 1. The aforementioned findings highlight the disparities in impact and scholarly focus within the digital payment study fields of both nations. These disparities are indicative of the different research interests and the influence of certain issues in defining academic conversation.

Top field of study

A field of study denotes a particular domain or specialty of scholarly or vocational concentration wherein individuals engage in endeavors such as education, research, or employment. A defined subject or branch of knowledge is encompassed within a more comprehensive academic or professional framework. With regard to academic disciplines, we have identified parallels between Malaysia and Poland.

Based on Figure 1, Malaysian researchers exhibit a well-distributed representation throughout several disciplines, whereby payment and business emerge as the prevailing categories, each accounting for a frequency of 40. The field of marketing exhibits a frequency of 28, whilst finance and computer-related disciplines demonstrate rates of 27 and 22, respectively. In contrast, researchers from Poland demonstrate a more focused distribution, prioritizing payment and business as their key areas of interest, albeit with lower frequencies compared to Malaysia, specifically 8 and 7, respectively. The frequencies of attention in the domains of marketing, computing, and finance are 6 and 4, respectively. This suggests that these fields have a considerably limited range of focus in comparison to researchers from Malaysia.

In conclusion, both Malaysian and Polish scholars demonstrate a shared interest in various disciplines, including payment, business, marketing, computer, and finance. In contrast, the distribution of research interests among Malaysian researchers appears to be more varied throughout different areas, whereas Polish researchers tend to have a more concentrated attention, with less variability in the frequency of their research pursuits across various fields of study. In general, the data underscores the presence of both commonalities and disparities in the domain of research interests among scholars in Malaysia and Poland.

Research publication: co-occurrence results for Malaysia and Poland

The technique of co-occurrence analysis is employed to investigate and visually represent the associations among publication in the dataset. Co-occurrence analysis is employed as a means to acquire a deeper understanding of the knowledge framework within a certain field, ascertain essential concepts, and investigate the interconnections among terms. It facilitates the comprehension of the topic framework within a corpus of literature or textual information. For this study, the researchers would like to examine the potential conceptual relationship and thematic relevance between the terminologies

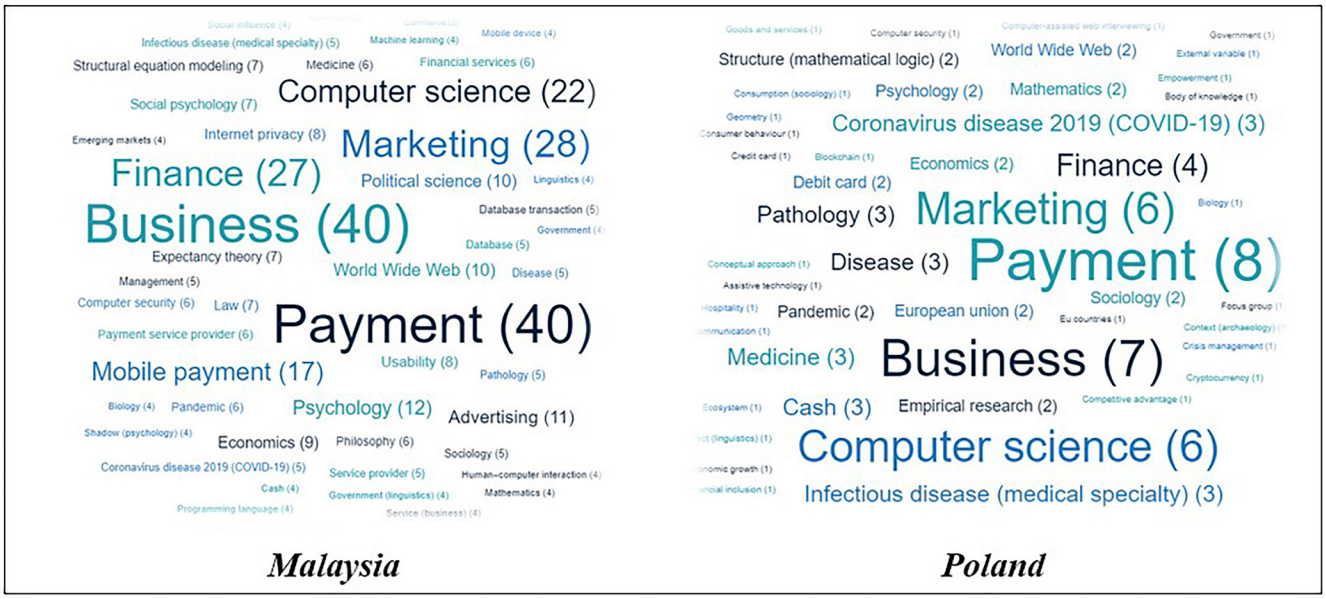

Figure 1. Comparison on the field of study.

