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RESEARCH ARTICLE

Consumers towards Sustainable Banking: An Exploratory Study of Individual ATM Usage in the Hungarian Banking Industry

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Abstract – The design and use of banking services may be an important part of sustainability efforts. The implementation of automated teller machine (ATM) services and offerings has a considerable impact on the economic viability and sustainability of banks. The use of such services enhances the security of transactions and reduces paper-based environmental damage. In Hungary, the use of cash is still widely accepted, expected, and applied as a method of saving and paying money. Therefore, the aspects of sustainability and consumer interests indicate a similarity of interests in this country, which makes an analysis of the perception of the ATM user experience crucial. However, research tends to concentrate on the phenomenon of financial digitalization and fintech, which indicates a research gap in the field of research on consumer perception of ATM use. Therefore, the objective of this research is to explore the factors that influence ATM use through attitudinal research. The questionnaire survey resulted in a sample of 214. Data were processed using factor analysis to identify key factors of ATM use. The results suggest that simplicity and reliability factors influence bank customers' satisfaction with ATM usage. The high demand for access to cash is also indicated by the fact that ease of use and 24/7 access to ATMs are the most important issues for customers. The novelty of this study lies in its attempt to link the proportion of image use typical of the Central European region with sustainability goals, thereby highlighting that optimizing the user experience is key.

Keywords – ATM, bank, consumer behaviour, exploratory factor analysis, Hungary

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1. INTRODUCTION

The continued significance of cash in people's lives, both internationally and domestically, is evident. The sustainability issue is reinforced by the energy use of automated teller machines (ATMs), which are known to consume significant amounts of electricity and contribute to carbon dioxide emissions. A shift to a cashless economy could bring a number of benefits, such as the conservation of renewable resources or the strengthening of the circular economy. However, until a society in which cash is not a prevalent form of currency is achieved, the optimization of existing physical infrastructure remains a priority. The practice of sustainable ATM usage encompasses not only the reduction of energy consumption but also the minimization of paper waste, such as digital receipts, and the optimization of network locations, thereby reducing customers' travel footprint. Efficient iterations of automated teller machines (ATMs) have been demonstrated to have the potential to mitigate the aggregate environmental impact of banking logistics to a significant extent.

This is corroborated by research (e.g., Gyurián et al., 2024), indicating that consumer behavior can be strongly influenced by external factors (eg, public and corporate sectors). Consequently, it is of critical importance that these actors are structured in the sustainability aspect. These perspectives are of high importance for banks as well, as the design of companies' production and operational processes in a way that does not compromise the needs of future generations is essential for companies to engage in sustainability on a daily basis (Buics & Mamun, 2024).

For these reasons, the manner in which ATM usage is shaped is at least a two-way factor, as it plays an important role in promoting both the visible (cash availability) and the hidden (sustainability) aspects of meeting consumer expectations. However, the high cash usage in Hungary

should be primarily focused on identifying consumer drivers, motivations, and satisfaction factors for ATM use. The findings of this analysis may provide a basis for the development of energy-saving solutions that consumers could adopt in the future. However, it is crucial to recognize that attitudes and financial awareness play a critical role in addressing the challenges faced by countries striving to transition towards a cashless future.

The advantages and disadvantages of modern money have undergone major changes in recent times, with the advent of new technologies and the evolution of financial practices. The proliferation of independent vending machines, the emergence of independent ATMs and the use of their shared ATM networks, and the introduction of government-sponsored initiatives are having an increasing impact on society.

In Hungary, the prevalence of instant payments is on the rise. The Instant Payment System (AFR) is a domestic transfer system that provides a transfer completion time of five seconds for transfers of up to HUF 20 million. The AFR (Automated Direct Debit) system is a domestic transfer system that completes transfers in five seconds for transfers greater than HUF 1.5 million (National Legislative Directory, 2023a). Additionally, there is a restriction on cash withdrawals over HUF 1.5 million. The planned threshold is HUF 1.5 million, while mandatory electronic payment facilities (QR code payment, Simple Pay) have also been implemented (National Legislative Directory, 2023b). Contactless payment was initially attempted in 2020, but this was only a temporary measure, as it has since been discontinued.

