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Decision-making in Export Financing Services by Banks in Hungary

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SUMMARY

The purpose of this paper is to investigate decision-making in export financing services by banks in Hungary. The case studies are of one export credit agency and eight commercial banks. The data was collected through interviews and to interpret the data content analysis with an inductive approach was used. The results show that the decision-making system in export financing services in Hungary tends to be centralized and bureaucratic with a mostly participative leadership style. Effectiveness in the decision-making process is influenced by decision-related factors, human-qualification factors, and organizational contextual factors which can be amplified by certain other factors.

Keywords: Export financing; Export credits; Decision-making; Hungary.
Journal of Economic Literature (JEL) codes: F13; F30; G21; M10
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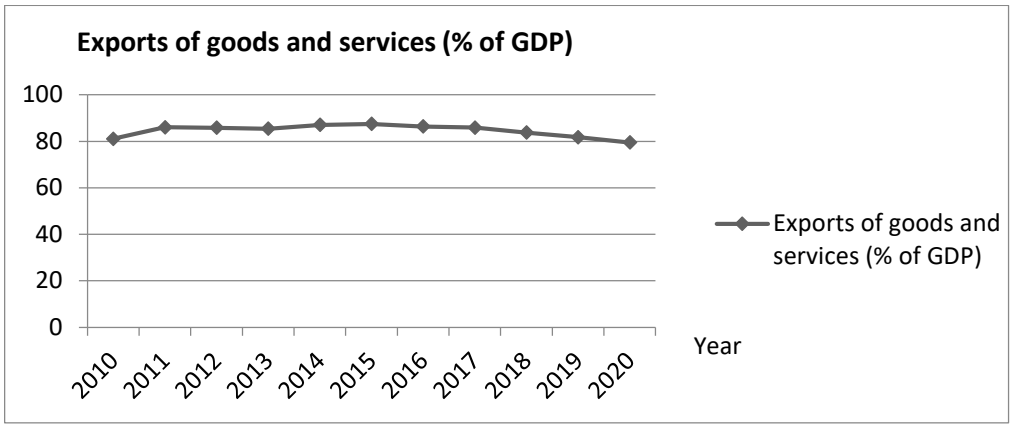
INTRODUCTION

In the international trade market, there has been very high uncertainty in predicting future circumstances. Problematic risks through Brexit (the withdrawal of the United Kingdom from the European Union), conflict in the Middle East, the trade war between major economies like the United States and China, the recent worldwide economic crisis due to the Covid-19 pandemic, the conflict between Russia and Ukraine and how it may affect future political and economic ties inside Europe as well as between Europe and the USA, and so on make the nature of international trade very uncertain and disruptive. Risks, uncertainties, and structural shifts have a wide range of effects on industries, "affecting every step in the value-chains of global trade, from the industrial strategy of oil-producing countries, through manufacturing, technology risks, currency fluctuations, and the cost of finance, to social changes impacting labor supply, consumer demand, and political and environmental activism" (Reguero 2019, p. 13). Export financing, guarantees, and credit insurance organizations are crucial drivers that let exporters export more successfully in the international market. According to the U.S. EXIM bank (2019, p. 12), "Many governments reported that export finance and promotion programs are policy priority based on the effectiveness and profitability of these programs."

According to Hensman and Sadler-Smith (2011), the banking and finance sector is critical in the world economy; in which decisions made by this sector's top management have gravity and importance that overshadows other organizational processes, affecting all the stakeholders and even the overall economy. Decision-making about the facilities for exports is more critical when a considerable percentage of GDP comes from exports. In Hungary, the export of goods and services is reported in the World Bank database as 79.48 percent of GDP for the year 2020. As shown in Figure 1, from the years 2010 to 2020 this value stayed at around 80 percent of the GDP of the country. As the share of exports in GDP is high in Hungary, it is vital to facilitate and support the export activities financially that is usually done by services offered by the financial institutions.



Source: World Bank: https://databank.worldbank.org/

Figure 1: Exports of goods and services (% of GDP) in Hungary, 2010-2020

This study aims to discuss decision-making in export financing services by banks in Hungary. The case studies are on the Hungarian export credit agency (EXIM) and eight commercial banks in Hungary. In Hungary, the only bank that is specialized in supporting exporters is the state-owned Hungarian Export-Import Bank Plc. (Eximbank). Eximbank is integrated with the Hungarian Export Credit Insurance Plc. (MEHIB) and the joint organization is called EXIM. EXIM is a Hungarian export credit agency (ECA). According to OECD (n.d.), "Governments provide officially supported export credits through Export Credit Agencies (ECAs) in support of national exporters competing for overseas sales. Such support can take the form either of 'official financing support', such as direct credits to foreign buyers, refinancing or interest-rate support, or of 'pure cover support', such as export credit insurance or guarantee for credits provided by private financial institutions." Some commercial banks in Hungary provide some export financing services for exporters in addition to their regular services.

In the following, we introduce the banking system's history in Hungary, provide a literature review, present characteristics of export credit decisions, explain our research process and data Analysis, share our findings, discuss them, and finally present our conclusions.

HISTORY OF THE BANKING SYSTEM IN HUNGARY

In this chapter the highlights of the history of the banking system in Hungary are discussed. The aim is to show how the banking system has changed in response to economic and political changes over almost 70 years in Hungary.

In 1948, the National Bank of Hungary (NBH) obtained the monopoly of money circulation and all credit activities in the market, establishing the Hungarian banking system, which was modeled after the Soviet Union's structure (Hasan & Marton 2003). In the late 1970s, financial deregulation led to a sharp rise in the number of rival banks. As a result of disintermediation, among other things, commercial banks lost several significant positions against investment banks and against investment and counter-investment funds. The market share of these more recently established financial organizations grew, which led to a steady reduction in the role of banks in handling deposits and credit outsourcing. "Hungarian banking system had few years delay in the development process" (Pintér 2017, p. 56). According to Hasan and Marton (2003), the government of Hungary allowed a number of foreign banks to establish offshore activities in the early 1980s, despite the fact that these banks competed with state-owned banks in the foreign exchange and trade-related transaction markets. This was a relatively early step in the reform process. In 1987, the NBH took over as the central bank and handed its commercial activities to three new commercial banks, replacing the centralized mono-banking system with a two-tier banking system. In the 1980s these changes were important in Hungary because they made it possible for the post-socialist administration to start major reforms. A regulatory framework resembling a market economy was developed by the democratic government in 1991. Both the Bank of International Settlement's 8% capital adequacy ratio standard and the provision of reserves to cover faulty or dubious loans were mandated. The framework also outlined minimum capital criteria for new banks and stipulated that state ownership in all commercial banks should be reduced to no more than 25% by 1997 (Hasan & Marton 2003). According to

Pintér (2017) the quick process that came from Hungary's bank privatization program during the ten years leading up to 1997 saw four of the country's five largest state-owned banks sold to foreign investors. Privatization, followed by the banking sector's consolidation and a wave of deregulation and liberalization in the last two decades laid the groundwork for future financial system mergers.

In the early 2000s, fiercer rivalry in the local and international banks' retail credit markets indicated whether their strategies were comparable or dissimilar. At that time, local banks started to expand throughout Eastern Europe, competing not only with the parent banks of "foreign" banks but also with their subsidiaries. The balance sheets of the two groups during this time were marked by a rapid expansion of credit, significant profitability, and the emergence of liquidity and credit risks (Banai et al. 2010).

The next considerable change happened when Hungary joined the European Union on May 1, 2004. After joining, there were quite a few urgent changes made to the legal system (Csáki & Gelléri 2005). The national Act on Public Procurement had been altered as a crucial part of harmonizing legislative procedures to comply with EU requirements. The implementation of new legal and procedural requirements has had a significant impact on both bidders and tender issuers, as well as on current procurement procedures (Csáki & Gelléri 2005).

The recent two worldwide crises have had a considerable effect on the banking industry. The first one was the financial crisis in the years 2008–2009 and the second one is the Covid-19 pandemic. According to Banai et al. (2010), banks had to rely heavily on external help (but only temporarily) due to the liquidity crisis caused by the financial crisis of 2008–2009. The state and central banks provided this in the case of local banks, while parent banks provided it for foreign banks. Due to the large liquidity and credit risks in the Hungarian banking sector, which were exacerbated by the 2008 financial crisis, Hungarian banks exhibited severe procyclical behavior in response to the altered financial and macroeconomic environment. Wieder (2020) pointed out that according to the National Bank of Hungary, the domestic banking system was in considerably better form at the start of the Covid-19-induced economic crisis than it was at the start of the 2008–2009 crisis. He added that by the end of 2019, risk indicators for corporate lending had also made significant progress; the proportion of project loans in sector-level portfolios had reduced since the previous crisis, but businesses were still dealing with the coronavirus outbreak and unfavorable supply and demand shocks. Companies that lose a large amount of revenue may have trouble paying their debts. Hungary's institutions have a high cost-to-asset level when compared to other EU countries. The relatively low usage of electronic service channels, the poorer efficiency of economies of scale, and the spread of automation and digitization solutions to a lesser level could all be contributing factors. According to Tóth (2021), the Covid-19 epidemic, in addition to its multiple detrimental social and economic impacts, may lead to relevant developments in the domestic credit institution sector in the aspect of digital development; however, the issue is too complex and there are too many unknowns to tell for sure.

LITERATURE REVIEW

The decision-making process

In the studies of Drucker (2001) and Daft and Marcic (2016), six steps are defined for the decision-making process, which are almost the same in both studies. The six steps are:

1. Identify the necessity of decision-making, and classify the decision to see if it is a generic decision or an exceptional one that may need more creativity and new rules.
2. Examine the problem completely.
3. Specify the possible answers to the problems and their limitations.
4. Choose the solution(s) with the least degree of risk and solve the issues in more details.
5. Implement the decision.
6. Evaluate the result and effectiveness of the decision.

To make the process successful, it is not only important to follow the steps but also to know how it can be effective to employ this knowledge efficiently. In the following subchapters, we talk about the effective decision-making process and its limitations.

Effective decision-making process

As Simon (1948) stated, the key concept of managerial science is decision-making. Therefore, the effectiveness of decision-making should be studied deeply in any organization. Effective decisions result from "a systematic process with clearly defined elements and in a distinct sequence of steps" (Drucker 2001, p. 19). The process of decision-making is effective only if it can achieve business objectives. According to Drucker (2001), to have effective decision-making, decision-makers should identify whether the issue is to be handled as a generic issue or an exceptional one. He noted that a common error of decision-makers is to treat a generic problem like a unique and exceptional issue, which can just result in "frustration and futility". This

can be because of the lack of knowledge and the power of discernment of decision-makers about the issues.

In addition to these factors, according to Argyris (2001, p. 60), "the effectiveness of decision-making of top managers relies on the degree of innovation, risk-taking, flexibility, and trust in the executive system." In a survey (Argyris 2001), about 95% of executives believed that the effectiveness of the organizations mostly depends on the qualifications of their top-level people. For effective management decision-making, after determining the alternatives, managers should predict the possible outcome of the alternatives and decide which decision they should make (Swami 2013). Kittisarn (2003) mentioned that a suitable decision-making system should be selected for the organizational structure to make sure that the appropriate decisions are taken at the appropriate levels.

For an effective decision-making process, the implementation phase of the decisions is also so important. Drucker (2001) pointed out that in the decision-making process the most time-consuming stage is usually to turn a decision into effective action. Without implementation, the decision is just a concept. He stated that "Converting a decision into action requires answering several distinct questions: Who has to know of this decision? What action has to be taken? Who is to take it? What does the action have to be so that the people who have to do it can do it? The first and the last of these questions are too often overlooked" (Drucker 2001, p. 13).

Limitations in the way of the effective decision-making process

Drucker (2001) considered meeting the boundary conditions as the most difficult phase in the decision-making process. Simon (1979) stated that the rationality of people is limited by information shortage, people's cognitive limitations, and time limitations. In his bounded rationality model, he mentioned that according to the limitations, completely rational decision-making is not possible; decision-makers become satisfied with the decision that seems to them to be good and acceptable.

Argyris (2001) pointed out the behavioral limitations that exist in an organization, which is the contradiction of decision-makers' behavior in decision-making meetings with their real opinions about an effective executive order. The contrast between what leaders say and how they act in the workplace contributes to causing obstacles to transparency and trust, as well as the effective investigation for solutions, creativity, and flexibility that become more harmful in important decision-making than the normal one. Hammond et al. (1998) found eight traps in the psychological aspect to make decisions in organizations. "The anchoring trap" causes us to place undue emphasis on the first set of information we obtain. "The status-quo trap" pushes us toward keeping the status quo, even when better options are available. "The sunk-cost trap" leads us to repeat previous mistakes. "The confirming-evidence trap" causes us to search out evidence that confirms our existing biases while dismissing material that contradicts them. "The framing trap" happens when we misinterpret a situation; the entire decision-making process is jeopardized. "The overconfidence trap" causes us to exaggerate the precision of our forecasts. "The prudence trap" makes us overly cautious when making estimations regarding unknown circumstances. And "the recallability trap" causes us to overestimate the importance of recent, spectacular occurrences. In some cases while correct information is accessible, alternatives are well-defined, calculations of risk, benefit, and costs are correct, etc., still, good decisions may not be made because of the mindset of the decision-makers. The mentioned behavioral limitations and psychological traps can damage the decision-making process. However, being aware of these elements can help to avoid them.

Some limitations are more often observed in public organizations. According to Rainey (2003), some of these limitations are the extent to which managers have authority, the government bureaucracy, the powerful role of adjudication units, dependency on governmental funding, relying on other organizations for information and some other services, and employees' preferences and values. In public organizations, the authorization of employees is usually limited to people at higher levels and according to Rainey (2003), internal managers' influence and authority in public organizations have been reduced by external power, politics, and also adjudication units. Public organizations usually are so bureaucratic that they may negatively influence the adaptation of the organization. In public organizations employees may not be as committed as in private organizations.

Decision-making styles

Understanding and choosing the proper decision style in different situations make the decision-making process more effective. The ways that managers at different levels implement the decision-making process are different. They need to behave and decide differently based on the level and circumstances. Brousseau et al. (2006) showed that decision-making styles can have an effect on executive success and failure. Managers should have the ability to choose the appropriate style based on the circumstances they face. They proposed four decision styles based on how much managers focus on information collecting and in what way they create options; some decision-makers believe in one course of action and others prefer multiple courses. These four styles are Decisive, Flexible, Hierarchic, and

Integrative. To figure out how managers choose among these four decision styles, Brousseau et al. (2006) did empirical research. They investigated the behavior of managers at different levels across regions. By comparing every level of the four continents, they saw differences in each level of management among the regions. However, inside every continent, the behavior of managers at different levels was found to be almost similar in their leadership and thinking styles. In addition to the region, they also mentioned that in a public organization, decision-makers act differently in comparison to private organizations. This is because they are responsible to the government.

Vroom and Yetton (1973) proposed another category for decision styles based on the extent to which the managers involve the group in the decision-making processes. Their categories ranged from highly autocratic to highly democratic:

AI: Manager decides alone

AII: Manager decides alone by using the collected information

CI: Manager decides after getting ideas from individuals

CII: Manager decides after consultation with the group

GII: The manager allows the group to decide.

The decision-making style can range from the highly autocratic style (AI), in which the manager decides alone, to the consultative style (CI), in which before making decisions, the manager consults with individuals, and to the highly democratic one, that is the group style (GII), in which the manager gives the authority of decision-making to the group. Besides their thinking styles, managers can also change their approach to decision-making by considering the urgency of the case and the impact of the decision.