employed by academics from Malaysia and Poland. Figure 2 depicts the results for Malaysia and Poland. In general, two clusters have emerged from the dataset, and is connected by one central theme, Covid-19.

Cluster 1: resilience in sustainable fintech. For Cluster 1, six keywords that have co-occurred for both countries are disclosure, environment, fintech, humans, pandemics, and sustainability. The identified keywords within Cluster 1 indicate a thematic concentration on the resilience of the financial technology (fintech) industry in relation to external disruptions, specifically the COVID-19 pandemic. The utilization of terminology such as "disclosure," "environment," and "sustainability" demonstrates a cognizance of the wider ramifications of fintech on societal and environmental welfare. This cluster aims to investigate the strategies employed by fintech companies in response to pandemics, their efforts to include sustainable practices, and their disclosure of pertinent information during crisis scenarios. Understanding these initiatives ensures the durability, security, and ethical considerations of digital payment systems, increasing consumer trust and adoption even during crises.

Cluster 2: crisis management in ATM operations. Keywords that have co-occur are automatic teller machine (ATM) and crisis management. Cluster 2 is centered on the subject of crisis management, with a particular emphasis on the operational aspects and resilience of automated teller machines (ATMs) in times of crisis, potentially within the context of the COVID-19 pandemic. The chosen keywords suggest an analysis of the techniques and protocols that are put in place to guarantee the operational effectiveness and security of Automated Teller Machines (ATMs) in the face of difficult circumstances. This cluster explores the technological, operational, and security dimensions of crisis response in the context of ATM services. Indeed, digital payment is critical in addressing technological, operational, and security issues within the scope of crisis response, notably in the context of Automated Teller Machine (ATM) services. In the crisis response for ATM services, digital payment methods provide as a resilient solution across technological, operational, and security dimensions. These strategies could contribute to the overall success of response activities by providing alternate routes for financial services while addressing the challenges created by emergencies.

Discussions

The results demonstrate a notable discrepancy in the quantity of publications between Malaysia and Poland, suggesting the presence of underlying causes that contribute to these disparities. The reason behind Malaysia's notable prominence in terms of publication output may be ascribed to its expansive and heterogeneous research community, which may also serve as an indicator of augmented levels of research financing. This enhanced financial support empowers researchers to engage in a greater number of studies and subsequently publish them. Moreover, Malaysia's extensive research pursuits underscore a strong academic and scientific environment spanning diverse areas of inquiry. Both Malaysia and Poland exhibit a mutual dedication to scholarly study, as seen by the fact that majority (more than 70%) of their overall publications are classified as journal articles. This statement highlights their commitment to sharing study outcomes via reputable and peer-reviewed channels, so emphasizing their adherence to rigorous and scholarly research methodologies.

An analysis of publication trends over time reveals consistent upward trajectories in the quantity of publications for