The use of cash as a legal tender, which is also available through ATMs, has several advantages. Primarily, it enables freedom and independence. Banknotes and coins are the only type of money that individuals can hold without the involvement of a third party. In addition, cash payments do not require additional equipment, internet, or electricity. Compared to alternative forms of payment, financial institutions are unable to accept cash transactions unless they and the client have previously agreed upon an alternative payment method. The use of cash facilitates the respect of essential rights to confidentiality, data protection, and identity protection in contexts pertaining to financial matters.

Cash offers a range of options for the transfer and storage of digital currency, enabling individuals with restricted or no access to digital money to gain access to it. This is of particular importance for socially disadvantaged groups, such as the aged or those with lower incomes. It helps track spending, and cash allows greater control over spending, for example, by preventing overspending. Cash transactions are rapid, as banknotes and coins settle payments instantaneously. They are secure, as cash is proven to be secure from a cybercrime perspective, and, since it is central bank money, it does not involve financial risk for either the payer or the payee. The function of cash as a wealth store is based on its ability to serve as a medium of exchange with minimal risk of default. Additionally, it is a convenient means of transacting small-value transactions, such as offering gifts or making payments. (Wang & Hausken, 2024).

It is crucial to acknowledge that cash utilization is not a phenomenon exclusive to Hungary. It is also prevalent in Europe and worldwide. In Germany, cash is regarded as occupying a distinctive position within society, serving as the predominant method of payment and functioning as a store of value. This is possible because this form of money is able to provide security against digital means, as it does not allow the theft of personal data during transactions. Furthermore, cash serves as a readily available form of payment, offering a viable option in instances where an emergency or crisis situation arises. Typically, access to cash is provided through traditional sources, such as bank counters and ATMs. However, the structure of cash held by banks is undergoing a transformation, leading to a reduction in the number of sources of cash withdrawals and making it more difficult for citizens to access cash. Consequently, cash use is an integral aspect of the retail experience, and consumers should have the freedom to select the payment method they consider most suitable for their purchases. In light of these considerations, among others, the Bundesbank in Germany has identified the need to closely monitor the accessibility of cash to its customers (Deutsche Bundesbank, 2023).

In contrast, there are several arguments against the use of cash, including the emergence of a shadow economy, which cash facilitates. Cash can thus have a number of adverse effects, including distortions in the structure of production and a reduction in tax and social security revenues (which may result in higher taxes). Cash also facilitates the continued presence of a black and gray economy (Malte & Francz, 2018). It is important to recognize that users of payment instruments can be highly sensitive to alterations in the actual or inferred security of these instruments (Anneke, 2013). In this regard, the safety issues that emerge from the total eradication of cash are frequently underestimated. In order to comprehend the underlying reasons for this phenomenon, it is essential to be aware of the extent and diversity of cash use in the modern world (Krueger & Seitz, 2014). Given the tangible nature of cash, it is physically possible for it to be stolen, lost or destroyed. Additionally, the opportunity cost of storing savings in cash is greater than that of other forms of savings.

The use of cash in Hungary is relatively high (about three times the average of the EU) compared to other European countries (Statista, 2024). However, according to the 2022 International Monetary Fund data, the number of automated teller machines in Hungary has decreased significantly between 2015 and 2022. In 2022, the lowest number of ATMs was recorded, resulting in a moderate decrease compared to 2021. This decrease can be attributed to various factors, including the extensive coverage of point-of-sale (POS) terminals and the government's cash

reduction measures. The MNB has developed a strategy to reduce the proportion of cash payments and to focus on electronic transactions by 2030. The objective is to increase the proportion of electronic transactions from 31% to 60% (Hungarian National Bank, 2023).

The reduction in cash use would be indicative of several factors, including increased use of instant payment systems and the mandatory use of point-of-sale terminals. Furthermore, the financial expansion of blockchain applications in several countries may also contribute to this trend. However, these developments appear to be somewhat in contrast to the demand for cash use in these countries (Végső, 2020). Empirical studies have shown that customer satisfaction with an automated teller machine (ATM) is a significant predictor of overall satisfaction with a bank (Mwatiska, 2016). Due to the high cash usage in Hungary, this research examines only one segment of this; thus, the research question is What factors influence consumer satisfaction with ATMs? Some research (e.g., Skibinska-Fabrowska, 2023) indicates that the use of cash is also a key factor in modern economies, primarily due to its role as a store of value. Therefore, the findings of this investigation may also offer a potential solution for other countries facing similar challenges.