In group decision-making versus individual decision-making, more information and knowledge can be available related to the issue, a greater number of options can arise, the final decision can be accepted and comprehended better, and the overall knowledge of group members may increase. However, it can be more time-consuming and conflict between opinions can make the process slow and unpleasant. In some cases may become over-focused when it may not be necessary, and some people may have more power in the discussions (Kittisarn 2003, citing Bartol et al. 1998). Accordingly, in cases when time is more important, individual thinking matters, while group decision-making may be preferred while when more information, accuracy, and creative decision-making is more suitable. Although being fast is highly valued in today's financial sector, that should not limit the importance of information, as mentioned by Godbillon-Camus and Godlewski (2005). However, some other factors like the size of organization, the number of business cases, organizational and national cultural characteristics, power distance, and hierarchy level also affect decision-making methods. One decision-making way is the four-eyes principle, where the decisions can be made by two authorities. In this way, the individual authority is limited because the decision should be approved by another authorized person as well. In this way, the aim is to avoid individual errors (Lambsdorff 2015). This method also can be good for incorporating different opinions and using more competences compared to individual decision-making, and additional control can be applied by the second person. In comparison to decision-making in committees, it can reduce the time for arriving at decision. In some studies, it is mentioned that in a financial institution, the four-eyes principle is used to avoid corruption in decision-making. However, Li et al. (2015) referred to some studies that showed that this method is usually not useful to avoid corruption because the entire group can be corrupted. In their studies, they found that groups were more corrupt than individuals.

The authority of decision-making

Power and authority are required for people to achieve goals and engage in decision-making (Rainey 2003). To boost the effectiveness of an organization's performance, the structure of the organization and decision-making should be matched for decision-making to be centralized or decentralized (Kittisarn 2003). This categorization is referring to how the authority is divided between managers and units. In organizations with a vertical structure, centralized decision-making is mostly followed, in which authority is kept at top organizational levels to create vertical coordination. However, in decentralized decision-making, in addition to top managers, authority is distributed to lower-level managers as well. Kittisarn (2003) pointed out that in decentralized decision-making, speed and flexibility should be ensured in responses to client issues. It should be noticed that in real life, organizations are not totally decentralized or centralized and these concepts are relative (Kittisarn 2003). Top-level management has more control in centralized decision-making than in decentralized decision-making. In centralized decision-making, an organization may not be able to respond fast and effectively to changes compared to in decentralized decision-making. In decentralized decision-making, organizations may respond to customers' needs more quickly. Kittisarn (2003) added that most studies argue that the employees are closer to the clients and so can be better prepared to make most of the decisions but it may be more difficult to achieve efficiency through standardizing. However, depending on the organizational structure, its environment, and its needs,

managers can see which method can be most beneficial for the organization. Centralization can be more suitable than decentralization since the environment of the organization is more stable, the capability and experience of lower-level managers in decision-making are lower than those of upper-level managers, lower-level managers are less eager to take responsibility for decision-making, and organizational culture also does not allows them to do so, decisions are more major, organizations are in crisis, the size of the organization is larger, the organization is geographically less dispersed, and finally, managers must have more control over the process for organizations' strategies to be implemented effectively (Robbins et al. 2000).

To analyze the authority of decision-making in banks, Senyuta (2013) pointed out that estimates showed that more delegation of decision-making to lower levels affects the quantitative measurement of bank performance positively but has a negative effect on the quality of the decisions. This means that for example in loan services, the number of loans given to clients increases by delegating the authority to lower levels but the quality of the loans may not be guaranteed. Accordingly, to maintain the quality of decisions and at the same time keep the quantitative measurement of bank performance, the balance should be kept between these two elements. When considering soft information, the importance of delegation for decision-making comes into the picture (Senyuta 2013). However, the author pointed out that in the banking sector, more centralization has taken place in the decision-making process. The reasons for these issues can be advancement in informational technology by easy and cheap accessibility of information to higher levels and changes in market regulations (like the European Union's single-market policy). However, for soft information, it may not be so practical to send it to the top levels of a hierarchy without cost. It should be noticed that the expert knowledge of lower levels makes a difference to the competitive advantage of the organizations.

According to Godbillon-Camus and Godlewski (2005, p. 1), banks can access "hard information, which is external, via public information (quantitative data like balance sheet data, rating, scoring . . .), and soft information, which is internal, via bank-borrower relationship (qualitative like judgment, opinions, notes, reports . . .)." Analyzing hard information gives insight more into the past but soft information gives more insight about future plans. Although soft information is not verifiable and it is easy to manipulate, including it in risk analysis can improve the accuracy of borrowers' quality estimations. Soft information improves the predictive capacity of hard information (Godbillon-Camus & Godlewski 2005). To have precise information, a combination of both soft and hard information should be used. In an organization whose structure is more decentralized, soft information can be used more extensively because lower levels have increased authority over decision-making and can use their judgments of the organizational situation.

Another issue about hierarchy is that decision-makers at higher levels can decide more intuitively than the lower-level ones and this way is used mostly in cases of high uncertainty, limited time, less available precedent, unclear information, unpredictable variables, and the existence of a number of acceptable alternatives (Hensman & Sadler-Smith 2011, citing Agor 1989 and Parikh et al. 1994). Hensman and Sadler-Smith (2011) pointed out that their study on the banking and finance sector revealed that the decision factor, individual variables, and organizational contextual variables affect the decision-makers' reliance on intuition. Decision factors may not suggest a clear answer (multiple acceptable alternatives), uncertainty, conditions when there is time pressure, and lack of proper data that altogether make it hard to analyze the case rationally, and decision-makers may refer to their intuition. Individual variables like decision-makers' experience, expertise, confidence, and seniority give the decision-makers the competence to apply intuitive decision-making. Finally, some of the organizational contextual factors are organizational limitations, agreements, and formal regulations that limit intuitive decision-making, the hierarchy, authority, the politics, the team relationships in the organization that make people not show their opinions in order to keep the connections and respect the higher levels, and the organizational culture – that is, to what extent it allows people to share their intuitions.

CHARACTERISTICS OF EXPORT CREDIT DECISIONS

Decisions connected to financing export transactions belong to the category of decisions with high level of risk. This is especially true in the case of Hungarian companies exporting to countries outside of the European Union. The foreign trade policy of Hungary aims at entering into new markets, such as India and China, which contributes to the increasing the level of risk of exporters. Gergely Jákli, the CEO of EXIM, said in an interview: "Hungarian export companies can be the most successful if they also seek new markets outside the European Union. However, they need help to do that." (Jákli, 2021). EXIM has introduced new financing programs to increase the number of foreign countries in which they provide services for exporting companies (EXIM 2021).

The types of risks involved in exporting can be divided into three categories: market, credit, and operational risks. Credit risk includes the probability of default, loss given default and exposure at default

(Homolya & Benedek 2007). Direct state financial support is crucial for MEHIB in the portfolio of the bank, as export markets have dominant position where financial and legal risks are high (Roncz 2011). Parallel with the increasing global uncertainties of economies, the modeling of risks has gained more and more attention in exporting, which is true for banks financing export transactions (Vanek 2009). Risk handling aims at reducing the possible consequences of risks to a minimal level (Vértesy 2013, p. 29).

Related to the strategic importance of increasing exports of Hungary, EXIM is controlled by state level institutions. MEHIB provides insurance for exporting companies which is supported by the state budget. EXIM has close cooperation with the Hungarian Development Banks and the International Trade Development organization in developing export promotion strategic aims. The strategic goals of strategy involves the following (Roncz, 2011):

- Implementation of a coordinated strategy specified for organizations involved;
- Creation of a common knowledge base;
- Sharing information;
- Simplification of decision processes.

EXIM cooperates with 40 Hungarian financial institutions – among them commercial banks and leasing companies – to finance companies with an active role in export transactions. According to Jákli (2021), 13% of the credit provided for companies in 2020 was financed by EXIM.

RESEARCH PROCESS AND DATA ANALYSIS

In this study, by practical research on EXIM and eight commercial banks, we attempt to answer the following questions in the case studies:

- What is the mechanism of decision-making authority in the process of decision-making?
- To what extent is there flexibility in decision-making processes?
- Which elements are effective to reach a successful decision and what are the limitations in the process?

The case studies of this study are from EXIM and eight banks in Hungary. The names of the banks are not included due to our agreement with the interviewees. EXIM is the integrated company of Hungarian Export-Import Bank Plc. (Eximbank) and Hungarian Export Credit Insurance Plc. (MEHIB). Among these case studies, only EXIM's activities are specialized in supporting exporters as an Export Credit Agency (ECA); for this reason we have not included it with the banks' group and have mentioned it separately. In the other cases, export financing activity is one of the services they provide. Although our subject is about banks and EXIM is an ECA, we should note that Eximbank and MEHIB share the same management structure.

In this study, eleven semi-structured interviews were conducted in banks in Hungary. Interviews were held one by one and face to face with each interviewee in the bank's office. The language of the interviews was English. The list of interview question can be found in the Appendix.

The interviews are divided into:

1. 2 interviews with the same person from EXIM in 2019 and 2021
2. 9 interviews in 8 commercial banks. For Bank 3, there are 2 interviewees. The second interviewee is now working for another bank. He worked as a manager in Bank 3 for 2 years till 2019.

Each interview was conducted in 2021 except for one interview from EXIM in 2019.

Banks number 1, 2, 3, and 7 have a mother bank in another country and are called foreign-owned banks in this study. The mother of Bank 1 is Austrian, Banks 2 and 3 are Italian, and Bank 7 is Dutch. The others are local banks.

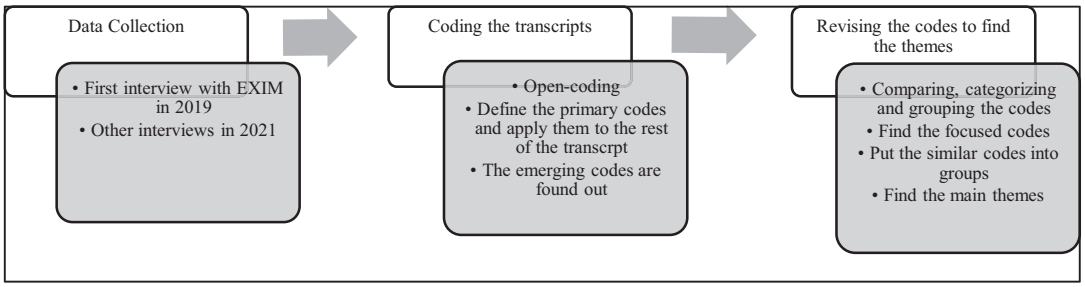
The positions of the interviewees are as follows: Seven heads of departments (Banks 2, 3 (two interviewees), 5, 6, and 7; and EXIM), one head of unit (Bank 8), two senior experts (Banks 1 and 4). Four of them are working in the trade finance or/and international relations departments; two of them are working in the risk management department and the other four are working in the different departments that mostly had previous experience in the area of trade finance. The criteria for choosing the interviewees were the ones who are mostly in the middle or lower level of management and who have considerable experience and knowledge in export financing activities. In middle and lower management, they are somehow in a position of decision-making and at the same time see the issues touching the results of decisions.

To analyze the data from interviews, we used qualitative content analysis with an inductive approach.

The process of collecting and analyzing data is summarized in Figure 2. To implement this method we first implemented the 'Open Coding' by reading the transcript word by word and line by line. Following Easterby-Smith et al. (2015), open-coding let us divide the long text into manageable codes. After this phase we could identify some primary codes and implement coding the rest of the transcript by these codes and also in cases that we could not put it into the defined codes, we created some emergent codes. Then we compared, categorized, and grouped the broad range of codes. We looked for some more focused codes to label the groups in a more organized way. Then we could make some groups with similar concepts from the related coded parts. For an easier and more intelligible interpretation of data, we categorized the themes into the final six main concepts as follows:

1. The authority of decision-making
2. Reaction to change in the decision-making process and approach
3. The decision-making approach in urgent/emergency times and crisis
4. Limitations of effective decision-making
5. Important factors for effective decision-making
6. Implementing decisions effectively.

To understand deeply the decision-making authority, flexibility in the process, and decision-makers' view, we think the first three categories show the decision-making process and its environment, and the fourth category 'limitations of effective decision-making' can help to understand the reasons for the approach. To recommend what can be done to make the process more effective, the limitations and the two last categories may help us.



Source: Own construction

Figure 2: The process of collecting and analyzing data

FINDINGS

The authority of decision-making

In this section, the aim is to investigate the banks' decision-making authority. For this reason, the level of authority and the regulations of banks define the authorized people for decision-making. The group or individual decision-making, members of the decision-making groups, the involvement of people in decision-making, and finally the leadership style of the organization are discussed based on the interviewees' responses.

We categorized the case studies into EXIM, local banks, and foreign-owned banks. Except for EXIM which is specialized in support of export activities, the interviewees in the banks mostly pointed out that the decision-making process in export financing activities is the same as other risk-taking activities in their organizations. The National Bank of Hungary's regulations should be followed by all banks. The authority of decision-makers is classified based on the amount of credit limit. It means that when the value of the credit is above the maximum limit defined for one level then the case shall be decided at a higher level. All the processes of these authorizations are written in detail and are tightly controlled.

Decision-making units in all banks are formal committees where each official member has voting rights and/or they rely on the four-eyes approval principal. Top management is usually involved in the committees in addition to the middle managers of related departments. The difference is in the number of levels. In local banks, there are mostly three levels, which are four-eyes approval (two people), credit committee, and the boards' committee. Sometimes there can be some levels in-between the layers. For example in Bank 8, there is another level that is called the management committee that is between the credit committee and the boards' committee; it is not directly a group of decision-makers but controls the cases that should be decided by the board. In the case of Eximbank, there are five approval levels. The first and second levels from the bottom of the hierarchy are in the shape of four-eyes approval. The first level is four-eyes

approval by two decision-makers from different departments. The second level is four-eyes approval by two decision-makers from the same department who can approve the specific questions. The third level is the credit committee. The fourth level is the board of directors. The fifth layer is above the boards, that is the state bodies as a shareholder of EXIM (the Ministry of Foreign Affairs and Trade). In case of MEHIB (the insurance company), there are only four layers, as instead of the credit committee, there is an insurance committee. In the foreign-owned banks, the case is a bit different. With the exception of Bank 7, the foreign-owned banks, in addition to the three levels, also have two more layers that are related to their mother bank: the credit committee at the mother bank-level and its management board level.

In addition, according to the interviewee in Bank 1 decision-making authority for regional managers is very limited and it is only used when rather limited values are concerned. It should be noted that in case of export credit and financing, usually, the value is larger than the limits defined for the lower levels, and accordingly, such cases are decided by the credit committees.

The four-eyes principle in the banks is exercised usually by one decision-maker from the risk side and one from the front side (business or underwriting side). The decision-makers are usually managers, but it happens to be at the expert level in the case of rather limited value decisions where the protocols have already been accepted in the past and no new issues are involved. The interviewee in EXIM in 2021 stated that:

> "[…] at the lower levels, decisions are possible to be taken which are deemed to be technical and which do not intake an additional obligation from either of the institutions. In the case of first level four-eyes approval, we may talk about approval of even undertakings but not new deals and new limit undertakings. These decisions are connected to undertakings which are influenced by already executed deals or risks […]."

In Bank 7, one of the foreign-owned banks in Hungary, the decision-making process is different from that previously discussed. Decisions typically are not made in committees. Our interviewee said that:

> "In the credit chain only the higher-level approval body is the committee. So this is a very flat organization and personal accountability is really important in this organization."

She added that:

> "[…] we have a risk-taking system for 1 to 22 rates. The clients take credit ratings and based on the risk-taking and the seniority of the people, the decision-making levels are identified. The local mandate is the 'c' mandate, the regional mandate is the 'b' mandate and the global mandate is the 'a' mandate. So, it also is a hierarchal issue. Certain amounts can be approved in each mandate. Ex: we have a front office and risk management office. So the first line and the second line approval bodies together can sign a credit proposal."

Strategic decisions are made by top management. Middle managers are not decision-makers in strategic issues but they are involved in their preparation; they provide updates for top managers regarding the requirements in the micro-level, front side, and the local market. The interviewee in EXIM added that:

> "When the strategy is prepared definitely everyone is asked for their thoughts, inputs but later on strategies are finalized based on internal negotiations with top management, with the owner and with state representatives, etc. and at the end of the day strategy is always approved by the highest level of the bank."