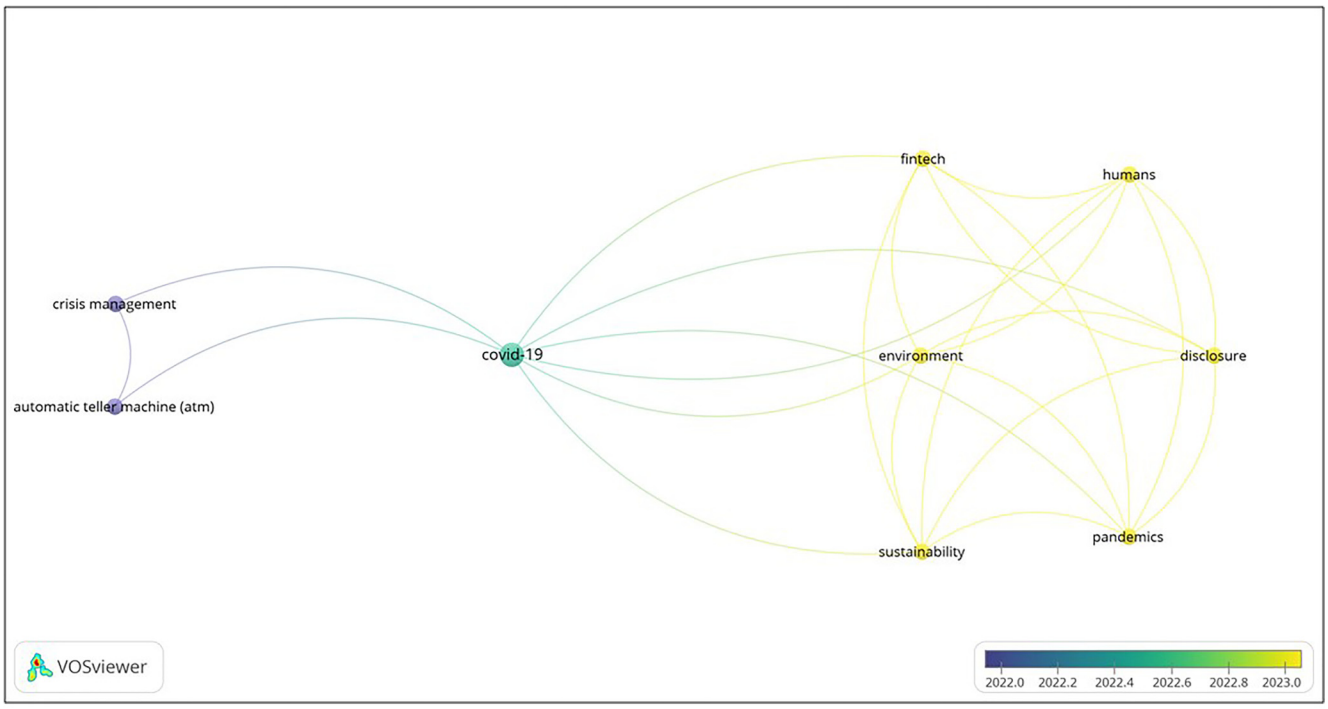

Figure 2. Co-occurrence map for Malaysia and Poland.

both Malaysia and Poland. Malaysia's research output experiences significant growth with particularly notable increases observed from 2020 onwards. The notable increase in publication activity in 2020, as indicated by the publication of ten publications, signaling a rebound in intellectual contributions. This pattern continued in 2021, with a total of ten publications, keeping a similar level of productivity. The trend carried over into 2022, with a significant increase in the number of publications, totaling 17 titles. This increase in publication frequency indicates a renewed zeal and increased participation in the selected subject within the scientific community. In contrast, Poland's research output had a reasonably constant development from 2019 – 2023. Prior to 2019, there were only two publications, with successive years keeping a stable annual count of two titles until 2022, when the count increased slightly to three titles. However, there was a significant drop in 2023 (as of the third quarter), with only one title published.

In the realm of academic inquiry, scholars from Malaysia and Poland demonstrate a shared inclination towards a wide range of subjects including payment systems, business studies, marketing, computer science, and finance. Nevertheless, a significant disparity becomes apparent in the allocation of research interests. Malaysian researchers have a diverse range of research interests across several domains, hence demonstrating a wider array of research endeavors. In contrast, researchers from Poland exhibit a higher level of focused concentration, with reduced fluctuation in the frequency of their research across different disciplines of study. In general, the data underscores the presence of both commonalities and unique trends in the scholarly research interests of academics in Malaysia and Poland, thereby underlining the breadth and depth of their individual fields of study.