The topic has been subject to advanced research, which results in the availability of certain findings. Consumers have expressed satisfaction with the perceived accessibility of ATMs, provided that they are secure. This indicates that the main motivation for using ATMs is the convenience of accessing cash quickly and easily, rather than the desire for optimal security. In light of this, it is evident that continuous quality improvement is essential for banks to maintain their competitive edge in the financial services industry (Idris, 2014).

Further research has also identified factors and analyzed the relationships between them. This research has found that ease of use, satisfaction, convenience, and safety are the dimensions that positively influence customer satisfaction with the quality of ATM service. Furthermore, reliability was identified as a key factor in predicting customer satisfaction (Nigati et al., 2023). It is crucial to note that these studies are not exclusively relevant to Hungary. Therefore, their findings may not be universally applicable to consumers in this country. The number of comparable studies conducted in Hungary is limited, making this research a valuable addition to the existing literature.

2. METHODOLOGY

The objective of the survey is to assess the factors influencing the use of automated teller machines (ATM) among bank customers in Hungary. To achieve the a priori focus of the study, exploratory factor analysis is employed, which is a multivariate analysis that can be utilized to achieve the desired results. Furthermore, the selected methodology is appropriate to evaluate the validity of the construction, which is further substantiated by the reliability assessment provided by the Cronbach Alpha test (Chan & Idris, 2018). However, the purpose-sampling strategy focused primarily on university students through convenience sampling. This approach was taken because business students in the university environment may possess the highest financial knowledge and greatest openness to digital technologies, which could serve as a foundation for cashless financial transactions that are now a hallmark of the university environment.

The questionnaire was based on validated questions, which were distributed in Hungarian to potential respondents. To ensure the accuracy of the translations, 15 test completions were carried out. In light of the feedback received during the test period, the questionnaire items were refined and then the survey was conducted through a questionnaire survey among the students of the Faculty of Economics of the Széchenyi István University of Győr in an online form using Google Forms. A total of 220 questionnaires were filled in during the survey period (10.10.2023 - 08.11.2023). The questionnaire consisted primarily of closed-ended questions, which included both nominal (demographic) and ordinal (Likert scale) items. The Likert-scaled questions were measured on a 5-point scale (strongly disagree - strongly agree), as this was considered the optimal method for measuring the respondents' responses (Chen et al., 2015). After cleaning the data (responses that were uniform had been removed), 214 valid responses were available for analysis, resulting in a validity rate of 97.27%.

With regard to the composition of the sample, the following descriptive statistics have been determined. The gender distribution revealed that 71.49% (153 respondents) were female and 28.51% (61 respondents) were male. In terms of generations, Generation Z had the highest number of completions (69%), followed by Generation Y (14%), then Generation X (12%) and Baby Boomers (5%). In terms of education, 65% of the respondents had a high school diploma and 35% had a BA/BSC degree, so students with master's degrees were also included in the survey.

It should be noted that the average number of debit cards available for cash withdrawals is approximately one per bank customer. In particular, customers hold the highest number of cards in the highest income category, defined as individuals earning over HUF 350,000 (approximately 7 955 EUR), with a mean of at least two debit cards. This suggests that a proportion of respondents maintain accounts with two commercial banks, which may be indicative of a high level of confidence (e.g. knowledge of constructions) in saving and using money.

The exploratory factor analysis must satisfy a number of conditions, as outlined below: substantial number of correlations between variables, measured by Spearman's rho due to ordinal scale (Ritter, 2012) >0.3 (Habing, 2003); Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO): >0.5, Bartlett's Test sig.: <0.05, Total Variance Explained: > 33%, Communalities: >0.25, Factor Weights: > 0.25, Goodness of Fit Test: >0.00 (Barna & Székelyi,

2008); Cronbach Alpha>0.7 (Cronbach, 1951). An exploratory factor analysis that meets the aforementioned criteria guarantees the validity and reliability of the model construct (Chan & Idris, 2018).