According to the interviewees, most banks seem to follow participative leadership. However, the leadership style in Banks 3 and 5 tends to be somewhere between autocratic and participative. In Bank 7 the leadership style tends to be much more of a laissez-faire style. For EXIM, the interviewee believed that the precise explanation of the leadership style for the organization was to call it 'collegial' leadership and it was hard to put it into the three categories of autocratic, participative, and laissez-faire styles. He added that:

> "[…] I think that such an answer should be for any other financial institution in Hungary because it is required to operate in a specific way by law. So setting up committees, having 'collegial' decisions, having a primary review of the discussed matter, opinions provided from different units, independent evaluations of the matters discussed by different units, these are all requirements of the law banding for credit institutions."

The interviewee in Bank 7 pointed out that the laissez-faire leadership style can be successful in normal times but when there is a crisis, it may not be so effective. The direction will be lost and she mentioned that in her experience in crises a more autocratic style could help. She added that it should be taken into consideration "what kind of management approach would fit to the actual situation."

Reaction to change in decision-making process & approach

Here we discuss how the banks react to the needs of change and the limitations they face in deciding about change and/or implementing it. We provide information on how the decision-making process regarding export financing activities can be flexible in banks in Hungary, who can initiate changes, and who is authorized to decide on their approval.

Because of the highly regulated decision-making process and the obligatory transparency in Hungarian banks, it is hard to implement any change which requires a lot of extra effort. They need to follow a very formal process. If there is any room for flexibility, it is clarified in the regulations and applies to very few cases, according to the interviewee in the Bank 2. The first interviewee in Bank 3 pointed out that in case of this possibility, they still needed to get permission from higher levels. Each employee can initiate changes but it should be approved by top management. In case of foreign-owned banks it is a bit more complicated because after the approval by the top management in Hungary, it should be approved by the mother bank. In both cases, the National Bank of Hungary's approval is a must. All of these difficulties make it hard to initiate and implement any changes. Therefore, in the banks, the procedures have remained mostly unchanged. However, this is not necessarily a negative aspect. The interviewee in Bank 2 mentioned that it could be good as everything was clear and everybody knew exactly what guidelines they should follow. He added that:

> "[…] They are minor changes in decision-making due to the organizational changes. But the main logic and the authority are actually pretty fixed. However, there is always a revision of every internal regulation biannually at least. And the proposal goes to the related board to see if it is feasible or not."

According to the first interviewee in Bank 3, although theoretically implementation of some changes can be possible, in real life, radical changes have not happened. However, the second interviewee mentioned that during his two years of working in Bank 3, there was one considerable change which was to shorten the procedure, and they eliminated certain documentation. In Bank 5, the interviewee mentioned that in the last five years, the only change was because of the Covid-19 pandemic, which made them review the decision-making process.

The case for Bank 7 is a bit different because of the Dutch culture of the mother company. The organization is more open to change compared to other institutions in this case study. The interviewee mentioned a big change in the decision-making process. About ten years ago, it was decided to change the decision-making process from a committee basis to a mandate basis with a four-eyes approval principal. In their experience, the committees were not working effectively. They are now satisfied with the new way and do not see any need to change it.

The interviewee in EXIM in 2021 mentioned also that the decision-making process and regulations are the same as in 2019, when we had the first interview with him. Only some minor technical changes may have happened since then. He pointed out that:

> "[…] in the decision-making approach itself, there can be no change. However, they know the freedom given by the overall general regulation of EU and Hungarian regulation which is concluded based on the EU requirement. So you do not have the maneuver to change your internal processes on substantial matters. However, in the process itself, I would say there are some possibilities to implement changes. For example, there is no specific regulation neither prescribed by the European Central Bank nor by a financial institution of the country (which prescribes the authority regulation) which would define that a bank and/or an insurance company need to conclude a decision on the board level after 5 billion HUF."

So, the ECA has the space to maneuver to change this limit but cannot change the decision-making approach.

The decision-making approach in urgent/emergency times and crisis

The core aim of this section is to discuss what the decision-making approach of banks is in response to times of crisis or times when there is a need for urgent/emergency decisions. We analyse the possibility for the banks to have some different way or approach of decision-making in these cases, and see to what extent the banks can be flexible in irregular cases.

The solutions of the banks in response to urgent situations are different. For example, the interviewee in Bank 2 pointed out that:

> "In the regulation there is the possibility to have emergency committees. To organize an emergency committee, the members should agree that the case is so important that it should be decided earlier than regular time."

The second interviewee in Bank 3 noted that if there were an emergency case, more meetings than in regular

times could be held. In Banks 5 and 8, in case of emergency, within the allowed terms in regulations, lower levels may have been delegated to specific decisions. In Bank 6, the interviewee mentioned that decision-makers would agree on prioritizing decisions for a specific purpose. In Bank 8, in case there is no time to implement the decision-making process in its formal time and process, the chief risk officer (CRO) is allowed to speed up the process of preparing documents.

To bring up the question of how they would respond to the crisis, the example of the Covid-19 pandemic was used. The interviewees mentioned that the most considerable change was to hold meetings virtually, start home office functioning, change a few policies about decisions, and arrange more cooperation among managers and employees. The banks that already had the systems – digitalization and facilities for home offices – could respond more efficiently to this situation. Accordingly, if banks are up-to-date with technologies and facilities they can confront such crises better. In Bank 7 the interviewee mentioned:

> "They did a lot of cooperation, renovation and collaboration. Covid-19 did a larger push for digitalization and it is needed worldwide now."

In addition, Bank 7 has a strong culture of organizational learning. When they encounter an issue, they go back and consult the lessons learned or have a discussion. This assessment is done twice a year. She also pointed out the flexibility to use different people when it was needed:

> "[…] In cases we needed different people, and then those people came to the picture because different situation needs different types of people."

The interviewee in Bank 5 stated that making a rapid decision was not a good idea since you would need to see the outcome and he added that:

> "[…] In Covid-19 time, we know that we have to be more conservative for project finances which are in the field of the hotel business. So it is not important to make decisions quickly but we should see it in a strategic way. We have to specify the worth this project has and then make the decision and implement it."

Similarly, the interviewee in Bank 8 mentioned that during COVID-19 the rules were more conservative, the number of loans was reduced, and the bank was not as business-friendly as it formerly was. He added that while the decision-making process has so far not changed, a few policy documents have changed slightly during the pandemic.

In EXIM, during Covid-19no regulation changed in some elements that the interviewee in EXIM pointed out that:

> "In the point of view of approval, preparation of decision-making materials, no regulation changed in lower level or at the supervisory authorities."

The changes were to ease the repayment conditions for a domestic portfolio for the clients who already had contracts with EXIM. The interviewee in EXIM added that:

> "In pandemic time we cannot speak of a huge amount of new portfolio. There was not the time of new deals; there was a time of normalizing the already available deals."

In EXIM, during the pandemic, all portfolios were affected in some way, and some moratorium circumstances were altered, resulting in a period of intense decision-making to make the right decisions. In addition, they established a Covid committee to deal with specific operational issues that were difficult to fit into the regular operational committee.

In EXIM, the interviewee indicated that sometimes in unexpected circumstances, the standard established set of processes might not be followed; they might put the decision-making process on hold to avoid losing the business cases while waiting for a proper decision.

Limitations of effective decision-making

In the previous sections the decision-making approach in the banks regarding export financing activities, their reaction to the needs for change, and their decision-making solutions to irregular times were discussed. However, in all cases there may be some limitations decision-makers face in making the process of decision-making effective. In this section, we discuss the most important and frequent limitations regarding the interviewees' experiences. The limitations are in regulation, time and speed, lack of willingness to make decisions, people who are involved in the process of decision-making, information, budget, standardization, lack of willingness for simplifying the process, and not enough measurement of efficiency of decision-making process.

The most frequently noted limitation was the 'regulation'. In the opinions of most interviewees, banks in Hungary are over-regulated. For foreign-owned banks may be more difficult because as the interviewee in Bank 3 stated:

> "[…] there are a lot of internal and external rules. There are a lot of governmental rules, regulations, and policies from the mother company and also the Hungarian banking system."

The interviewee in EXIM referred to regulation as the biggest limitation in Export Credit Agencies (ECAs). He noted that:

> "Hungarian Export-Import Bank is a financial institution which is fully under the regulation of banks and financial regulations of both Hungary and the European Union."

He gave one real example of how regulations can result in considerable limitations:

> "After the crisis 2008-2009, the first obstacles for financial sector participants in preparing the development plan were regulations. More than 20% of companies and banks who are doing business in the European Union pointed out that the regulation was the biggest obstacle. Because in all cases when the new regulation is introduced, the regulators do not always know how the market functions in real life and the new regulations are always hard issues to be solved […]."

In general, requirements and the volume of information, documents, requesting a large amount of collateral, and other material from clients are sometimes unnecessary that makes dissatisfaction among clients.

According to the interviewee in Bank 1, the overregulation makes the process very time-consuming and if the client only has a short time, they may lose the client. Interestingly, the second most frequently mentioned limitation is time and slow speed in the process of decision-making, especially when the case is export credits, because it is not an easy product and therefore is time-consuming to decide properly (interviewee in Bank 4). The existing bureaucracy and lack of authority at lower levels in decision-making are considered to be a very important issue as they increase the time needed for decisions. This can be even more time-consuming in the case of foreign-owned banks, as the interviewee in Bank 1 noted:

> "[…] this is the common problem for the Hungarian banks owned by foreign mothers because a lot of deals must be sent to the mother bank for approval. And this is a problem because officially all these Hungarian banks are independent banks but officially or not officially big deals should be sent to the mother bank. This is the same structure for every Hungarian bank owned by Western mother bank […]."

However, the interviewee in EXIM had a different aspect to time. He mentioned time is needed for the preparation and analysis of the information. He mentioned that there should be a balance between time and the depth of information. As he said:

> "[…] definitely if you want to have a full picture of what you approve, then time needs to be spent to present the specific matter what you approve. Decisions could be taken much faster but whether these decisions would be the best, it is hard to tell. […] But in the end, you need to have some balance between the need of time for the specific decision and the deepness of information you get, the deepness of analysis you do."

In today's business world, one solution to access proper data in as short time as possible is that organizations should access blockchain technology. Hungarian financial institutions still do not have access to this technology.

As the interviewee in Bank 7 pointed out, a lack of willingness to make decisions can be a limitation for effective decision-making:

> "When people are not able to make a decision or when people don't want to give their name to the decision, they ask lots of questions, and they push back the proposals so many times to reconsider and they don't submit again."

She noted that sometimes it is not about lack of willingness but can be about a lack of decision-making ability of people or very slow decision-makers, even if had an infinite amount of data.

The interviewee in EXIM also said that:

> "Decision-making is very much limited theoretically by the people who are participating in decision-making."

So in EXIM, in all phases of the decision-making process, eligible and skillful people should be used. They have an impact on the quality of the decisions for example by interpreting the information properly. He mentioned that the other limitation is information, which is influenced by how it should be collected, evaluated, presented to the decision-makers effectively.

However, the interviewee in Bank 3 mentioned that hiring skilled employees and keeping them in the

organization needs a high budget. The budget also is needed for providing better facilities in the decision-making process. In addition, the interviewee in Bank 1 mentioned that hiring enough employees requires a big budget and added that:

> "The client's executives are serving a lot of clients. It is very difficult to serve every client's day-by-day issues they have. We should not forget that after having financial sources there is a quite long process to check the flow of process as making extra monitoring is required. This is the main problem that we are facing."

Therefore, one important limitation is the budget. The other limitations noted by interviewees are standardization, lack of willingness for simplifying the process, and not enough measurement.

Important factors for effective decision-making

It is important to know which factors are important to have an effective decision-making in the organization. In this point, these factors are discussed.

Data, information, and knowledge are noted as very important factors for effective decision-making by most interviewees. Some of them mentioned the necessity of proper technology, well-integrated systems, and clearness for an effective decision-making process. Everything must be clear, such as having clear rules, a clear understanding of rules, clear information, and clear expectation of clients and banks, and proposals should be clear and have the key points. The interviewee in Bank 2 pointed out that:

> "[…] for the clients also the clear expectation is a value because the business colleagues know what they can deliver and what not. In most cases, we know what can fly at risk and what cannot. We have a common understanding of risk levels. And this is not measured and it is not written. It is coming from management, I think. For years we have stable management and they deliver these messages. We saw in the committees that which risks were considered and what the approach was."

The interviewee in Bank 7 pointed out that:

> "[…] how many questions, what kind of information you obtain from these questions, the data availability is important for effective decision-making. Decision-makers also should know the basics to make the decisions and should have broad knowledge about the area and have enough time to make decisions. So if you have the right people with the right knowledge and experiences and the right personality, good group dynamic, clear questions, good cooperation among people and be able to rely on each other, … then they can make good decisions. […] it is important to have a supportive environment in the organization and to have an inclusive environment that your opinion is heard. So you can express your opinion because it not results [in] punishment."

The interviewee in Bank 8 explained why simplified, good quality, and clear proposals play an important role:

> "Right way of presentation of the facts, risk, and documentation is so important. Because the application is sometimes too long, so it is important to provide the most important facts and risks is presented to the decision-makers. […] By standardization, we would understand certain limits and requirements for decisions."

The interviewee in Bank 2 pointed out that the proposals for export financing activities should be deeply analyzed because of the complex environment and he said that:

> "[…] it is important to have the clear definition within the bank what is the expectation of the proposal, what it should contain and what should not because the managers and the decision-makers have no time to read 100 pages without any added value. So that is the main topic."

Some interviewees put value on delegating more authority to lower levels because they believed the effectiveness of the decision-making process could be enhanced. They also mentioned that from the risk side, delegating more authority to lower levels may not be so valued. As the interviewee in Bank 2 pointed out:

> "There is always a hard procedure to align the authorities. Because from the business side we would like to be more flexible and have more authority to decide more freely, but we have risk department which is thinking the other way around and want the decisions to be made at the higher level possible."

In EXIM as an ECA and a state agency, more than being effective, the point is to be prudent. They need to have transparency and prudentiality to achieve the defined goals. The interviewee in EXIM added that:

> "[…] from the business point of view, it can hardly become effective. This is always a conflict of interests between effectiveness, quickness, and transparency and prudentially inside the financial organizations, especially in state financial organizations. It is important to find the balance between these important factors […]."

Implementing decisions effectively

While we discussed the importance of having effective decision-making process, it should be mentioned that while a good quality decision may be made, it will matter if the decision is not implemented in an effective way. As mentioned earlier in the literature section of this study, "Without implementation, the decision is just a concept." Accordingly, here it is discussed how the decisions regarding export financing services can be implemented effectively.

In addition to the qualified employees who will apply the decisions, clear, simple, and convincing decisions are required to effectively achieve the purpose of decisions. Digitalization and high technology were mentioned by interviewees as important in today's business environment to implement decisions effectively. The working speed in the organizations is crucial to achieving effectiveness. In this context interviewee in Bank 3 pointed out:

> "The problem of losing clients is sometimes because we are not fast enough. […] and if we don't have a system to have a quick process then we need at least 2 or 3 weeks to answer the request of our partners. But in real life clients need an answer within 1-2 days, so you lose the client. So, lots of clients left us because we were really slow."

The interviewee in EXIM mentioned that as Eximbank and MEHIB are integrated, they are unified with one structure and share the same staff, management, leaders, decision-making bodies, and the same owner. Nevertheless, sometimes there may be a conflict of interest between the insurance company and the bank. However, because of this integration, the client can deal with both issues in one place and it reduces the paperwork and increase efficiency. Accordingly, if there will be collaboration and harmony in the export financing industry in a country, the whole process can be more efficient.