Finally, the presence of two distinct clusters can be attributed to the multidimensional influence of exogenous shocks, particularly the COVID-19 pandemic, on several dimensions of the financial environment. Cluster 1 investigates the wider ramifications of financial technology (fintech) on sustainability and the welfare of individuals during pandemics. It emphasizes the industry's contribution to addressing environmental issues and meeting the demands of society. In contrast, Cluster 2 centers its attention on the particular obstacles and managerial approaches associated with ATM operations during periods of crisis, thereby illuminating the resilience of conventional banking infrastructure. Collectively, these clusters provide a thorough depiction of how the financial sector strategically maneuvers and adjusts to unanticipated obstacles, demonstrating a simultaneous emphasis on the overall welfare of society and the intricate operational complexities of vital financial services. The prevalent motif of resilience highlights the significance of being adaptable and well-prepared when confronted with unforeseen setbacks.

Conclusions

In conclusion, this bibliometric analysis offers a detailed examination of the research landscape concerning digital payment in Malaysia and Poland. The findings underscore a growing fascination with digital transformation and unveil a wide range of issues and trends within this field.

The findings of this study provide useful insights for policymakers, researchers, and industry practitioners in developing strategies and initiatives to boost digital payment efforts. Stakeholders may make informed decisions and adopt evidence-based ways to support sustainable digital payment practices if they have a thorough awareness of the research landscape and emerging trends. Dive deeper into digital payment processes in various industries, such as manufacturing, services, and retail, to gain critical insights into industry-specific difficulties and possibilities in payment system digitalization.

In essence, this study adds significantly to the body of knowledge about digital payments in Malaysia and Poland. It lays the groundwork for future research, policy creation, and industry practice enhancement to support the ongoing digital revolution, notably in the field of digital payment. In the digital world, ignoring prospects for advancement in payment systems can limit competitiveness, harm operational efficiency, and represent a danger of long-term failure.

Disclaimer

I confirm that I own all figures and tables included in my submission. The figures, created using VOSviewer, a free software, which downloaded to my computer, and the tables, based on my analysis with LENS.ORG, are my original work and findings.

Data availability

No data are associated with this article.

Software availability

The software used can be freely downloaded as follows:

VosViewer via https://www.vosviewer.com

LENS.ORG via https://www.lens.org/

References

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Open Peer Review

Current Peer Review Status: ? ✓ ? ✗

Version 1

Reviewer Report 06 December 2024

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✗ **Sabrina Leo**
Sapienza Università di Roma, Roma, Italy

I appreciate the opportunity to review this manuscript, which addresses the critical and timely topic of digital payments. While the paper tackles a relevant area of research, I regret to note that its theoretical and methodological contributions fall short of expectations. Below, I provide a detailed evaluation of the manuscript's limitations and areas for improvement.

After thoroughly reviewing the manuscript, I recognise its relevance to the ongoing global discourse on digital payment systems, particularly its comparative bibliometric analysis of Malaysia and Poland. While the study brings an interesting and timely perspective, its contributions to the academic and policy-oriented discussions appear limited by several theoretical and methodological weaknesses. That said, the manuscript does exhibit strengths that merit acknowledgment. Below, I provide a detailed evaluation of its contributions, shortcomings, and areas for improvement.

The manuscript's comparative approach between two distinct economies—Malaysia, as a fast-growing adopter of digital payment systems, and Poland, a European leader in contactless payment technologies—stands out as a valuable effort. By leveraging bibliometric tools such as VOSviewer and LENS.org, the study offers a methodological foundation for mapping research trends, identifying thematic clusters, and understanding citation patterns. The emphasis on contextualising findings within the broader socioeconomic realities of the two nations adds a layer of practical insight, particularly in linking digital payment adoption to economic modernisation and financial inclusion.
The analysis of publication trends and research focus areas reveals significant disparities in the research outputs of Malaysia and Poland. This insight could inform targeted strategies for academic collaboration and policy formulation. The exploration of emerging thematic clusters, particularly around fintech resilience and ATM crisis management during the COVID-19 pandemic, provides timely reflections on the adaptability of digital payment infrastructures to external shocks.