A normal distribution is not an exclusionary criterion for factor analysis (Muthén & Kaplan, 1985); rather, the measurement of normality violation (skewness, skewness) is recommended for the purpose of testing normality. Acceptance threshold values have been established in the literature as falling between -2 and +2 (George & Mallery, 2010). It should be noted that some literature (e.g., Chou & Bentler, 1995) considers kurtosis values below 7 to be acceptable. Exploratory factor analysis was performed using the maximum likelihood method and the varimax rotation. The methodology employed in the paper is a type of factor extraction method, namely common factor analysis, which permits an optimal distribution of the explained variance across factors, with no factor explaining an excessive proportion of the variance (Kaiser, 1958). Statistical analyzes were performed using the IBM SPSS Statistics 25 software package.

3. RESULTS AND DISCUSSION

In this paper, the results are presented only for the best-fitting model. The model meets the constraints of the literature in terms of variation from normalization, since the skewness ranges from -1.57 to -0.43, while the kurtosis takes values between -0.14 and +2.87. The Spearman correlation values between the variables used to construct the model also meet the thresholds, ranging from 0.236 to 0.613, and in 5 cases do not reach 0.3, which is an acceptable ratio for the analysis. In terms of ATM use, two factors have been developed, with variables (items) formulated on the basis of a validated questionnaire (Andika et al., 2020):

- Simplicity
  - The ATM provides clear instructions on how to use it.
  - The ATM is easy to use for transactions.
  - The ATM language is easy to understand.
  - Waiting time at the ATM is acceptable.
- Safety
  - The ATM provides quality bank records.
  - The ATM provides fast service.
  - Predictability of ATMs is important to me.
  - The ATM provides instant money at all times.
  - I feel safe during ATM transactions.

The composition of the variables that were constructed to the factors differs in part from the original questionnaire results, which were related to Indonesia. This discrepancy can be attributed to the Hungarian-specific thinking and attitudes among consumers. This is manifested in the fact that the simplicity factor developed in the present study was derived from the original research by mixing the variables of ease of use and convenience factors. In the case of the safety factor, it was formed from the variables of the fulfillment, trust, and security factors. Therefore, the findings indicate that the bank customers in the study sample have disparate attitudes, making them more susceptible to ATM use. However, this divergence is inherent, as it is attributable to variations in concern that are culturally determined.

The reliability of the variables utilized to construct the factors was evaluated through Cronbach's alpha values. These tests demonstrated the acceptability of the variables for factors, with a value of 0.824 for simplicity (4 items) and 0.735 for safety (5 items). The total explained variance is 47.34%, which is also in line with the literature. It should be noted that the variances explained by the factors differ substantially, despite the rotation method (varimax).

The variances explained by simplicity (39.70%) and safety (7.64%) are particularly noteworthy. This is not a finding that renders the analysis or the developed model unacceptable. However, the greater explained variance of the first factor should be considered when interpreting the results. This indicates that the importance of simplicity may be more pronounced than that of safety for the sample in the context of ATM use. In addition, on the basis of the KMO value (0.881), the adopted model is considered to be very good, and Bartlett's test also demonstrates significance, which supports its acceptability. The goodness-of-fit test for model fit yielded a value of 0.834, which is consistent with the threshold reported in the literature.

It is appropriate to use factor weights and factor loadings (Table 1) as the primary component of the assessment, in addition to meeting the established thresholds. Factor weights indicate that ease of use and clear language are the most critical variables influencing ATM use. This suggests that for bank customers, the simplicity of ATMs is the dominant factor in determining their usage. This may be attributed to the prevailing attitudes towards the usage of technology. The ease of use of technology can have a typically positive impact on the perceived usefulness of technology (Basukia et al., 2021) and can also be associated with rapid productivity.

Table 1 Factor Analysis Factor Weights and Factor Loadings

Variable name	Communalities (Factor weights)	Factor loadings	
		Simplicity	Safety
clear instructions	0.560	0.693	-
easy to use	0.708	0.808	-
clear language	0.690	0.785	-
waiting time	0.378	0.447	-
transaction tracking	0.323	-	0.408
speed of transactions.	0.470	-	0.597
stability of functions	0.281	-	0.455
availability at any time	0.572	-	0.748
secure transactions	0.279	-	0.480

Source: Authors' own research, 2024

In contrast, the two items related to security (stability of functions, secure transactions) have the least impact on the

overall factor analysis. This may be due to the fact that from the consumer's point of view, the use of ATMs is strongly limited to cash withdrawals and sometimes cash deposits, so that these basic expectations may not be very important as baseline expectations. However, other variables (e.g. speed, traceability) are becoming more important due to the ever-decreasing time requirements and the expectation of quick access to cash.