DISCUSSION

From the interviews, it seems that EXIM and the commercial banks' organizational environments tend to be hierarchal with a relatively stable environment. It seems that there is an approximate tendency to centralization and bureaucracy in their decision-making processes. In lower levels, the four-eyes approval principal with very limited authority is followed and at higher levels, they decide in committees. However, Bank 7 compared to other banks seems to be more flexible, less centralized, and more flat but it is still a hierarchal organization. In the foreign-owned banks and in EXIM, there are more layers of decision-making than in local banks because above the board meeting, in EXIM there is another decision-making body which is the owner (Government bodies in the Ministry of Foreign Affairs and Trade) and in foreign-owned banks, in case of Banks 1, 2, and 3, there are two more levels, which are the credit committee and the boards in the mother bank. In Bank 7, the case was different as they follow a different organizational culture (Dutch culture). They have three mandates. Based on these mandates, the levels of decision-makers change and it is in the shape of four-eyes approval decision-making (one from the front office and one from the risk management office). The only approval level in the shape of the committee is in the higher-level bodies.

Decision-making in Hungary is always group decision-making and nothing can be decided alone, whether the process involves committees, higher-level meetings, or the four-eyes approval principal. The committees are always very formal. The leadership style in the case studies tending to be mostly participative or lies between autocratic and participative leadership styles, except for Bank 7 which has the laissez-faire leadership style. The mother bank of Bank 7 is Dutch, Banks 2 and 3 are Italian, and Bank 1 is Austrian. According to the GLOBE project, the Country Practice Score of the cultural driver 'power distance' which shows to what extent people accept unequal distribution of power, is reported between relatively high and high for Hungary and Italy, relatively high for Austria, and almost medium for the Netherlands. This can explain the considerable difference in the decision-making authority distribution between Bank 7 and the other case studies.

Regulation plays a very crucial role in the decision-making process in the financial institution in Hungary. All details about the decision-making process are regulated and written. According to the interviewees in some cases it is even overregulated, which may not be really necessary. All the banks need to follow regulations defined by the National Bank of Hungary in addition to their internal regulations. In the case of foreign-owned banks, they also need to follow the mother banks' regulations, which is influenced by another country's rules. In EXIM, in addition to internal regulations and given regulation by the National Bank

of Hungary, they need to follow the EU and OECD requirements for ECAs.

As all of the banks operating in Hungary need to follow the regulations given by the National Bank of Hungary, the general processes of decision-making in banks are almost the same. Transparency is highly valued and controlled in the banking industry. They are not so change-friendly because if they would want to apply any change they need to go through a very time-consuming and hard path, get approval from the higher levels, the National Bank of Hungary and in the case of a foreign-owned bank, the permission of the mother bank also is needed. However, the organization of Bank 7 is more flexible towards change due to the Dutch national culture.

In case of emergency, the banks in general act more flexibly than in normal times. Different solutions were told by interviewees in different banks, such as having more meetings at a time, giving more authority to lower levels to decide, having some emergency committees if necessary, prioritizing the decisions based on the urgent situation, and accelerating the preparation of documents needed for decision-making.

In response to the Covid-19 crisis, the banks acted almost the same way. They shifted to the home office where possible, continued their meetings in virtual platforms, digitalization was improved, and more collaboration among employees and managers was put in place. In EXIM, in addition to these actions, they created a Covid committee for the Covid-related operational issues that were not so easy to deal with in a regular operational committee. The banks which were ready with their digitalized and home office facilities before the pandemic could change over to virtual work much faster and more successfully.

To discuss the effectiveness of decision-making in export credit and financing activities in Hungary, it should be noticed that clearness in every requirement and phase of the decision-making process was mostly mentioned as an influencing factor. This means clearness in information, proposals, rules, and its comprehension, in expectations from banks and clients, etc. The simplicity and clarity in which the purpose of decisions is considered at all phases of decision-making and implementation are highly valued. Access to high technologies, up-to-date facilities, and skilled human resources is essential to keep the balance between clearness and not missing any important points. In addition to competence, being skilled and experienced gives employees the confidence to make decisions. In general, the quality of decisions and the efficiency of the process are dependent on the skilled and experienced decision-makers and other employees and also on the facilities, both of which need a high budget. In 2019, the Human Development Index is reported as 0.85 (the maximum can be 1) for Hungary by the United Nations Development Programme (UNDP). This shows that Hungary has a good human infrastructure and capabilities. Therefore, employees, lower-level managers, and middle-level managers most probably have the ability and are qualified to be involved in the decision-making process. However, as mentioned above, hiring and keeping qualified employees requires a good budget for high incomes and an efficient process to decrease the costs. More clients bring more money. However, complicated regulations, requirements, paperwork, and processes that require too much time lead to losing clients. By decreasing the unnecessary requirements and documents asked from clients, giving more authority to lower levels, and decreasing the existing bureaucracy level, the process can be made faster. Foreign-owned banks asking for approval for some cases from the mother company is another factor that makes the process slower. In addition to faster processes, access to soft information in decision-making will be much higher when more authority is provided to lower levels.

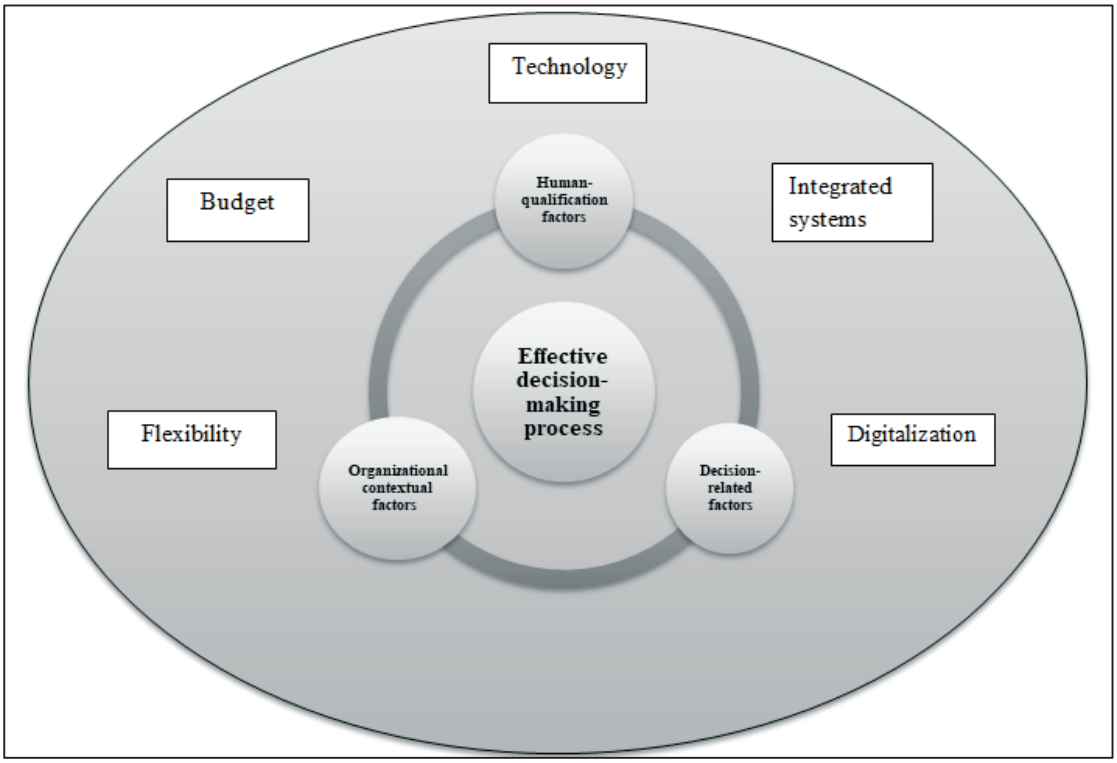
The accessibility of good quality data and information and the ability to analyze it effectively are factors that play a crucial role in the effective decision-making process. To achieve this aim, high technology, digitalization, and integrated IT systems in the organization and even in the industry are a game-changer. In today's business world, access to more artificial intelligence and blockchain technologies should be achieved. In Hungary, banks are not yet accessing blockchain technology.

According to the literature, effective decision-making supports the achievement of business objectives. The meaning of effectiveness in commercial banks and Eximbank is different. As mentioned above, what is important for EXIM as an export credit agency is to fulfill the requirements defined by the state to support exporters. However, in commercial banks, it is important to increase profitability in addition to meeting the requirements defined by the National Bank of Hungary or other superior organizations. Accordingly, considering the goals and strategies of the organizations is very important in the effective decision-making process.

Based on our results, the factors influencing the effectiveness and efficiency of the decision-making process can be categorized into three categories: decision-related factors, human qualification factors, and organizational contextual factors. These categories are almost the same as the categories given by Hensman and Sadler-Smith (2011) regarding the factors affecting intuitive decision-making in the banking sector. Data, information, time, clearness, and simplicity of the proposals and the decisions made belong to the 'decision-related factors category'. The qualifications-related factors like experience, skills, courage, ability, the willingness of decision-making, and knowledge of the people in the organizations belong to the 'human-

qualification factors' category. Finally, the factors like bureaucracy, delegation of decision-making authority, power distribution, hierarchy, goals and strategies, regulations, and laws belong to the category called 'organizational contextual factors'. The three categories are shown in Figure 3.

As shown in Figure 3, some other factors can also influence the quality of decisions and the influence of the three above-mentioned categories on effective decision-making; we call these 'amplifier factors'. These factors are budget level, having some flexibility (in regulations and decision-making approach), technology (ex: artificial intelligence and Blockchain technologies), digitalization, integrated systems, etc. Accessibility to these amplifier factors can create a competitive advantage for the organization in the market.



Source: Own construction

Figure 3. Conceptual framework to describe the factors influencing the effective decision-making process in export financing services by banks in Hungary

One factor can be a limitation in one situation and in another situation it can be a factor to increase the effectiveness and efficiency. What really matters is in what context it is used and how it is implemented. Keeping the balance between all the elements and not just putting all energy and attention into some factors is essential. None of the factors should be sacrificed for others. All of them should be taken into consideration and the balance among them should be kept. The key is balance. Each of the factors influences the other ones. It is like a chain where the elements have an effect on each other.

CONCLUSIONS

Based on the large share of the export income in the GDP of Hungary, research on export-related topics is crucial. As export financing is very important in the growth of exports and decision-making in this area is very crucial, this study aimed to discuss the decision-making in export financing services provided by banks in Hungary. The case studies are EXIM and eight commercial banks.

The result of most of the case studies shows that the decision-making procedures appear to have a relative inclination toward centralization and bureaucracy. The decision-making is in the shape of a committee at higher levels and the lower levels with limited authority often employ the four-eyes principle. In banks in Hungary, there is no individual decision-making. The groups of decision-making are all formal. They mostly follow a participative leadership style except for a few banks with a leadership style between autocratic and participative and one bank (foreign-owned bank) with the laissez-faire leadership style. The regulations in Hungary are very strict and need to be followed very carefully. If there is some flexibility for example in urgent cases or crisis situations, then it should be included in the regulations and decision-makers should follow them.

We categorized the factors that directly influence effective decision-making into three groups: decision-related factors, human qualification factors, and organizational contextual factors. In addition, some amplifier factors can influence the quality of these three categories. These factors are budget level, flexibility, technology, digitalization, integrated systems, etc. A competitive advantage can be achieved by amplifier factors in addition to the decision-related factors, human-qualification factors, and organizational contextual factors. In addition, to be effective, the interests of both the risk management side and front office side should be taken into consideration.

We recommend that the amplifier factors should be given more attention. Among them, flexibility is an issue that is not followed in many Hungarian banks. That probably is due to point of view of the political system in the country and EU that defines the external regulations for the banks. Having flexible regulations provides the managers with the possibility to choose a style that is suited for the situation they are in. The style can be based on the nature of decisions, the amount of information they have to ask from clients, the time they may spend on the decisions, the authority they may delegate to the lower levels, the special consideration they may apply for some clients, and so on. For example, when the case is urgent with a previous reliable client, they should be able to make some shortcuts to keep the client but in a case of a crisis, they may need more information and more time for the decision. More group decision-making in the shape of committees or large groups at higher levels can be suitable when there is time for a decision. But when there is an urgent case then the individual or four-eyes approval methods may be more suitable, especially when the question of a decision is more generic. In addition, as the larger the size of an organization, the more efficient it may be to give more authority to the lower levels with a larger allowed credit limit. By giving authority to the lower levels there is the advantage of using soft information besides hard information. Although, as mentioned in the literature section, the four-eyes principle may not be an effective way to avoid corruption, it is useful for building in different opinions and more controls. What is important is to have the flexibility to be free to choose the best option possible at a particular time. Another issue that should be taken into consideration in Hungarian financial institutions is access to blockchain technology, which can help in gathering a large amount of information in a shorter time, which would help to satisfy both the risk management side and the front side of the organization.

For future studies, we are planning to compare the issue in Hungary with data from another country.

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APPENDIX

Interview Questions

1. Interview questions asked from EXIM interviewees in 2019:

1. What is the approach of decision-making in the organization? Do you think the current decision-making approach in the organization is effective? And what is your suggestion for that?
2. What is your opinion about effective decision-making and what are the important factors to have an effective decision-making process?
3. To what extent group decision-making is used in the organization? Do you think the group decision-making is more effective for this organization's structure or individual decision making? To what extend do you think group decision-making can be efficient? Please explain how it is done in the organization?
4. In what condition can the decision-making approach change? (Please explain both permanently and temporary)? Who will decide about the changes?
5. By reading the strategies of the organization during 2017-2021, mostly it can be understood that the organization care about supporting the export rather than being profitable. Is it true? Please explain the details about this kind of decisions. Also please explain to what extent is the organization is dependent on Governmental budget?
6. What are the strategic decisions to avoid big loss during the possible financial crisis? Do you think the efficiency of the information systems can be effective in this area? What is the strategy for information systems and technology used in the organization?
7. What is the decision-making approach and solutions in urgent situations in EXIM?

2. Interview questions asked from all the interviewees in 2021:

1. What are the decision-making (DM) approaches & methods in the organization? What types of decisions are delegated to lower-level members in your organization? Are middle-level managers involved in developing the strategy of the organization?
2. What type of leadership is characteristic for the organization? (e.g. autocratic, participative, laissez-faire)? In your opinion, is this method effective? Can you mention examples from the last 3 years when the decision-making system resulted in failure, or led to problems in the organization? How can the decision-making process be more effective in the organization? Who is responsible in the organization for initiating changes in the decision-making system?
3. Which factors do you think are important for effective decision-making? To what extent are decision-making processes prescribed in written document? Is there possibility for decision-makers to implement changes in the decision-making process?
4. Is there a cause-and-effect relationship used in evaluation the efficiently of the decisions made? Are these measure quantitative or qualitative (or a combination of the two) types?
5. How frequently are evaluations in the organization in relation to efficiency of decision-making? If the answer is yes, then who can initiate the evaluation? Are the evaluations made in regulated intervals, e.g. annually, or biannually, or in five years intervals. Is this evaluation part of the strategy evaluation and control process?
6. What are the important factors for implementing the decisions effectively? What types of measures are used? Is the evaluation person-specific, or the unit of evaluation is a department or a directorate?
7. To what extent are the rules flexible, that can it be adapted to the specific conditions of the situation? What are the limitations in the way of effective decision-making?
8. What type of motivation means are used which intend to realize higher level of efficiency?

9. Is decision-making based on the goals and strategies of the organization? And how can be more in the same direction? What system is used in the organization to specify the requirements from lower level employees/managers (e.g. Balanced Score Card)?
10. To what extent is group decision-making used in the organization? Are there formal decision-making groups, or ad.hoc emerging informal groups? And what is its benefit? Are there intentions to increase the reliance on group decision-making?
11. In what condition can the decision-making approach change? Who is entitled to empower lower-level individuals/groups with decision-making responsibilities? How frequently were the decision-making approaches changed in the last five years?
12. What is the approach of the organization when there is a need for urgent DM or in a crisis time? Who is entitled to specify the new approach in case of regular operative decisions of credit decision or insurance solutions?
13. Your suggestions about improving the system? Is there a need to change the system in a short run, or can it be decided parallel with strategic changes or developing a new strategy?