Despite its merits, the manuscript suffers from significant theoretical and methodological

limitations that limit its contribution to the field.
First, while bibliometric analysis is a well-established methodology, its application in this study remains superficial. The clustering of keywords, for example, is underdeveloped and fails to provide deeper insights into the underlying themes and interconnections. For instance, the paper identifies clusters related to fintech resilience and ATM crisis management but does not elaborate on the broader implications for the digital payment ecosystem or policy recommendations. The analysis remains descriptive rather than offering actionable insights.
Second, the manuscript does not sufficiently address the limitations of its bibliometric data. The disparity in research outputs between Malaysia and Poland is highlighted, but the underlying reasons—such as differences in academic funding, research priorities, or institutional capacities—are not explored. Additionally, the heavy reliance on data extracted from a single database (LENS.org) raises concerns about the comprehensiveness and representativeness of the dataset. A more rigorous cross-validation using other bibliometric databases such as Scopus or Web of Science would have strengthened the study's reliability.
Moreover, the selection criteria for publications are inadequately justified. While the exclusion of certain studies is mentioned, there is no discussion of the potential bias introduced by these exclusions or their impact on the findings. This omission detracts from the transparency and robustness of the methodology.
Another significant omission in the manuscript is the lack of a dedicated section reviewing existing literature reviews on digital payments. A robust bibliometric study should contextualise its findings within the broader academic landscape, and this requires engaging with prior literature reviews that have shaped the field. Notable examples include studies such as Dahlberg et al. (2008) and Dahlberg et al. (2015), which provide foundational insights into mobile payments and their adoption. Similarly, more recent works such as Alkhowaiter (2020), Shaikh and Karjaluoto (2015), and Panetta et al. (2021) explore critical themes such as technological adoption, user behaviour, and the evolution of digital payment systems.
Incorporating an analysis of these reviews would not only position the current manuscript within the context of existing scholarship but also help in identifying gaps that this study aims to address. By neglecting this aspect, the manuscript misses an opportunity to demonstrate its added value and differentiate its contributions from those of previous studies. I strongly recommend including a section that systematically analyses these influential reviews, thereby enhancing the paper's theoretical grounding and academic rigour.
From a theoretical perspective, the manuscript lacks a clear conceptual framework to contextualise its findings. While it provides a comparative analysis of research output, it does not integrate this with existing theoretical discussions on digital payments, such as those related to financial inclusion, consumer behaviour, or technological adoption frameworks. Without such a foundation, the study's contributions to academic discourse remain limited.
Finally, the study's policy implications are underdeveloped. While it identifies themes and trends in research, it does not effectively translate these findings into actionable recommendations for policymakers, particularly in the areas of digital payment adoption, financial inclusion, or cross-border collaboration.

While the manuscript offers a novel comparative lens on the research landscapes of Malaysia and Poland, it ultimately falls short in advancing the academic and practical understanding of digital payment systems. The study's descriptive focus, methodological gaps, and lack of theoretical integration diminish its impact.
To enhance their contribution, the authors should consider expanding the bibliometric dataset to include multiple sources and ensure greater representativeness. This would allow for a more

detailed and critical analysis of the identified clusters, linking them to broader theoretical frameworks and practical implications. It would also strengthen the discussion of contextual factors that influence research output in Malaysia and Poland, such as funding disparities or policy differences, and develop clear and actionable recommendations for policymakers and stakeholders based on the findings.
In its current form, the manuscript highlights important trends but does not sufficiently elevate them to the level of meaningful academic or policy contributions. I recommend significant revisions to address the aforementioned issues before considering publication.

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Is the work clearly and accurately presented and does it engage with the current literature?
Partly

Is the study design appropriate and is the work technically sound?
Partly

Are sufficient details of methods and analysis provided to allow replication by others?
Partly

Are all the source data and materials underlying the results available?
Partly

If applicable, is the statistical analysis and its interpretation appropriate?
Partly

Are the conclusions drawn adequately supported by the results?
Partly

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Sabrina Leo is Associate Professor at the Department of Management, Faculty of Economics, Sapienza University of Rome. She holds a Ph.D. in Banking and Finance from the same institution. With extensive teaching experience across various financial disciplines, she currently lectures on courses such as Economia degli Intermediari Finanziari and Strategie,