In an increasingly fast-paced world, banking customers are looking for faster solutions, so it is not surprising that online solutions (e.g., apps, internet banking) can provide a better option for investment opportunities rather than over-the-counter banking (e.g., withdrawals), while ATMs can provide a relatively fast solution for cash withdrawals. Additionally, access to ATMs is perceived as easy by Hungarians, but also by European citizens, despite the fact that the number of ATMs per capita varies widely from country to country (Esselink & Hernández, 2017).

In terms of factor weights, ease of use is also the most important element for simplicity, as the entire use of the technology can be based on this customer perception (expectation). In terms of security, it is somewhat surprising that the need for continuous availability is the most important factor weight, as this may partly contradict the increasing adoption and use of digital payments. This is consistent with research in Poland, which shows that the use of cash remains an important part of modern economies. However, the use of cash as a store of value rather than as a means of payment may be indicated by an increase in demand for high-denomination banknotes, while this is not the case for lower denominations (Skibinska-Fabrowska, 2023).

Therefore, precautionary demand may also have a significant impact on the Hungarian population, while transactional demand is likely to decrease, partly due to the development of digital technology. In addition, the importance of meeting the need for cash at all times is also understandable and may be relevant for certain customer characteristics (e.g. age groups) and reasons for using cash (e.g. services).

It is evident that the proliferation of fintech service providers has become a significant phenomenon, as these solutions are facilitating the adoption of digital transactions, particularly those conducted via mobile devices, in lieu of traditional methods (Agarwal et al., 2020). The age of consumers can also exert an influence on the impact of fintech providers (Krupa & Buszko, 2023), with cash usage potentially being affected in varying ways by these digital financial solutions. Furthermore, research has indicated that there is a significant negative correlation between ATM intensity and bank efficiency. This is due to the fact that banks are focusing their resources on investments and innovations in the field of financial technology (fintech) (Liao, 2023).

A considerable body of research indicates that European countries exhibit a high propensity to engage in cashless transactions. The advent of the Coronavirus (Covid-19) pandemic has served to accelerate this trend, as the handling of cash carries inherent risks of infection. Moreover, these effects were not confined to the period of the pandemic, but are predicted to persist in the long term (Wisniewski et al., 2021). The utilization of cash and cashless payments are, in essence, complementary. In contrast, card and credit transfer payments represent a considerable proportion of transactions in Middle Eastern and Eastern European countries. These forms of payment are also prevalent in Western European countries, yet the adoption of electronic payment methods is on the rise. It is noteworthy that both in Central and Eastern Europe and in Western Europe, a positive correlation between economic growth and electronic payments can be observed (Grzelczak & Pastusiak, 2020).

The existence of cash use in European countries is characterized by the existence of common region-specific factors, with the use of bank cash in the more developed countries being explained by their level of economic development, income inequality and internet penetration. In Central and Eastern European countries, cash use is negatively related to trust and inversely related to technological development (Titova et al., 2021). Therefore, the degree of reliance on cash and the associated indicators exhibits some degree of variation across European countries, underscoring the importance of a nuanced examination of this phenomenon.

In summary, there appear to be underlying assumptions that influence ATM use. These assumptions include the idea that more sophisticated ATMs align with consumers' desire for the speed of transactions, which could be adversely affected by the possibility of ATM closures. In the context of international sustainability challenges, the pronounced inclination toward "simplicity" indicates that global banking initiatives should prioritize the streamlining of transaction processes. By decreasing the time spent at terminals and simplifying interfaces, financial institutions can achieve lean operations that satisfy both customer convenience and energy efficiency. This would contribute to broader sustainability development goals (ESG) related to responsible consumption and infrastructure.

4. CONCLUSIONS

First, the analysis, in accordance with several existing literature, although utilizing a distinct methodology, demonstrates that consumers expect today the use of cash and, consequently, the importance of the easy availability and usability of ATMs. The frequency of use and the propensity to save money, and its forms, may, of course, vary according to the specific preferences and financial structures of customers. It appears that the benefits of ease of use are the most important for consumers in relation to ATM use. However, some studies have concluded that the need for ATMs as banking machines is diminishing among

consumers (Cho et al. 2023). In light of these considerations, it is also important to note that the present research, in conjunction with other studies (e.g., Adbullahi, 2021), demonstrates that the consumer model that determines customer satisfaction is in a state of constant evolution. Consequently, a continuous analysis of consumer intentions is essential in this regard. Secondly, it is important to recognize that the provision of ATM banking services can have a substantial influence on consumers' interest in and willingness to utilize other banking services and products (Ireri, 2023).