A Systematic Review and Weight Analysis of Mobile Financial Services Adoption Literature from 2011 to 2021

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SUMMARY

The global extent and use of the internet and mobile have increased the importance of mobile financial services (MFS) and payments. However, only limited numbers of review studies are accessible on the topic. Therefore, this paper aims to offer a systematic literature review (SLR) methodology and perform a weight analysis of articles published between 2011 and 2021. By reviewing 61 studies, the results indicate that the unified theory of acceptance and usage of technology (UTAUT) followed by the technology of acceptance model (TAM) are the main conceptual frameworks and models adopted. It reveals that attitude, perceived ease of use, performance expectancy, habit, social norms, and perceived usefulness are the best behavioral intention predictors. The critical technological factors of using MFS were provided, followed by future research opportunities.

Keywords: Mobile banking; mobile payment; mobile money; mobile wallet; mobile financial services; systematic literature review

Journal of Economic Literature (JEL) code:M21, M29, G21, G23

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INTRODUCTION

The rapid rise in the growth of mobile technology throughout the world is a phenomenon that has been mainly notable among poor people, primarily due to the prepaid model. Since their importance in disseminating information, particularly the innovations related to mobile money services, mobile technology has been acknowledged worldwide to deliver financial services. With the expansion in the coverage of mobile phone networks and accelerating user growth, mobile financial services have become a powerful channel for the banking industry to offer its customers a wide range of services, overcoming temporal and spatial hindrances. Due to their unique features, such as always-on availability, mobility, and personalized small devices, mobile phones have promptly spread in developed and most developing nations to overcome geographical and socio-economic barriers. Indeed, mobile technology has the potential to allow two primary questions to be addressed simultaneously: from the demand perspective; it represents a possibility for financial inclusion among a population that is underserved by traditional banking services. From the supply angle, it opens up the opportunity for financial institutions to deliver a great diversity of services at low cost to large customers of the poorest sections of society and people living in remote areas.

Mobile financial service (MFS) is a broad term that encompasses a variety of financial services that can be conducted on a mobile phone (Gbongli et al., 2020). The typology of mobile financial services entails three leading forms: mobile banking, mobile payment, and mobile money transfer (Gbongli et al., 2020) (FIRPO, 2009). Mobile banking is an additional medium for prevailing customers to interact with the bank. It enables them to open new bank accounts, gain account information, check their balance, block missing cards, transfer funds, obtain branch and ATM locations, and even make financial investments. Mobile payment enables users to make person-to-business payments for goods and services through mobile phones either at the

point of sale terminal or remotely. The customers are gradually using these services as it increases their convenience by excluding the need for coins and cash for small transactions. Mobile money refers to the service that allows users to transfer money between people with less access to bank accounts (Kim et al., 2018) (Gbongli et al., 2019). The GSMA (2021) report indicates that in 2020, there are 1.2 billion registered mobile money accounts, 5.2 million unique agent accounts globally, 310 mobile money deployments are live in 96 countries, and a 17 percent year-on-year increase in the accounts (GSMA, 2021). Total mobile money transaction values grew by 22 percent in 2020 to reach $767 billion. Therefore, the industry is unprecedently processing over $2 billion daily while having more than doubled in value since 2017. Accordingly, the GSMA expects this value to surpass $3 billion daily by 2022.

These trends recommend that significant growth opportunities remain, leading to predictions of potentially massive increases in mobile money users. Although mobile money services seem to be incredibly promising, there is still a need to understand their growth potential and grow this potential fully (Gbongli et al., 2017). Despite such prevalent adoption of smartphones and internet networks, the adoption ratio of mobile financial services is comparatively low (Deb & Agrawal, 2017) (Thakur & Srivastava, 2014) (Gbongli et al., 2020), and the financial industry has faced resistance from customers who were skeptical and reluctant to adopt these novel services. Due to these challenges, financial services must continuously assess customers' readiness to adopt technology-based mobile financial to offer adequate services that provide the best value for both the consumer and the service provider.

Several studies use qualitative and quantitative methods to analyze mobile financial services (MFS) and related factors that impact consumers' adoption. Despite substantial research on MFS initiatives revealed in international journals across disciplines, there have been scant attempts to provide an integrative model that improves our understanding and explains MFS adoption. Additionally, our examination of the literature background elucidated that the general studies are spread across various areas and contexts in which adoption has been studied. Such fragmented literature makes it challenging for scholars to build upon the existing knowledge and advance the research in the area. Considering the complex nature of MFS as a merging of mobile and financial services, MFS as a focus of research deserves analysis on a broad range of issues surrounding the seamless connection and coordination of these different factors.

To help researchers overcome this challenge, we suggest organizing the literature in the area and critically synthesizing it for future reference. Towards this prospective, the current study proposes to employ the systematic literature review (SLR) methodology and perform weight analysis, which provides an extensive way assessment of the related work, and yields numerous advantages as discussed by earlier SLR studies (Behera et al., 2019) (Seth et al., 2020). Based on the weight analysis, the current research will reconcile conflicting evidence and draw a "big picture" in mobile financial services research. The study further proposes highlighting the critical technological factors of using mobile financial services, which contribute to an opportunity for financial services to build the right mobile financial for human needs.

Following earlier systematic review studies, the remaining sections are organized as follows. Section 2 offers a brief overview of the methods used to ascertain the relevant research included in this review. Section 3 focuses on the general characteristics of the selected studies and the key themes emerging from existing research. Section 4 conducts weight analysis and outlines the findings. The following section assesses the critical technological factors of MFS. Finally, this study concludes with research limitations and future research directions.

METHODOLOGY

We adopted an established research technique for systematic literature reviews to analyze the literature on mobile financial services (MFS) and derive a comprehensive classification of its determinants. A systematic review remains a literature review that intends to answer a formulated question on the topic(s) by finding, describing, and assessing evidence from all published work associated with that question within a particular set of boundaries (Eriksson, 2014). This technique has several advantages over traditional narrative reviews. However, narrative reviews are built mainly on the experience and subjectivity of the author. They generally exclude a section describing the related papers' data sources and localization strategy. This clues to several methodological flaws, especially the non-inclusion of significant contributions, which can bias the author's conclusions (Cipriani & Geddes, 2003) (Fradet12, 2013). Therefore, there is evidence that systematic reviews mitigate chance effects, enhance the legitimacy and authority of the ensuing evidence, and offer more consistent outcomes upon which to draw conclusions and make decisions (Waddington et al., 2012) (Fink, 2014). Five steps are generally followed when performing a systematic review of the literature (Booth et al., 2016): (1) formulation of research questions; (2) establishing of inclusion and exclusion criteria; (3) identification of relevant studies; (4) assessment of selected studies; and (5) summary and report of the findings.

Inclusion and exclusion criteria

Based on (Wu et al., 2021), Inclusion and exclusion criteria were settled to select material related to our study, create a boundary, and limit our methodology's scope. Table 1 displays these criteria and their rationale for inclusion or exclusion.

Table 1
Inclusion and exclusion criteria

Criteria	The rationale of the criteria
Inclusion criteria	
Topic: Articles where mobile financial services (mobile financial services; mobile banking/m-banking; mobile payment/m-payment, mobile wallet/m-wallet; mobile money are explicitly mentioned as the main topic	The present study's central concept is the adoption of mobile financial services. With this criterion, we consider that articles focusing on or related to this topic can be identified
Document type: Empirical and conceptual academic articles published in peer-reviewed journals	As recommended by (K. Rhaiem & Amara, 2021) and (Voight & Hoogenboom, 2012), this criterion is applied to warrant the quality of the used material. It is expected, however, that empirical studies lead to a more sound and relevant comparative analysis
Covered period: 2011-2021	There was a review of work on Mobile Money and Payment from 2001 to 2011 conducted by (Diniz et al., 2011). Since studies on mobile financial services are recent, the timespan's starting year of publications on this topic was not fixed. This allows us to identify the earliest study on the topics.
Language: English	(K. Rhaiem & Amara, 2021) stressed that 75–90% of total academic articles in the leading scholarly business journals are published in English
Exclusion criteria	
All forms of publications other than research articles published in academic journals	This criterion is adopted due to time and resource limitations. Publications like books, book reviews, conference proceedings, theses, and professional publications were excluded. This criterion enables to include material published in academic journals merely
Articles written in a language other than English	Though the authors master different languages, the vast mainstream of researchers is likely less exposed to publications in a language other than English. Thus, compared to English published, the articles' potential effect of non-English publications on the academic area is likely to be limited. This criterion is added to exclude articles with abstracts in English, but the main text is written in other languages than English

Source: author's based on K. Rhaiem & Amara (2021)

Search strategy

Following the earlier works on the adopted procedure (M. Rhaiem, 2017) (K. Rhaiem & Amara, 2021), the crucial keywords were identified based on the authors' expertise and after reading 15 recently published articles in the field of mobile financial services (mobile banking, mobile payment, and mobile money). The electronic search was performed using an adapted query incorporating the Boolean operators "AND" and "OR".

The present study used the following keywords to search relevant research outputs using the Scopus database: ("Mobile Financial" OR "Mobile Payment" OR "Mobile wallets" OR "M-Payment" OR "M-Banking" OR "Mobile Banking" OR "Mobile" OR "m-money" OR "mobile money") AND ("Adoption" OR "Acceptance") AND ("Financial service"). The performed keyword search returned 329 articles. The subsequent step involved evaluating each article's title, keywords, and abstract to check whether all the inclusion and exclusion criteria were acknowledged.

This procedure recommended the exclusion of 122 articles from the list. Several of these rejected articles were concerned more with ATM adoption, m-shopping, apps adoption, mobile services in general, and m-commerce, to mention a few. The remaining 207 research papers were passed through quality screening employing the most recent journals' ranking of the ABDC (Australian Business Deans Council) and the ABS (Association of Business Schools). Only papers published in journals ranked (1) as A* (best or leading journal in its field), A (highly regarded journal in the field or subfield), and B (well-regarded journal in the field or subfield) (hence, excluding C and D ranked journals) with the 2022 ABDC journals' ranking or (2) as 4* (world's elite journal), 4 (top journal), 3 (highly regarded journal), and 2 (well-regarded journal) concerning the latest 2021 ABS ranking, were retained. The result of this quality screening led to the elimination of 146 articles. Therefore, 61 articles were booked. Next, an in-depth examination and reading were carried out to further evaluate the retained articles' eligibility. This step confirmed that the 61 included articles matched all the criteria and were eligible for consideration in the systematic review.

GENERAL CHARACTERISTICS OF THE SELECTED STUDIES AND DISCUSSION

Distribution of the articles by publication outlet

Table 2 revealed that studies on mobile financial services were published in 13 various journals. With no surprise, The International Journal of Bank Marketing rated first with 8 articles (13.11%), followed by Computers in Human Behavior with 7 publications (11.48%) and to mention a few. Out of the 61 retained articles, 31 (50.81%) were in Information System/ Information Management area, 18 (29.51%) in the Marketing/ Tourism/ Logistics area, 8 (13.11%) in the Management area, 3 (4.92%) in the Marketing area, and 1 (1.64%) in the Finance area. Based on the 2022 ABDC journals' ranking, the majority of articles (30 articles or 49.18%) were published in journals ranked A, whereas only 7 articles (11.47%) were published in journals ranked A*, and 13 articles (21.31%) were published in journals ranked B. There are 5 articles published in four Journals that were not found in the 2022 ABDC journals' ranking but listed under the 2021 ABS journals' ranking. Concerning the 2021 ABS journals' ranking, 24 articles (39.34%) were published in journals classified 1, 28 articles (445.90%) were published in journals classified 2, and 8 articles (13.11%) were published in journals classified 3. Only one article was published in a journal that is not found in the 2021 ABS journals' ranking but was listed in the 2022 ABDC journals' ranking.

Regarding the Analysis of journals by citations, apart from the number of articles, the contribution of a particular journal can also be evaluated by h-index, implying that a number, h, of journal publications have been cited h times. This measure can be considered one of the genuine indicators for influencing the publishing activity of the journal in the research area under consideration. In this study, the journal with the most impact is the Journal of Business Research, associated with an h-index of 217. An h-index of 217 implies that this number of publications has been cited at least 217 times. Table 2 shows the journals ordered by the number of documents published and the impact measured with the h-index.

Table 2.
List of journals with the most productivity and impact on MFS (2011- 2021)

Academic journals	2022 ABDC	2021 ABS	Impact factor	Subject area	Articles	%	H-Index
International Journal of Bank Marketing	A	1	4.412	MRK, TRM/LG	8	13.11%	87
Computers in Human Behavior	A	2	6.829	IS	7	11.48%	203
International Journal of Information Management	A*	2	14.098	IS	6	9.84%	132
Journal of Theoretical and Applied Electronic Commerce Research	B	1	3.049	IS	3	4.92%	33
Australasian Journal of Information Systems	A	1	2.317	IS	2	3.28%	22
Journal of Electronic Commerce Research	B	1	2.861	IS	2	3.28%	37
Journal of Islamic Marketing	B	1	3.418	MRK, TRM/LG	2	3.28%	43
Journal of Enterprise Information Management	A	2	5.396	IS	2	3.28%	67
Journal of Retailing and Consumer Services	A	2	7.135	MRK,TRM/LG	2	3.28%	104

Service Industries Journal	B	2	5.7	MRK, TRM/LG	2	3.28%	70
Technology Analysis and Strategic Management	B	2	2.874	MGT	2	3.28%	72
Technological Forecasting and Social Change	A	3	8.593 .	MGT	2	3.28%	134
Psychology and Marketing	N/A	3	2.939	MKT	2	3.28%	124
Transportation Research Part C: Emerging Technologies	A*	N/A	8.089	MRK, TRM/LG	1	1.64%	147
Journal of Organizational Computing and Electronic Commerce	A	1	2.571	IS	1	1.64%	43
Aslib Journal of Information Management	B	1	1.903	IS	1	1.64%	44
Information Technology and Management	B	1	2.627	IS	1	1.64%	39
International Journal of Emerging Markets	B	1	2.488	MRK, TRM/LG	1	1.64%	32
Journal of Internet Commerce	B	1	3.892	MGT	1	1.64%	31
Service Business	B	1	2.791	MRK, TRM/LG	1	1.64%	36
Social Responsibility Journal	B	1	2.209	MGT	1	1.64%	37
Electronic Commerce Research	A	2	3.747	IS	1	1.64%	82
Journal of Computer Information Systems	A	2	3.41	IS	1	1.64%	66
Journal of Strategic Marketing	A	2	2.4	MRK, TRM/LG	1	1.64%	56
European Management Journal	B	2	5.075	MGT	1	1.64%	109
Thunderbird International Business Review	B	2	1.841	MGT	1	1.64%	42
Electronic Commerce Research and Applications	N/A	2	6.014	IS	1	1.64%	82
International Journal of Retail and Distribution Management	N/A	2	3.771	MKT	1	1.64%	87
Information Systems Frontiers	A	3	6.191	IS	1	1.64%	73
Internet Research	A	3	6.773	IS	1	1.64%	94
Journal of Business Research	A	3	7.55	IS	1	1.64%	217
International Journal of Finance and Economics	N/A	3	3.070	FINANCE	1	1.64%	41

Notes: Information Systems (IS); Management (MGT); Marketing/ Tourism/ Logistics (MRK, TRM/LG); Marketing (MKT); Not Available (N/A)

Source: Own calculations

Publication trend and investigated countries

Table 3 illustrate the detailed publishing timeline of the studies included. The majority of studies (52 of 61 or 85.24%) included in this review were published between 2015 and 2021. It is the period where the publication trend has increased to reach, so far, a peak of 14 articles (22.95%) in 2020. Scholars' growing interest in mobile financial services implies that various providers gradually adopt this new service. Therefore, the distribution of the selected empirical studies by country/region showed that the most studied countries are the United States, Spain, and India, with a frequency of 6 each (i.e., 9.83% each) (See Table 4).