Performance e Digital Innovation nelle Banche. Her research interests include digital innovation in banking, digital payments, sustainable finance, and ESG metrics, with a notable focus on Distributed Ledger Technology and blockchain applications in the financial sector.Professor Leo has published extensively on these themes, including contributions that explore blockchain integration in ESG reporting (https://doi.org/10.1080/09537325.2021.1999921), credit guarantee schemes (https://doi.org/10.1007/978-3-031-67431-0_30), and the broader implications of DLT for banking efficiency and resilience(https://doi.org/10.1017/9781009411783). She is a prolific author, contributing to leading academic journals and serving as editor for books on contemporary financial issues. Professor Leo has secured numerous competitive research grants, including those addressing ESGdisclosures and blockchain innovation. Recognized for her academic excellence, she received the "Outstanding Woman Researcher in Banking and Finance" award at the VIWA 2022.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to state that I do not consider it to be of an acceptable scientific standard, for reasons outlined above.

Reviewer Report 25 November 2024

https://doi.org/10.21956/openreseurope.19719.r45915

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Marija Antonijević
Institute of Economic Sciences, Belgrade, Serbia

The introduction section needs better structuring and should include the following elements:
1. What is the significance of the research topic?
2. What were the findings of prior studies?
3. What areas require further research (research gaps)?
4. What is the research objective? The aim and what the authors want to examine should be clearer and more concise.
5. What makes this research innovative and unique (novelty)? The authors should explain why Poland and Malaysia were chosen for examination.
It is necessary to strengthen the literature review section and include the results of previous similar studies related to digital payments.
It is unnecessary to state the research aim in the Methods and Results and Findings sections. The results and findings section should be entitled “Results”. The authors should adequately position tables and figures to align with the text.
Tables 3, 4, and 5 should not be placed consecutively. Thus, there should be explanatory text between them. Additionally, the authors should avoid repeating data from the tables and focus only on interpretation.
The discussion section is missing a comparison of the results with other studies. The paper lacks

limitations and directions for further research. It is unclear how this study specifically contributes to policymakers.

Is the work clearly and accurately presented and does it engage with the current literature?
Partly

Is the study design appropriate and is the work technically sound?
Yes

Are sufficient details of methods and analysis provided to allow replication by others?
Partly

Are all the source data and materials underlying the results available?
Partly

If applicable, is the statistical analysis and its interpretation appropriate?
Partly

Are the conclusions drawn adequately supported by the results?
Partly

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Digital banking, Financial inclusion, Digital financial inclusion

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Reviewer Report 21 November 2024

https://doi.org/10.21956/openreseurope.19719.r45062

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Santanu Purohit
University of Petroleum & Energy Studies, Dehradun, Uttarakhand, India
Dr Sujoita Purohit
Department of science, Mohanlal Sukhadia University (Ringgold ID: 29798), Udaipur, Rajasthan, India

Importance of this manuscript for the scientific community:
Given the dynamic nature of technology enhancement and its specific technology-related operational requirements in digital payment, this manuscript substantially contributes to the

scientific community by discussing the usage of and challenges related to the subject. I find that the comprehensive way of targeting this concept makes for an overall valuable contribution to the manuscript.

Suitability of the title of the article :

The title, which succinctly encapsulates the digital payment aspect in both countries, is not only fitting but also enhances the manuscript's readability and alignment with its subject matter.

The comprehensiveness of the abstract:

The article comprehensively captured the topic from both Malaysia's and Poland's perspectives. While the analysis is done beautifully, various sectors responding to digital payment should have been brought together to give a holistic impact of the digital payment transformation in society in both countries, and a comparison could have been handy.

Appropriateness of the subsections and structure of the manuscript:

The manuscript's structure and subsections make sense, and the subsections flow together logically. The thought evolution is straightforward for readers to follow because each segment is properly identified.

Scientific correctness of this manuscript:

The manuscript's thorough analysis of Digital payment from both countries' perspectives further supports its technical soundness. The text is scientifically reliable and beneficial for both scholars and industry personnel because of its systematic analysis and application of evidence-based findings.

Sufficient references covered in the manuscript:

The references include relevant sources, which are often sufficient. However, adding more current references (within the last two to three years, for example) that highlight digital payment in various sectors in the countries and technical developments in customer service could improve the literature's foundation.

Suitability of the language/English quality of the article for scholarly communications:

The quality of the English and the language are appropriate for academic communication. Technical principles are successfully communicated in the well-written manuscript's straightforward and succinct language. While minor sentence structure adjustments could increase readability even further, the manuscript's language quality is generally suitable for professional and academic audiences.