The originality of this research lies in its discovery that simplicity as a driving force outweighs security in transitional economies. This suggests that sustainable banking strategies should prioritize functional efficiency over complex security barriers in order to maintain customer loyalty during the digital transition. This simplification enhances the user experience while concurrently reducing the resource and energy requirements of transaction processes. Consequently, it is a pivotal instrument for ensuring environmental sustainability. In consideration of the findings, it is possible to propose a series of specific recommendations for consideration by banks and policy makers:

- The availability of ATMs is important for bank customers;
- banks should locate ATMs in convenient (safe, accessible) locations to meet cash needs;
- banks should decide on the closure of ATMs on the basis of their availability and utilization;
- the language of ATMs should be simple, clear, and easy to use;
- banks should ensure that transactions at ATMs can be processed quickly and without interruption;
- in addition to the digitization of public finances, the social expectation of cash use and the conditions for its use should be important in government decision-making;
- the government may wish to broaden the range of alternative cash withdrawal options (e.g., cash-back program).

In partly contrast to the aforementioned points, the Hungarian government has proposed a series of measures with the objective of ensuring the long-term viability of the banking sector. These proposals place a particular emphasis on the development of digital banking. One of the proposed solutions is to reduce the growth rate of cash usage, given that in 2021, the value of cash in circulation reached HUF 7,500 billion, resulting in an indirect cost of approximately HUF 50,000 billion to Hungarian citizens.

In order to encourage the utilization of digital solutions, the provision of electronic payment solutions has been made mandatory since 2021, in accordance with Article 5/F of Act CLXIV of 2005. The implementation of cashless solutions has the potential to facilitate the development of the locality's image, influence money usage habits and contribute to the whitening of the economy (Becsei et al., 2021). It is perceived that there may be significant differences between the implementation and acceptance of cash and cashless payments, which may be influenced by lifestyle factors. This makes it challenging for banks and governments to determine the appropriate levels of importance to assign to these factors in their strategic decision-making processes.

In general, it is important to remember that this analysis is only exploratory and thus outlines a research direction. However, the results of the exploratory factor analysis indicate that validity of the construction is satisfactory. Conversely, the analysis is grounded in a questionnaire survey, which is cross-sectional in nature (referring to a specific location and time period) and based on a non-representative sample.

The demographic composition of the data sample thus constrains the extent to which the conclusions can be generalized, rendering them non-representative. Nevertheless, the survey of the expectations of university students who responded to the questionnaire has provided insights that have led to the development of interest insights through exploratory analysis. The analysis can even be extended by using a structural model (e.g. partial least squares structural equation modeling) based on maximum-likelihood estimation (Ton et al., 2022), which is already widely used in both digitization and sustainability (Szabó-Szentgróti et al., 2024). Further analysis of a larger representative sample with several demographic groups could reveal even more important findings for banks, governments, and even fintech providers alike.

REFERENCES

Abdullahi, M. (2021). Customer Satisfaction and Automated Teller Machine (ATM) Services: A Review of related literature. *The International Journal of Business & Management*, 9(5), 176–182.
DOI: 10.24940/theijbm/2021/v9/i5/BM2105-039

Agarwal, S., Qian, W., Ren, Y., Tsai, H.-T., & Yeung, B. Y. (2020). The Real Impact of FinTech: Evidence from mobile payment technology. *SSRN*, 1-13.
DOI: 10.2139/ssrn.3556340

Andika, N. K., Suryani, N. K. and Kusuma, G. A. T., (2020). Building Intention To Save Through ATM Services-Palarch's. *PalArch's Journal of Archaeology of Egypt/ Egyptology*, 17, 806–820.