Table 3
Authors contributing to the literature on mobile financial services/year

Years	Number of articles	Authors
2011	1	(Lin, 2011)
2012	5	(Zhou, 2012), (Yu, 2012), (Al-Jabri & Sohail, 2012), (Peng et al., 2012), (Keramati et al., 2012)
2013	0	N/A (Not Available)
2014	3	(Oliveira et al., 2014), (Goh & Sun, 2014), (Francisco Liébana-Cabanillas et al., 2014)
2015	8	(E. L. Slade et al., 2015), (Gonçalo Baptista & Oliveira, 2015), (Al Khasawneh, 2015), (E. Slade et al., 2015), (Koenig-Lewis et al., 2015), (Francisco Liébana-Cabanillas et al., 2015), (Di Pietro et al., 2015), (Lu et al., 2015)
2016	5	(Tam & Oliveira, 2016b), (Tam & Oliveira, 2016a), (Yen & Wu, 2016), (Oliveira et al., 2016), (Alalwan et al., 2016)

2017	7	(Khalilzadeh et al., 2017), (Bailey et al., 2017), (Gupta & Arora, 2017), (Alalwan et al., 2017), (Goncalo Baptista & Oliveira, 2017), (Changchit et al., 2017), (F. Liébana-Cabanillas & Lara-Rubio, 2017)
2018	4	(Johnson et al., 2018), (Farah et al., 2018), (Francisco Liébana-Cabanillas et al., 2018), (Su et al., 2018)
2019	7	(Sharma, 2019), (Raza et al., 2019), (Giovanis et al., 2019), (Baabdullah et al., 2019), (Hussain et al., 2019), (Owusu Kwateng et al., 2019), (Kalinic et al., 2019)
2020	14	(S. Singh, 2020), (Alhassan et al., 2020), (Patil et al., 2020), (Suhartanto et al., 2019), (Thusi & Maduku, 2020), (Verkijika, 2020), (Kalinić et al., 2019), (Moorthy et al., 2020), (N. Singh et al., 2020), (Changchit et al., 2020), (Talwar et al., 2020), (Zhang & Mao, 2020), (Okello Candiya Bongomin & Ntayi, 2019), (Frimpong et al., 2020)
2021	7	(Jadil et al., 2021), (Wei et al., 2021), (Wu et al., 2021), (Chawla & Joshi, 2021), (Giovanis et al., 2021), (Rafdinal & Senalasari, 2021), (Purohit & Arora, 2021)
TOTAL	61	

Source: Own work

Table 4
The geographical scope of studies

Country	Frequency	Country	Frequency
United States (USA)	6	Indonesian	1
Spain	6	South Korea	1
India	6	Mozambique	1
Taiwan	5	South African	1
Portugal	4	France	1
United Kingdom (UK)	3	Uganda	1
Malaysia	3	Italy	1
Jordan	3	Iran	1
China	3	Bangladesh	1
Pakistan	2	Thailand	1
Ghana	2	Brazil	1
Greece	2	Oman	1
Saudi Arabia	2	Unspecified African Countries	1
Indonesia	2	Unspecified (literature review data)	1

Source: Own work

Most influential works

Assessing the prolific author offered vital information about the author's contribution and impact on the research areas. Total citations per year compare the article's influence irrespective of the year in which it was published and considered to be important indicators of influence of the articles in the area of MFS adoption behavior. From this end, it was deemed essential to identify the highly cited articles and studies that provided novel agendas for the field research.

The singularity of the Matthew effect, whereby the researcher tends to cite scholarly articles that are highly cited, is noticeable and is regarded as a better source of information. To uncover the most influential articles published in mobile financial services, we set the cut-off limit to 50 citations and considered only the 20 most highly cited papers between 2011-2021. Table 5 presents the list of highly cited mobile financial services papers published in reputed peer-reviewed journals.

The Analysis of the highly cited papers reveals the fact that (Alalwan et al., 2017), with the document title "Factors influencing adoption of mobile banking by Jordanian bank customers: Extending UTAUT2 with trust," is the highest number of citations which is 502 citations with Google Scholar Rank (GSRank) 1, significantly contributed towards mobile financial services field, particularly the mobile banking perspective. Their contribution laid the foundation for empirical research works in mobile banking by extending the Unified Theory of Acceptance and Use of Technology (UTAUT2) alongside trust and opened up new vistas of scholarly inquiry. Subsequent to their work, practicing scholars explored the field using established theoretical frameworks, and some scholars even extended the established frameworks by developing and validating new constructs which they

felt were largely missing in prior literature (Merhi et al., 2019). Furthermore, some scholars extended the methodological perspective by incorporating advanced statistical analysis in their research (Sharma, 2019).

The next highly cited article in the league has been contributed by (Lin, 2011). His work also examined the adoption behavior with mobile banking and drew upon innovation diffusion theory and knowledge-based trust literature. The mobile banking service characteristics proposed are used mainly across different studies on mobile financial services in conjunction with established theoretical frameworks. Highly cited research works to aid in attaining theoretical development and methodological maturity and popularity across various disciplines.

Table 5
Top 20 Cited documents in the field of mobile financial services

S. No	Authors	Title	Source Title	Cites	Cites Per Year	GSRank
1	(Alalwan et al., 2017)	Factors influencing adoption of mobile banking by Jordanian bank customers: Extending UTAUT2 with trust	International Journal of Information Management	502	100.4	1
2	(Lin, 2011)	An empirical investigation of mobile banking adoption: The effect of innovation attributes and knowledge-based trust	International Journal of Information Management	499	45.36	1
3	(Oliveira et al., 2016)	Mobile payment: Understanding the determinants of customer adoption and intention to recommend the technology	Computers in Human Behavior	465	77.5	2
4	(Yu, 2012)	Factors affecting individuals to adopt mobile banking: Empirical evidence from the UTAUT model	Journal of Electronic Commerce Research	422	42.2	1
5	(Oliveira et al., 2014)	Extending the understanding of mobile banking adoption: When UTAUT meets TTF and ITM	International Journal of Information Management	397	49.63	2
6	(Gonçalo Baptista & Oliveira, 2015)	Understanding mobile banking: The unified theory of acceptance and use of technology combined with cultural moderators	Computers in Human Behavior	391	55.86	5
7	(E. L. Slade et al., 2015)	Modeling Consumers' Adoption Intentions of Remote Mobile Payments in the United Kingdom: Extending UTAUT with Innovativeness, Risk, and Trust	Psychology and Marketing	344	49.14	3
8	(Al-Jabri & Sohail, 2012)	Mobile banking adoption: Application of diffusion of innovation theory	Journal of Electronic Commerce Research	252	25.2	3
9	(Alalwan et al., 2016)	Consumer adoption of mobile banking in Jordan: Examining the role of usefulness, ease of use, perceived risk and self-efficacy	Journal of Enterprise Information Management	240	40	11
10	(Khalilzadeh et al., 2017)	Security-related factors in extended UTAUT model for NFC based mobile payment in the restaurant industry	Computers in Human Behavior	228	45.6	1
11	(E. Slade et al., 2015)	Exploring consumer adoption of proximity mobile payments	Journal of Strategic Marketing	175	25	15
12	(Tam & Oliveira, 2016b)	Understanding the impact of m-banking on individual performance: DeLone & McLean and TTF perspective	Computers in Human Behavior	167	27.83	4
13	(Koenig-Lewis et al., 2015)	Enjoyment and social influence: predicting mobile payment adoption	Service Industries Journal	160	22.86	17

14	(Zhou, 2012)	Examining mobile banking user adoption from the perspectives of trust and flow experience	Information Technology and Management	153	15.3	5
15	(Francisco Liébana-Cabanillas et al., 2014)	The moderating effect of experience in the adoption of mobile payment tools in Virtual Social Networks: The m-Payment Acceptance Model in Virtual Social Networks (MPAM-VSN)	International Journal of Information Management	151	18.88	18
16	(Johnson et al., 2018)	Limitations to the rapid adoption of M-payment services: Understanding the impact of privacy risk on M-Payment services	Computers in Human Behavior	149	37.25	1
17	(Francisco Liébana-Cabanillas et al., 2018)	Predicting the determinants of mobile payment acceptance: A hybrid SEM-neural network approach	Technological Forecasting and Social Change	141	35.25	2
18	(N. Singh et al., 2020)	Determining factors in the adoption and recommendation of mobile wallet services in India: Analysis of the effect of innovativeness, stress to use and social influence	International Journal of Information Management	120	60	1
19	(Bailey et al., 2017)	Mobile payments adoption by US consumers: an extended TAM	International Journal of Retail and Distribution Management	103	20.6	3
20	(Patil et al., 2020)	Understanding consumer adoption of mobile payment in India: Extending Meta-UTAUT model with personal innovativeness, anxiety, trust, and grievance redressal	International Journal of Information Management	96	48	4

Source: author's based on compiled information from Scopus Database

Brief review of the selected papers

This section reviews the adoption of various mobile financial services methods by providing some information on theories and models adopted, techniques for collecting and analyzing data, and studied factors influencing use and adoption behavior. However, more detail on theoretical models' occurrences and mobile financial adoption drivers are booked in the upcoming section. To ease our understanding, these drivers will be categorized into three perspectives: Technological – Personal – Environmental (TPE).

Adoption of various mobile financial payment services/ payment methods

The critical themes acknowledged in mobile financial payment services/ payment methods literature are mobile financial services, mobile payment, mobile banking, mobile wallets, and mobile money. Each theme is discussed below by using examples of related studies. Out of 61 published articles in the last decade (i.e., 2011-2021), 29 research papers (48%) were focused on mobile payment, followed by 27 research papers (44%) on mobile banking. There are only 2 articles published on mobile wallets (3%), 2 articles on mobile money (3%), and 1 article on mobile financial services (2%).

Mobile financial payment services

Mobile financial payment services refer to the use of a mobile phone to access financial services and execute financial transactions. For example, (Yen & Wu, 2016) predicted the antecedents of continued usage intention of mobile financial services (MFS) in Taiwan. By extending TAM with perceived enjoyment, mobility, and personal habit, the authors further examined the moderating effect of gender on customer relationships. SEM was used for survey data of 368 MFS users. It was found that perceived mobility, personal habit, perceived usefulness, and perceived ease of use were the main antecedents that impact continued usage intention in MFS. However, perceived enjoyment was found to have no statistical significance with intention. Moreover, gender moderates the relationships between the variables in the proposed model. Perceived mobility affecting usage intention will be stronger for men than for women, whereas personal habit affecting usage intention will be stronger for women than for men.

The present section reviews the study on mobile financial service adoption determinants, focusing on perceived mobility and personal habit impacts. Nevertheless, the study has some limitations, which allow fruitful future research. First, because studies on mobile financial services are relatively limited, mainly when considering the various early studies on information technology adoption and innovation diffusion, the theoretical grounds for the relationships among constructs are not robust. Second, while usage

intention is used here as a dependent variable, examining the actual usage for future work is advised.

Mobile payment

Mobile payment denotes the payments made for goods and services using mobile devices, entailing wireless handsets, personal digital assistants, radiofrequency devices, and near-field communication-based devices (Chen & Nath, 2008). Twenty-nine studies out of 61 examined mobile payment in the context of mobile financial services during the last decade.

Four studies focused on India (S. Singh, 2020), (Patil et al., 2020), (Purohit & Arora, 2021), (Talwar et al., 2020)). For example, (S. Singh, 2020) aimed to explain users' post-adoption behavior toward mobile payment systems in India. Data were collected from 370 respondents using the unified theory of acceptance and use of technology (UTAUT) framework and the expectation confirmation model (ECM), along with two additional constructs: perceived security and trust. It was found that the integrated model has a higher predictive power to explain continuance intentions for mobile payment systems with significant elements of satisfaction, trust, performance expectancy, and effort expectancy.

(Patil et al., 2020) examined Indian consumer use behavior towards mobile payment using a Meta-UTAUT model adapted as the theoretical lens with personal innovativeness, anxiety, trust, and grievance redressal as extensions. By employing SEM for the data analysis, the empirical examination of the model among 491 Indian consumers found all proposed hypotheses to be significant. This study explained 66 % and 50 % variance in behavioral intention and use behavior, respectively.

(Purohit & Arora, 2021) investigated the factors influencing mobile banking adoption among the bottom of the pyramid (BoP) group in an emerging market. Data were collected from 332 bank customers in the BoP group through a convenient sampling method which was analyzed using structural equation modeling (SEM). It was found that perceived usefulness and ease of use positively influence the attitude toward mobile banking, while the perceived risk and perceived deterrents influence the attitude negatively. The subjective norms and the attitude positively affect mobile banking adoption. Knowledge of mobile banking has a strong effect on ease of use, but it does not influence the perceived usefulness of mobile banking.

The study of (Talwar et al., 2020) used cross-sectional data entailing 954 respondents in India to empirically tested antecedents and outcomes of initial trust based on the information systems success (ISS) model, transaction cost economics (TCE) theory and the IT continuance model as theoretical lenses. Using SEM for the analysis, the findings show that Information and service quality positively correlated with initial trust. Initial trust is positively associated with confirmation and perceived usefulness. Perceived usefulness positively correlated with continuation intention.

Four studies also studied mobile payment in the USA ((Khalilzadeh et al., 2017), (Bailey et al., 2017), (Zhang & Mao, 2020), (Johnson et al., 2018)). (Khalilzadeh et al., 2017) aimed to assess the determinants of near-field communication (NFC) based mobile payment (MP) technology acceptance by providing an integrated model unified theory of acceptance and use of technology (UTAUT) and technology acceptance model (TAM). The model was tested using structural equation modeling (SEM) with data collected from 412 restaurant customers in the USA. It was found that facilitating conditions do not impact the intention to use NFC-based MP. Social readiness positively impacts the NFC-based MP use in restaurants. Users consider NFC-based MP as fun when they perceive it as useful. Other factors such as attitude, security, and risk are the most influential factors in NFC-based MP usage.

(Bailey et al., 2017) used survey data entailing 240 Midwestern University students in the USA to explore mobile payment adoption by extending the basic TAM with self-efficacy, new technology anxiety, and privacy concerns, particularly tap-and-go payment. By employing SEM, the finding revealed that self-efficacy significantly impacts perceived ease of use and perceived usefulness. These, in turn, impact attitude, which affects the intention to use mobile payment. Privacy concerns also affect attitudes toward mobile payment and behavior intention to use mobile payment. New technology anxiety impacts perceived ease of use but not perceived usefulness. Therefore, this study emphasizes the roles of self-efficacy and privacy concerns.

(Zhang & Mao, 2020) focused on examining the effects of consumer factors on behavioral intention to adopt mobile payments. Building upon the theory of reasoned action (TRA) and technology acceptance model (TAM), a behavioral intention model was constructed involving enhanced cognitive, affective, and social antecedents. Cognitive antecedents include the relative advantage, perceived usefulness and ease of use in the TAM, and technology characteristics (e.g., responsiveness and mobility); affective antecedents emphasize positive and negative emotions related to NFC mobile payments usage. Both antecedents are estimated to affect attitudes. In addition, social antecedents examine subjective norms and the influence of network externalities. By collecting data from 394 adult nonusers of NFC mobile payments in the United States and performing SEM analysis, the finding revealed that all three antecedents significantly affected individual consumers' intention to adopt NFC mobile payments, explaining a significant amount of variance.

(Johnson et al., 2018) investigated the impact of factors influencing m-payment service adoption by

applying the diffusion of innovation theory model and exploring the effect of perceived ubiquity, security, and privacy risk. With a sample of 270 survey responses collected using convenient sampling and analyzed using PLS-SEM, it was indicated that ease of use, relative advantage, visibility, and perceived security positively impact the individual's intention to use m-payment services. Ubiquity and trialability positively influence the individual's perception of security, while concerns over privacy risks negatively affect perceptions of security. 46.3% of respondents identified themselves as current users of m-payment services, which may suggest a renewed interest on the part of the consumer.