Is the work clearly and accurately presented and does it engage with the current literature?

Yes

Is the study design appropriate and is the work technically sound?

Yes

Are sufficient details of methods and analysis provided to allow replication by others?

Yes

Are all the source data and materials underlying the results available?

Yes

If applicable, is the statistical analysis and its interpretation appropriate?

Partly

Are the conclusions drawn adequately supported by the results?
Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: digital transformation, service marketing, marketing management

We confirm that we have read this submission and believe that we have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Reviewer Report 08 November 2024

https://doi.org/10.21956/openreseurope.19719.r45069

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Weilun Huang
Wenzhou Business College, Wenzhou, China

The study titled *"Bibliometric Analysis on Digital Payment Using Lens.org and VOSviewer: A Comparison of Research Between Malaysia and Poland"* offers a comparative bibliometric analysis of digital payment research between Malaysia and Poland. Utilizing the Lens.org database and VOSviewer for visualization, the authors examine trends, influential publications, and the structure of research outputs in digital payment studies within these two countries. The study identifies key themes like resilience in fintech and crisis management in ATM operations, highlighting each nation's unique focus and challenges in digital payment.
Detailed Review Based on Criteria

1. **Is the work clearly and accurately presented and does it engage with the current literature?**
   Response: Partly
   Evaluation: The article presents a substantial amount of data on the bibliometric analysis of digital payment research in Malaysia and Poland. However, it occasionally lacks clarity in distinguishing between purely descriptive data and analytical insights that connect this research to broader trends in digital payment. While the authors reference some recent literature, the review could be enhanced by integrating additional global perspectives on digital payment evolution to situate the findings within a broader context.
   Recommendation: The authors should deepen their engagement with recent and global literature on digital payments, especially works on fintech resilience and digital transformation post-COVID-19, to underscore the relevance of the study within a global framework.
2. **Is the study design appropriate and is the work technically sound?**
   Response: Yes
   Evaluation: The study utilizes a recognized approach—bibliometric analysis with tools like Lens.org and VOSviewer, ensuring technical robustness. The use of quantitative indicators and network visualizations through VOSviewer provides a credible methodological

foundation, appropriate for uncovering publication patterns and co-occurrence of research themes.
Recommendation: To further strengthen the study design, the authors might briefly discuss the limitations of bibliometric analysis, such as biases in database coverage or the exclusion of certain types of publications that may impact the findings.

3. **Are sufficient details of methods and analysis provided to allow replication by others?**
Response: Partly
Evaluation: While the methods section outlines the data sources, search terms, and software tools used, it lacks specifics on certain analytical decisions, such as threshold settings in VOSviewer or criteria for dataset cleaning. These omissions may make replication challenging for other researchers.
Recommendation: The authors should include more granular details on the methodological steps, particularly any filtering criteria and parameter settings in VOSviewer. Such additions will ensure transparency and facilitate replication.
4. **Are all the source data and materials underlying the results available?**
Response: Partly
Evaluation: While the main source, Lens.org, is open-access, the article does not specify if the specific datasets extracted are openly accessible or if they are available upon request. Given that data transparency is essential for replicability, this aspect should be clarified.
Recommendation: The authors should consider including an appendix or a link to the datasets or a clear statement on data availability to enhance transparency.
5. **If applicable, is the statistical analysis and its interpretation appropriate?**
Response: Partly
Evaluation: The article uses citation analysis as a measure of influence, but the interpretation could benefit from a more nuanced statistical perspective, particularly regarding the significance of citation disparities between the two countries. This would provide a more detailed analysis of why certain trends are statistically meaningful.
Recommendation: Adding statistical tests or significance measures when comparing citation rates or publication trends could provide deeper insights into the observed patterns.
6. **Are the conclusions drawn adequately supported by the results?**
Response: Partly
Evaluation: The conclusions generally align with the results presented; however, they could benefit from a more critical discussion. For example, the article notes Malaysia's higher output but does not thoroughly discuss potential factors or systemic influences (e.g., economic or policy differences) that might account for this.
Recommendation: The authors should offer a more comprehensive analysis of the implications of their findings, especially in terms of how digital payment research can impact policymaking or industry practices in each country.