Anneke, K. (2013). The Safety of Cash and Debit Cards: A Study on the Perception and Behavior of Dutch Consumers. *SSRN Electronic Journal*, 9(245), 77–98.
DOI: 10.2139/ssrn.1947293

Barna, I. & Székelyi, M. (2008). SPSS Survival Kit for SPSS. Multivariate Analysis Techniques for Social Researchers (in Hungarian), Budapest: Typotex Publishing.

Basukia, R., Tariganb, Z.J.H., Siagianb, H., Limantaa, L.S., Setiawana, D., & Mochtara, J. (2021). The effects of perceived ease of use, usefulness, enjoyment and intention to use online platforms on behavioral intention in online movie watching during the pandemic era. *International Journal of Data and Network Science*, 6, 253–262.
DOI: 10.5267/j.ijdns.2021.9.003

Becsei, A., Csányi, P., Bógyi, A., Kajtor-Wieland, I., & Kovács, L. (2021). A fenntartható bankolás 10 pontja. *Gazdaság és Pénzügy*, 8(3), 244-271.
DOI: 10.33926/GP.2021.3.1

Buics, L. & Mamun, M. A. A. (2024). Sustainability in Textile Manufacturing Processes by Waste Reduction: A Case Study from Bangladesh. *Chemical Engineering Transactions*, 107, 439-444.
DOI: 10.3303/CET23107074

Chan, L. L. & Idris, N. (2017). Validity and Reliability of The Instrument Using Exploratory Factor Analysis and Cronbach's alpha. *International Journal of Academic Research in Business and Social Sciences*, 7(10), 400-410.
DOI: 10.6007/IJARBSS/v7-i10/3387

Chen, X., Yu, H. & Yu, F. (2015). What is the optimal number of response alternatives for rating scales? From an information processing perspective. *Journal of Marketing Analytics*, 3(2), 69–78.
DOI: 10.1057/jma.2015.4

Cho, S. et al. (2023). Determinants of Bank Closures: What Ensures Sustainable Profitability in Mobile Banking? *Electronics*, 12(5), 1196.
DOI: 10.3390/electronics12051196

Chou, C. & Bentler, P. M. (1995). 'Estimates and tests in structural equation modeling' in: Hoyle, R. H. (eds.) *Structural equation modeling: Concepts, issues, and applications*. Sage Publication, 37–55.

Deutsche Bundesbank (2023). Access to cash in Germany: analyses of the spatial availability of cash withdrawal facilities. Available at: https://www.bundesbank.de/resource/blob/830308/4d5679957cb8d585ca94d1caa76b7411/mL/2023-01-zugang-bargeld-data.pdf (accessed: 06 June 2024)

George, D. & Mallery, M. (2010). SPSS for Windows Step by Step: A Simple Guide and Reference, 17.0 update (10th ed.), Boston: Pearson.

Grzelczak, M. & Pastusiak, R. (2020). Cashless Payments and Economic Growth in Selected European Countries. *Annales Universitatis Mariae Curie-Skłodowska, sectio H – Oeconomia*, 54(3), 33-46.
DOI: 10.17951/h.2020.54.3.33-46

Gyurián, N. N. & Gyurián, N. (2024). Consumers' Perceptions of Environmental Protection and Exploring Pathways to Sustainable Solutions. *Chemical Engineering Transactions*, 107, 205-210.
DOI: 10.3303/CET23107035

Habing, B. (2003). Exploratory Factor Analysis. University of South Carolina, Columbia. https://www.stat.sc.edu/~habing/courses/530EFA.pdf (accessed: 05 May 2024)

Esselink, H. & Hernández, L. (2017). The Use of Cash by Households in the Euro Area. *ECB Occasional Paper No. 201*.
DOI: 10.2139/ssrn.3077823

Hungarian National Bank (2023). Cash flow 2030 (in Hungarian). https://www.mnb.hu/letoltes/penzforgalom-2030-strategia.pdf (accessed: 18 May 2024)

Idris, B. (2014). 'Customer Satisfaction of Automated Teller Machine (ATM) Based on Service Quality' in Nd. (eds.) *The 2014 WEI International Academic Conference*. West East Institute, 41-48.

Ireri, E. (2023). Influence of automatic teller machines on Uptake of Products and Services in Commercial Banks in Kenya. *International Journal of Arts and Social Science*, 6(9), 85–92.

Kaiser, H. F. (1958). The varimax criterion for analytic rotation in factor analysis. *Psychometrika*, 23, 187-200.