Six articles studied mobile payment in Spain (Kalinić et al., 2019), (Francisco Liébana-Cabanillas et al., 2014), (Kalinic et al., 2019), (F. Liébana-Cabanillas & Lara-Rubio, 2017), (Francisco Liébana-Cabanillas et al., 2018), (Francisco Liébana-Cabanillas et al., 2015)). For instance, (Kalinić et al., 2019) examined the moderating impact of gender on the acceptance of peer-to-peer mobile payment systems. A multi-group SEM analysis was used to test the moderating effect of gender by using survey data from 701 Spanish smartphone users. The study acknowledged significant differences between the two observed groups. It identified that men are more likely to use mobile payments than women and are consequently less impacted by the probable risks involved. Furthermore, men are more easily affected by their social environment, while women are more influenced by their innovativeness.

Another study (Francisco Liébana-Cabanillas et al., 2014) focuses on the moderating effect of experience on intention to use the SMS mobile payment tools on Virtual Social Networks. The proposed research model was built on modifying the classical technological acceptance models (TRA, TAM, and UTAUT) and tested with a survey of 2012 Spain mobile payment users through a quota sampling method. Using the SEM for data analysis, the finding showed that external influences, attitude, usefulness, and risk are determinants of intention to use mobile payment. It was highlighted that previous experience increases intention of use.

(Kalinic et al., 2019) aimed to analyze the individuals' usage intention of peer-to-peer (P2P) mobile payment. Using a two-stage approach (SEM and artificial neural network models) for data analysis, the research model is assessed with data collected through an online survey from a sample of 701 respondents in Spain. The findings showed that consumers perceive the usefulness of P2PM-pay as the most crucial factor affecting their decision to adopt this innovative technology. The significant impact of social norms and perceived trust are also corroborated. In comparing the findings of the SEM and the artificial neural network (ANN) analyses, the most significant difference is in the strength of the effect of the two variables, such as security and data protection. The ANN analysis increases the relative importance of perceived trust and perceived risk in the intention to use P2PM-pay. Therefore, the author argued that a multi-analysis approach helps understand model variables' effects.

A study by (F. Liébana-Cabanillas & Lara-Rubio, 2017) explored the determinants of m-payment from the merchants' perspective using logistic regression and neural network analysis. Based on 151 Spanish merchants for the data set, these different analyses show that the neural network analysis is the most precise tool in this research when predicting the use of mobile payment systems in a particular business. The author argued that the probability of adopting mobile payment systems is higher in those companies which find considerable advantages in their adoption.

(Francisco Liébana-Cabanillas et al., 2018) focused on analyzing the individuals' intention to use NFC m-payment to determine which variables are the most relevant. To this end, the authors have conducted a study through an online survey of 191 Spanish users of smartphones. Extending the TAM model, the primary data analysis included a two-stage research methodology: SEM and neural network modeling. This study found that perceived usefulness and security were the most significant variables influencing the intention to use. The results of neural network analysis confirmed many SEM findings but also gave a slightly different order of influence of significant predictors.

(Francisco Liébana-Cabanillas et al., 2015) assessed users' acceptance of Quick response (QR) code mobile payment systems using convenient sampling of 168 participants from Spain and extending the TAM framework. The data were analyzed using SEM. It was found that attitude, innovation, and subjective norms are determinants of the future intention to use this technology.

Two articles (E. L. Slade et al., 2015), (E. Slade et al., 2015) focus on mobile payment in the United Kingdom. For example, (E. L. Slade et al., 2015) studied consumers' adoption intentions of remote mobile payments (RMP) in the United Kingdom by extending UTAUT with innovativeness, risk, and trust. Using survey data from 268 British m-payment respondents and performing SEM analysis, the following results were found: performance expectancy, social influence, innovativeness, and perceived risk significantly influenced nonusers' intentions to adopt RMP, while effort expectancy did not. The inclusion of mobile payment knowledge as a moderating variable showed a substantial difference in the effect of trust on the behavioral intention of those who knew about mobile payment than those who did not.

Another study by (E. Slade et al., 2015) explored consumer adoption of proximity mobile payments by extending the UTAUT2 model with trust and risk constructs. Using regression analysis with the data collected from 244 UK consumers, the result reveals that the extended model explains more variance in behavioral intention, but performance expectancy remains the strongest predictor across both models.

Two studies (Peng et al., 2012) and (Su et al., 2018) investigated mobile payment in China. For example,

(Peng et al., 2012) aimed to identify the factors determining tourists' acceptance of tourism m-payment through a survey of 421 tourists in China and tested against the extended TAM using the SEM approach. The empirical finding showed especially strong support for the impact of perceived security, perceived compatibility, destination m-payment knowledge, and tourist susceptibility to interpersonal influence.

(Su et al., 2018) investigated how users' Internet experience affects the adoption of mobile payment. The authors extended TAM and IDT (Innovation Diffusion Theory) while collecting survey data from 922 mobile users. They examined the mediating effect of five factors, i.e., perceived usefulness, perceived ease of use, compatibility, risk, and privacy concern, in the relationship between Internet experience and mobile payment adoption. It was found that the data of mobile users supported the partial mediating effects of the five factors.

Only one study regarding mobile payment was conducted in each of the following eleven countries ((Wei et al., 2021), (Wu et al., 2021), (Oliveira et al., 2016), (Verkijika, 2020), (Rafdinal & Senalasari, 2021), (Moorthy et al., 2020), (Koenig-Lewis et al., 2015), (Di Pietro et al., 2015), (Keramati et al., 2012), (Giovanis et al., 2021), (Hussain et al., 2019)). For example, (Wei et al., 2021) focused on the young generation's mobile payment adoption behavior by extending the UTAUT model with risk perception and bonus/rewards. To this end, 295 samples, with the majority being more tech-savvy, namely generation Y and generation Z in Taiwan, were collected from an online survey in Taiwan, while PLS-SEM and PROHIBIT models were used for data analysis. The empirical results demonstrated the positive effect of social influence on behavioral intention to adopt mobile payment. While behavioral intention and promotional activities are the drivers of the actual usage of mobile payment, perceived risks are found to exert a negative effect, reflecting the risk-averse preferences of the young generation in Taiwan. However, the moderation effect of gender revealed the absence of a gender gap in the use of mobile payment. The findings provide important implications for developing promotion programs motivating the young generation's mobile payment adoption.

(Wu et al., 2021) assessed the determinants of the intention to use cross-border mobile payments in Korea among Chinese Tourists. An Integrated Perspective of UTAUT2 with TTF and initial trust model, as well as task technology fit, were applied to 786 Chinese with the experience of using cross-border mobile payment while traveling to South Korea. With SEM analysis for data analysis, the following results were found: initial trust, performance expectancy, effort expectancy, facilitating conditions, price value, task technology fit, and initial trust significantly affect use intention.

Another study by (Oliveira et al., 2016) on mobile payment was conducted to understand the determinants of customer adoption and intention to recommend the technology. The authors combined UTAUT2, DOI (diffusion of innovations), perceived security, and intention to recommend in order to build a research model. The model was empirically tested using a survey entailing 301 responses in Portugal and analyzed with the SEM. It was found that compatibility, performance, social influence, and innovativeness influence adoption and the intention to recommend this technology.

(Verkijika, 2020) aimed to provide an adequate response model for understanding the acceptance of mobile payment systems. In this regard, a model that focuses on understanding the role of emotions (affect, anticipated regret, and anxiety) in accepting mobile payment systems were built. The affective components in the model were adapted from the social-cognitive theory (SCT) and the regret theory. Using a sample of 325 survey responses from South Africa, the finding showed that affect and anticipated regret had a significant positive influence on behavioral intentions to adopt mobile payments, whereas the impact of anxiety was not significant.

A study by (Rafdinal & Senalasari, 2021) analyzed the adoption of mobile payment applications during the COVID-19 pandemic using the TAM and technology readiness index (TRI). Using collected data from 400 mobile payment users in Indonesia and PLS-SEM to analyze the relationship between variables, the finding revealed the following: TRI constructs affect perceived usefulness (PU) and perceived ease of use (PEOU), except for discomfort, which has no significant impact on the PU. Further, attitude is influenced by two foremost TAM constructs: PU and PEOU. Meanwhile, the intention to use mobile payment applications is influenced by attitude.

(Moorthy et al., 2020) studied the antecedents of behavioral intention to adopt mobile payment among working adults in Malaysia. The constructs of UTAUT2 with perceived security were adopted as a theoretical base. The collected data from 225 participants through a convenient sampling were tested using multiple linear regression (MLR) analysis. It was found that performance expectancy, facilitating conditions, hedonic motivation, and perceived security are significant in mobile payment adoption. However, effort expectancy and social influence are not significant. This result contributed to a simple UTAUT2 model with perceived security as an additional construct in explaining the adoption intention of mobile payment.

For example, using SEM for data analysis, (Koenig-Lewis et al., 2015) extended TAM and UTAUT by incorporating perceived enjoyment, social influence, knowledge, and perceived risk for understanding mobile payment adoption.

Replications of established theories are tested in a new context of young people's adoption of mobile payment in France. Using an online survey (N = 316), hypotheses were tested based on a comprehensive

theoretical framework. The comprehensive model improves earlier models by explaining 62% of the variation in intention to use. Against expectations, perceived ease of use had no significant influence on perceived usefulness and intention to use. The study contributes to advancing understanding of perceived enjoyment which had no direct effect on adoption intention but a significant effect on perceived ease of use and perceived usefulness. Social influence reduces perceived risk, and further contribution is made by noting that perceived enjoyment lowers perceived risk.

(Di Pietro et al., 2015) investigated the main predictors of the intention to use mobile payment acceptance with the application to public transport in Italy. The primary reference models, such as the TAM, DOI, and UTAUT, are extended to add new ones tailored to the mobile payment/ticketing framework. With the survey of 439 respondents, the theoretical framework was tested using the SEM. The findings revealed that perceived usefulness, perceived ease of use, and the security of the technology influenced the intention to use that technology. Moreover, the perceived usefulness is simultaneously impacted by perceived ease of use, compatibility with users' values and needs, and their attitude toward mobile services. Furthermore, the model confirms the direct relationship between the intention to use technology and its actual usage.

Another study conducted by (Keramati et al., 2012) investigated customers' adoption of mobile payment services in Iran. The proposed conceptual model integrated technological and behavioral factors of adopting mobile payment services. With a survey entailing 623 Iranian customers, ANOVA and MANOVA analyses were used to assess the effect of demographic and cultural characteristics on other related research factors. The overall fitness of the proposed model is tested by confirmatory factor analysis and logistic regression. The model revealed that ease of use, usefulness, trust, compatibility, cost, norm, payment habit, availability of mobile phone skills, and convenience are suitable, and these factors influence adoption superiorly.

(Giovanis et al., 2021) investigated the adoption of proximity mobile payment services (PMPS) using an extended version of the DTPB. Based on a two-stage hybrid analytic methodology (partial least squares (PLS) regression and artificial neural networks (ANN)), the proposed model was validated empirically using a sample of 951 participants in Greece. The PLS finding indicated that the extended DTPB provides a solid theoretical framework for studying the adoption of PMPS. The results of the PLS-ANN sensitivity analysis agree that interpersonal influence is a more significant factor than external influence, although there were some contradictions regarding the determination of customer attitudes and behavioral intentions toward PMPS usage.

(Hussain et al., 2019) aimed to examine m-payment adoption for the bottom of the pyramid (BoP) segment in a developing country context based on a sample size of 247 BoP customers in Bangladesh. By performing confirmatory factor analysis and SEM, the study found that performance expectancy, effort expectancy, facilitating conditions, habit, and social influence significantly influence the BoP segment's behavioral intention. It is shown that performance expectancy, lifestyle compatibility, social influence, and habit have relatively more substantial effects and higher predictors of intentions.

Most studies on mobile payment during the past decades used quantitative research methods. The intention to adopt mobile payment was the most researched topic among the discussed studies. It was found that the adoption of mobile payments is influenced the most by attitude, social influence, perceived usefulness, and cognitive antecedents. Among the key factors affecting the non-adoption of mobile payment was lack of privacy and perceived risk. Future research should consider assessing how environmental factors such as social image and payment culture affect adoption. Moreover, moderating variables such as age, education, and experience will provide more insights for future research.

Mobile banking

Mobile banking enables customers to perform various banking activities using their mobile devices. It is defined as the product or service provided by the financial industry using a mobile device, namely a mobile phone, smartphone, or tablet (Gbongli et al., 2016) (Shaikh & Karjaluoto, 2014).

Twenty-seven out of 61 studies investigated the adoption and use of mobile banking in countries such as Portugal, Pakistan, Indonesia, Mozambique, South Africa, Malaysia, China, Taiwan, Jordan, Brazil, the USA, Saudi Arabia, Ghana, the UK, and India.

Three studies explored mobile baking in Portugal ((Tam & Oliveira, 2016b), (Tam & Oliveira, 2016a), (Oliveira et al., 2014)). For instance, (Tam & Oliveira, 2016b) combined the DeLone & McLean IS success model and the Task Technology Fit (TTF) model to investigate the influence of m-banking on individual performance. Based on a survey questionnaire of 233 individuals in Oman, the data analysis was performed using SEM. The finding revealed that use and user satisfaction are important precedents of individual performance and the importance of moderating the impact of TTF over usage on individual performance. System quality, information quality, and service quality positively affect user satisfaction.

Another study by (Tam & Oliveira, 2016a) investigated the determinants of mobile banking for individual performance and checked whether or not there are any age or gender differences. To address this concern, a research model was built based on the task-technology fit theory to integrate task and technology characteristics, technology usage, and individual performance while relating the age and gender subsamples.

The primary data (a survey of 256 individuals in Portugal) were analyzed using PLS-SEM. The findings revealed that TTF and usage are essential precedents of individual performance. The authors found statistically significant differences in path usage to performance impact for the age subsample and no statistically significant differences for the gender subsample.

Another study by (Oliveira et al., 2014) synergistically combined the strengths of three IS theories: the task technology fit model, the unified theory of acceptance and usage of technology, and the initial trust model for understanding mobile banking adoption. The model was tested in a study conducted in Portugal. Based on the sample of 194 individuals, partial least squares were performed to test the conceptual model proposed. It was found that facilitating conditions and behavioral intentions directly influence m-banking adoption. Initial trust, performance expectancy, technology characteristics, and task technology fit affect behavioral intention.

Three studies focused on mobile baking in Taiwan ((Lin, 2011), (Yu, 2012), (Lu et al., 2015)). For example, (Lin, 2011) investigated mobile banking adoption in Taiwan based on innovation diffusion theory and knowledge-based trust literature. Using a survey of 368 participants, both potential customers and repeat customers, the research model was analyzed with SEM. The results indicated that perceived relative advantage, ease of use, compatibility, competence, and integrity significantly impact attitude, leading to behavioral intention to adopt (or continue to use) mobile banking. Additionally, based on a multi-group analysis with *t*-statistics, it was found that the antecedents of attitude toward mobile banking differ between potential and repeat customers.

Another study (Yu, 2012) employed UTAUT and PLS regression for model analysis to investigate what influences people to adopt mobile banking. Through convenient sampling of 441 respondents in Taiwan, the study empirically concluded that individual intention to adopt mobile banking was significantly impacted by social influence, perceived financial cost, performance expectancy, and perceived credibility in their order of influencing strength. The behavior was considerably affected by individual intention and facilitating conditions. It was further found that gender significantly moderated the effects of performance expectancy and perceived financial cost on behavioral intention, and age significantly moderated the effects of facilitating conditions and perceived self-efficacy on actual adoption behavior.

Very few studies use a technique other than SEM. For instance, (Lu et al., 2015) adopted a multiple attribute decision-making (MADM) model by combining decision-making trial and evaluation laboratory (DEMATEL) with map (INRM), DANP (DEMATEL-based ANP), and the VIKOR method. A conceptual model was developed to explore the users' behavioral intention to adopt mobile banking services in the financial banking industry in Taiwan through DTPB and trust-related behaviors using the knowledge of experts. The study found the following results. Technology-facilitating conditions were the most significant criterion when evaluating mobile banking services in the financial banking industry. It also revealed that information integration and mobile banking services for user behavior intention structure are the most critical information integration areas in mobile banking services development.