Summary of Recommendations to Improve Scientific Soundness

1. **Literature Engagement:** Broaden the literature review to incorporate recent global studies on digital payments and fintech resilience.
2. **Methodological Detail:** Provide specific settings and criteria for data extraction and visualization to enable replication.
3. **Data Transparency:** Ensure dataset accessibility or clarify data availability in the article.
4. **Statistical Rigor:** Introduce statistical tests to strengthen interpretation of citation patterns and publication trends.
5. **Analytical Depth in Conclusions:** Expand the discussion on the implications of national

research disparities, possibly including socio-economic factors.

The other suggestions are:

1. Logical Structure

Assessment: The logical structure across sections lacks cohesion, particularly in linking the theoretical foundation to the empirical results. While the article provides abundant comparative data on digital payment research in Malaysia and Poland, there is an absence of organic transitions between sections, making it challenging for readers to understand the interrelationships among each research focus.

Suggestion: To improve logical coherence, consider reorganizing the sections. In the theoretical foundation, include an overview of digital payments in the global context to better introduce the cases of Malaysia and Poland. Then, connect the theoretical framework to the empirical results through clear paragraph transitions, forming a causal relationship between the two. Additionally, include brief summaries at the end of each section to emphasize key points and set up the following section.

2. Theoretical Foundation

Assessment: The theoretical foundation references some classic literature on digital payments and fintech; however, it does not fully discuss the economic and social impacts of digital payments, nor does it reflect how the theoretical basis supports the empirical analysis. Moreover, the current section on theory mainly focuses on the global development of digital payments and lacks an in-depth analysis of the specific contexts of Malaysia and Poland.

Suggestion: The theoretical foundation should focus more on core issues such as how digital payments impact economic development and financial inclusion, citing more diverse and recent literature. Include specific socioeconomic contexts of Malaysia and Poland, as well as the influence of related policies on digital payment development, to provide a solid theoretical basis for the empirical analysis. Additionally, consider supplementing the discussion on the impact of fintech on cross-border knowledge sharing to support the comparative parts of the paper.

3. Empirical Results

Assessment: The empirical results section presents substantial bibliometric data but lacks depth in analysis, resulting in relatively superficial conclusions. This section mainly reports data without discussing the underlying reasons or possible explanations for the findings. For example, the significant difference in publication volume between Malaysia and Poland is noted, but the paper does not explore potential institutional, cultural, or economic factors.

Suggestion: Increase the depth of interpretation within the empirical results section. For instance, analyze differences in digital payment policies, the degree of fintech adoption, and consumer acceptance levels between Malaysia and Poland to explain the statistical differences observed in the bibliometric analysis. Using charts or models to demonstrate how different factors influence digital payment research in each country could further enhance this section. Additionally, consider incorporating statistical tests, such as significance testing on various variables, to further validate differences in trends, citation rates, and other aspects between the two countries.

4. Recommendations

Assessment: The recommendations for improving digital payment research are relatively general and do not provide specific measures linked to the empirical findings. Furthermore, some recommendations lack a strong connection to the preceding empirical data, making them less relevant to the specific issues uncovered in the study.

Suggestion: The recommendations section should be closely linked to the findings of the

empirical results. For instance, if the results show a higher volume of literature in Malaysia compared to Poland, the suggestions could address policy guidance, research funding, and other measures that Poland could adopt to strengthen its digital payment research. It is also advisable to expand on the limitations of the research, such as the constraints of different data sources and the applicability of bibliometric methods, to help readers understand the reliability and generalizability of the current findings. Further, consider proposing directions for future research, such as the potential benefits of cross-border collaboration and region-specific policy experimentation, to provide more targeted guidance for researchers and policymakers.

Is the work clearly and accurately presented and does it engage with the current literature?
Partly

Is the study design appropriate and is the work technically sound?
Yes

Are sufficient details of methods and analysis provided to allow replication by others?
Partly

Are all the source data and materials underlying the results available?
Partly

If applicable, is the statistical analysis and its interpretation appropriate?
Partly

Are the conclusions drawn adequately supported by the results?
Partly

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Digital Payment

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.