Krueger, M. & Seitz, F. (2015). The Importance Of Cash And Cashless Payments In Germany: Overview And First Estimates. https://www.api.semanticscholar.org/CorpusID:211256549 (accessed: 18 May 2024)

Krupa, D. & Buszko, M. (2023). Agedependent differences in using FinTech products and services—Young customers versus other adults. *PLoS ONE*, 18(10), e0293470.
DOI: 10.1371/journal.pone.0293470

Liao, C.-S. (2023). How does fintech affect bank efficiency in Taiwan? *PLoS ONE,* 18(8), e0289629.
DOI: 10.1371/journal.pone.0289629

Malte, K. & Franz S. (2018). Pros And Cons Of Cash: The State Of The Debate. *Credit And Capital Markets*, 1 (51), 15-40.
DOI: 10.3790/ccm.51.1.15

Muthén, B. O. & Kaplan, D. (1985). A comparison of some methodologies for the factor analysis of nonnormal Likert variables. *British Journal of Mathematical and Statistical Psychology*, 38(2), 171–189.
DOI: 10.1111/j.2044-8317.1985.tb00832.x

Mwatsika, C. (2016). Impact of ATM Banking Performance on Customer Satisfaction with the Bank in Malawi.

International Journal of Business and Economics Research, 5(1), 1–9.
DOI: 10.11648/j.ijber.20160501.11

National Legislative Directory (2023a). MNB Decree 57/2022 (XII. 22.) (in Hungarian). https://www.njt.hu/jogszabaly/2022-57-20- 2C.0 (accessed: 18 May 2024)

National Legislative Directory (2023b). Act CLXIV of 2005 on trade 5/F.§. (in Hungarian). https://www.njt.hu/jogszabaly/2005-164-00-00 (accessed: 18 May 2024)

Nigati, A. G., Belete, A. A. & Habite, G. M. (2023). Effects of automated teller machine service quality on customer satisfaction: Evidence from commercial bank of Ethiopia. *Heliyon*, 9(8), e19132.
DOI: 10.1016/j.heliyon.2023.e19132

Ritter, N. L. (2012). 'A comparison of distribution free and nondistribution free factor analysis methods' in Nd. (Eds.) *Annual Meeting of the Southwest Educational Research Association*. Southwest. Educational Research Association. 1–15.

Skibinska–Fabrowska, I. (2023). Demand for Cash and its Determinants - a Post-Crisis Approach. *Journal of Central Banking Theory and Practice*, 2, 103–131.
DOI: 10.2478/jcbtp-2023-0016

Statista (2024). Value of ATM cash withdrawals with cards issued by resident PSPs at terminals provided by resident PSPs in the 27 countries of the EU from 2000 to 2022. https://www.statista.com/statistics/1132848/value-of-atm-cash-withdrawals-europe-by-country/ (accessed: 22 May 2024)

Szabó–Szentgróti, E., Konczosné, Sz. K., Rámháp, Sz., & Kézai, P. K. (2024). How Consumers Accept Unmanned Smart Stores? – Introducing a Proposed Technology Acceptance Model. *Chemical Engineering Transactions*, 107, 373-378,
DOI: 10.3303/CET23107063

Titova, Y., Cornea, D. & Lemeunier, S. (2021). What Factors Keep Cash Alive in the European Union?. *De Economist*, 169, 291–317.
DOI: 10.1007/s10645-021-09384-3

Ton, A. D., Szabó-Szentgróti, G., & Hammerl, L. (2022). Competition within Cross-Functional Teams: A Structural Equation Model on Knowledge Hiding. *Social Sciences (BASEL)*, 11(1), 30.
DOI: 10.3390/socsci11010030

Végső, T. (2020). Comparative Analysis of the Changes in Cash Demand in Hungary. *Financial and Economic Review*, 19(1), 90–118
DOI: 10.33893/FER.19.1.90118

Wang, G. & Hausken, K. (2024). Research in International Business and Finance. *Research in International Business and Finance*, 67(B), 102115,
DOI: 10.1016/j.ribaf.2023.102115

Wisniewski, T. P., Polasik, M., Kotkowski, R., & Moro, A. (2021). Switching from Cash to Cashless Payments during the COVID-19 Pandemic and Beyond. *International Journal of Central Banking*, 20(3), 303-337.