Similarly, three studies (Alalwan et al., 2017), (Alalwan et al., 2016), (Al Khasawneh, 2015) investigated mobile banking adoption in Jordan. For example, (Alalwan et al., 2017) investigated the factors affecting behavioral intention and mobile banking adoption by Jordanian banks' customers. With an extended UTAUT2 model and trust, 343 participants were obtained as data was collected through a convenient sampling while employing SEM for analysis. It was mainly found that behavioral intention is significantly and positively influenced by performance expectancy, effort expectancy, hedonic motivation, price value, and trust.

(Alalwan et al., 2016) proposed and examined a conceptual model based on TAM that best explains the key factors influencing Jordanian customers' intention to adopt mobile banking by adding perceived risk and self-efficacy as external factors. The model was tested using SEM with convenient sampling data from 330 Jordanian. The study showed that behavioral intention is significantly influenced by perceived usefulness, perceived ease of use, and perceived risk.

(Al Khasawneh, 2015) conducted a study to empirically examine consumer adoption of mobile banking in Jordan based on a convenient sampling of 268 respondents. The data was performed using SEM by incorporating TAM with constructs including perceived trust, perceived credibility, and consumers' attitudes and intention to use m-banking. The finding revealed that perceived ease of use, perceived usefulness, perceived credibility, and perceived trust significantly positively influence attitude, which positively affects the intention to adopt mobile banking.

Two studies (Raza et al., 2019), (Farah et al., 2018) highlighted the understanding of mobile banking adoption in Pakistan. For example, (Raza et al., 2019) examined the factors impacting mobile banking acceptance in Islamic banks in Pakistan by using the UTAUT model. With collected data from 229 respondents through convenient sampling, the model was analyzed using confirmatory factor analysis and PLS-SEM. The performance expectancy, facilitating conditions, social influence, effort expectancy, perceived value, habit, and hedonic motivation were taken as independent variables. Behavioral intention was taken as the mediator, and actual usage was used as the dependent variable. The empirical evidence stressed

that all the variables except for social influence have a significant positive impact on the intention, which leads to actual usage.

Another study by (Farah et al., 2018) studied the critical factors explaining consumer intention and use behavior in mobile banking adoption. Extending UTAUT2 with Non-monetary, Trust, and perceived risk constructs, a convenience sampling technique was used to collect data from 490 respondents in Pakistan. Using SEM for data analysis, the study identified that most of the predictors of intention, such as perceived value, performance expectancy, habit, social influence, effort expectancy, hedonic motivation (except for facilitating condition), perceived risk, and trust, are significant. All predictors of usage behavior are significant.

Two studies used the data collected in Saudi Arabia ((Al-Jabri & Sohail, 2012), (Baabdullah et al., 2019)). For example, (Al-Jabri & Sohail, 2012) examined factors affecting the adoption of mobile banking in Saudi Arabia. Based on the regression analysis of 330 responses from actual banking users, it was found that relative advantage, compatibility, observability, and perceived risk significantly affect the intention to adopt mobile banking. Trialability and complexity were not found to have a significant effect on adoption. It was found that the proposed model explains 42.8 % of mobile banking adoption based on the Diffusion of Innovation theory.

A study conducted by (Baabdullah et al., 2019) identified and examined the most important factors that could predict Saudi customer's continued intention to adopt mobile banking. The proposed conceptual model was built on the TAM and task-technology fit (TTF) model by integrating perceived privacy and security. By using the data of 320 respondents from a convenience sample of Saudi banking customers, the study adopted the SEM technique for data analysis. It was found that the main results supported the impact of perceived privacy, perceived security, perceived usefulness, and task-technology fit on the customers' continued intention to use mobile banking.

While most studies investigated mobile banking adoption in a single country (although the countries studied in the corresponding case are diverse), some studies (Changchit et al., 2020), (Frimpong et al., 2020)) compared it between developed and developing countries. For example, (Changchit et al., 2020) compared mobile banking perceptions among consumers in the U.S. (355 respondents) and in Thailand (400 respondents) using factor analysis and statistical t-tests data analysis. The result found a significant difference in subjects' attitudes toward mobile banking between these two nationalities. On average, the U.S. subjects' attitudes toward mobile banking are significantly higher than Thai subjects.

(Frimpong et al., 2020) focused on a cross-national investigation of trait antecedents of mobile-banking adoption between the UK and Ghana. Based on insights from innovation adoption and personality research, this study tested a model of mobile-banking adoption using data from a developed and a developing country. Based on convenient and purposive sampling, survey data from 1,340 participants from the United Kingdom and Ghana were used for PLS-SEM analysis. The results indicated that intrinsic traits are more substantial in explaining consumers' attitudes toward mobile banking in Ghana than in the United Kingdom. However, no significant variance between the two countries was observed concerning the mediation effect of consumers' attitudes on the intention to use mobile banking.

Except for the cross-national study, the following eleven countries recorded only a single-country study related to mobile banking. For example, (Sharma, 2019) identified vital antecedents impacting mobile banking acceptance in Oman. The research extends the original TAM by incorporating two cognitive antecedents, i.e., autonomous motivation and controlled motivation, together with trust components for understanding adoption. Data were collected from 225 mobile banking users in Oman and analyzed using an SEM-artificial neural network. It was found that trust and autonomous motivation are the two main predictors influencing mobile banking acceptance.

Another study conducted in Indonesian by (Suhartanto et al., 2019) examined mobile banking adoption in Islamic banks by integrating TAM and Religiosity-Behavioral Intention Model. With a sample size of 300 mobile banking customers of Islamic banks from Indonesia, PLS-SEM was applied to assess the association between perceived usefulness, perceived ease of use, religiosity, satisfaction, and adoption. The finding disclosed that integrating TAM and the Religiosity-Intention model explains Islamic bank consumers' adoption of mobile banking. Besides perceived usefulness and perceived ease of use, the results of this study emphasize the importance of religiosity in mobile banking adoption

The study by (Gonçalo Baptista & Oliveira, 2015) in Mozambique proposed an innovative and comprehensive theoretical model combining UTAUT2 with cultural moderators to offer new insights into factors affecting acceptance and how culture influences individual use behavior. The model was tested using PLS-SEM in a quantitative study conducted with a 252 sample size. Performance expectancy, hedonic motivation, and habit were the most significant antecedents of behavioral intention. To explain mobile banking use behavior, the most important drivers were the effect of habit and culture on intention over use behavior. Collectivism, uncertainty avoidance, short-term, and power distance were the most significant cultural moderators.

(Thusi & Maduku, 2020) aimed to analyze the determinants of mobile banking app acceptance and use from a sample of 352 millennial retail banking customers in South Africa through convenient sampling. A multi-perspective framework is used based on UTAUT2, multi-dimensional institution-based trust, and risk. The findings suggested that performance expectancy, facilitating conditions, habit, perceived

risk, and institution-based trust are significantly associated with adopting mobile banking apps and that facilitating conditions, perceived risk, and behavioral intention directly influence mobile banking app behavior.

A study (Goh & Sun, 2014) used a modified TAM with 105 participants from Malaysia to examine how gender differences influence the adoption of Islamic mobile banking. Using a PLS-SEM, this study revealed two different and remarkable models that impact the acceptance of Islamic mobile banking. Male Muslims desire status and value orientations; therefore, perceived self-expressiveness significantly affects their acceptance of Islamic mobile banking. On the other hand, female Muslims prefer social and utilitarian orientations; thus, their acceptance of Islamic mobile banking was significantly influenced by perceived usefulness and social norms. The author argued that the finding should be interpreted as speculative and should not be relied upon to depict behavior in the surveyed communities accurately.

One study (Zhou, 2012) focused on China by examining mobile banking user adoption from trust and flow experience perspectives. With 200 respondents through random sampling, the collected were conducted employing SEM. The finding indicated that structural assurance is the main factor affecting trust, whereas ubiquity and perceived ease of use are the main factors influencing flow experience. Trust significantly affects flow experience, and both factors determine usage intention, affecting actual usage.

(Giovanis et al., 2019) investigated which of four well-established theoretical models (i.e., TAM, theory of planned behavior, UTAUT, decomposed theory of planned behavior (DTPB)) best explains potential users' behavioral intentions to adopt mobile banking services. Based on the convenient sampling of 931 potential users in Greece, the data were performed using SEM. The result of the study revealed that the best model is an extension of the DTPB with perceived risk. Customers' attitude, determined by three rationally-evaluated MB attributes (usefulness, easiness, and compatibility), is the primary driver of consumers' intentions to adopt m-banking services. Perceived risk negatively affects attitude formation and inhibits willingness to use m-banking services.

One study conducted by (Goncalo Baptista & Oliveira, 2017) in Brazil identified the potential impact of using game mechanics and game design techniques in accepting mobile banking services. The theoretical model based on UTAUT was tested in a quantitative study using SEM with 326 entailing actual local banking customers in Brazil. The findings showed a direct and strong relationship between gamification and intention to use mobile banking services. This supports that gamification can help make banking activities more exciting, engaging, and enjoyable when used and designed appropriately, increasing customer acceptance, engagement, and satisfaction.

For instance, (Changchit et al., 2017) examined the determinants of attitudes toward using and accepting mobile banking in the USA. With a convenient sampling, a total of 309 students enrolled at a southwestern United States university participated in this study using multiple regression techniques for data analysis. Besides perceived usefulness and perceived ease of use included in the original TAM model, the modified model involved five additional factors (perceived privacy, perceived security, previous experiences, normative beliefs, and technology competency) as determinants of attitude toward the usage of mobile banking. It was found that perceived usefulness, perceived ease of use, perceived security, and previous experiences were key determinants for whether subjects intend to use mobile banking.

One study (Owusu Kwateng et al., 2019) examined factors influencing customers to adopt and subsequently use m-banking services in Ghana using the UTAUT2 model with age, educational level, user experience, and gender as moderators. With a purposive sampling of 300 users of m-banking services in Ghana, the primary data collected were analyzed using PLS-SEM. Findings indicated that habit, price value, and trust are the main factors influencing the adoption and use of m-banking in Ghana. Individual differences in gender, age, educational level, and user experience responded in a different way as they moderate the relationship between UTAUT2 constructs and use behavior.

(Gupta & Arora, 2017) investigated the adoption of mobile banking among Indian consumers using the framework of behavioral reasoning theory (BRT) to hypothesize relationships between values, reasoning constructs, attitudes, and intentions. With the collected data from 379 Indian banking consumers, confirmatory factor analysis and SEM were used to analyze the data. It was found that "reasons for" and "reasons against" impact m-banking adoption. Regarding the "reasons for" m-banking adoption, ubiquitous was the primary determinant, and among the "reasons against" m-banking adoption, the tradition barrier was the primary determinant. The findings also confirmed that the value of "openness to change" significantly influences reasons for adoption and has no impact on reasons against and attitudes toward m-banking.

The studies on mobile banking mainly focused on antecedents of acceptance and use of mobile banking and customer attitude. Although the above studies offered valuable insights into the mobile banking industry using theories such as TAM, UTAUT2, and DTPB models, they have some limitations that provide future research directions. First, no qualitative study was performed by the researchers of this literature review. Indeed, all the surveys were conducted by questionnaire, and no data collection was done by interview. Future research could adopt a qualitative approach or a

combination of quantitative and qualitative approaches to understand consumer behavior regarding mobile banking better. Second, most studies adopted convenience sampling techniques, limiting the generalizability for the entire population. Therefore, it is suggested that future research study different demographic groups within the target population (Farrokhi & Mahmoudi-Hamidabad, 2012). Third, most studies focus on a single country or even a city, and few comparative studies have been conducted in this literature review. Indeed, out of 26 studies regarding banking adoption, only two studies have recently opted for cross-national research such as (Changchit et al., 2020) conducted a study between the United States and Thailand, while (Frimpong et al., 2020) opted for UK and Ghana. This kind of work would allow us to measure the impact of cultural factors on mobile banking adoption.

Mobile wallet

Mobile wallet refers to remote payment technologies which need to be installed in the smartphone to allow the consumer to store his money and perform transactions directly from the wallet (Madan & Yadav, 2016). Interestingly, only two studies out of 61 focused on mobile wallets, and they were conducted in India (Chawla & Joshi, 2021), (N. Singh et al., 2020). For example, (Chawla & Joshi, 2021) aimed to enhance the performance of attitudes toward mobile wallet adoption among Indian consumer segments. Integrating TAM and UTAUT, a nationwide survey was conducted to obtain 744 responses based on convenience sampling. Primary analyses were performed using one-way Analysis of Variance (ANOVA) and Importance-Performance Map Analysis (IPMA). The finding regarding each cluster indicated that the top three critical constructs are perceived usefulness, security, and lifestyle compatibility, as indicated by the IPMA.

A study (N. Singh et al., 2020) explored factors influencing users' recommendations to use m-wallet in India. Combining the TAM and UTAUT2 to develop the study model included 206 responses in India and SEM technique for data analysis. It was found that ease of use, usefulness, perceived risk, and attitude significantly affect the user's intention, which further influenced the users perceived satisfaction and recommendation to use mobile wallet services. The study also determined the moderating effect of stress and social influence on user satisfaction and recommendation.

Research on mobile wallets focused on factors affecting adoption and customer satisfaction. The following limitations can be underlined based on the above overview of the studies. First, the studies did not test for the effect of age, gender, and education as potential factors affecting mobile wallet adoption. Future research should include these variables in their proposed models. Second, because the two studies focused on India, thus data were collected from respondents living in India. From this perspective, studying mobile wallets at the cross-national level can provide additional insight into mobile wallet adoption and satisfaction.

Mobile Money

Mobile money is a digital payment platform that transfers money between cellphone devices. (Alhassan et al., 2020) investigated consumer acceptance and continuance of mobile money in Africa using secondary data with the TAM model and employed SEM for data analysis. The research model tests the context-based constructs to determine how these constructs affect peoples' intentions and attitudes toward the continued use of mobile money. The empirical results suggested that the availability of electricity remains an essential factor for mobile phone functionality and continuing use of mobile money in the long run. It also found a correlation between regulations that are perceived to be enabling and the intentions of individuals to continue using mobile money. However, there is a negative correlation between rural dwellings and individuals' intentions to use mobile money.

(Okello Candiya Bongomin & Ntayi, 2019) aimed to establish the mediating effect of trust in the relationship between mobile money adoption and usage and financial inclusion, focusing on rural Uganda. A quantitative survey based on 379 micro, small and medium enterprises (MSMEs) located in northern Uganda was analyzed using PLS-SEM. The authors found evidence that trust increases mobile money adoption and usage to raise the scope of financial inclusion of MSMEs in developing countries. Moreover, when the individual effect was determined, trust also had a significant and positive effect on financial inclusion.

The studies on mobile money generally focused on enablers and the inhibitors of mobile money adoption and customer satisfaction. Based on the above overview of the studies, the following limitations can be underlined. The studies did not test for the effect of age, gender, and education as possible elements impacting mobile money adoption. Future studies are encouraged to include these variables in their proposed models.

What are the analytical techniques that underpin the studies of MFS?

The majority of studies (47 articles or 77.04%) on mobile financial services used structural equation modeling (SEM) and partial least square (PLS) as the main tools of analysis. For the last two decades, SEM has become the most commonly employed technique for many scholars investigating complex relationships between latent constructs (Astrachan et al., 2014). However, with the increasingly challenging requirements of covariance-based SEM (CB-SEM) in

terms of distribution assumptions, sample size, and model complexity (Astrachan et al., 2014) (Hair et al., 2014), the use of the partial least squares SEM (PLS-SEM), a less restrictive method, is enjoying widespread popularity and success with academicians (Souiden et al., 2019). PLS-SEM applications have grown exponentially in the past decade (Leguina, 2015), especially in the social sciences (e.g., (Ali et al., 2018) (Ringle et al., 2020)), and its use is expanding in marketing (Kumar et al., 2020) (Buzeta et al., 2020) (Gbongli et al., 2019) and information system research (Chin et al., 2020). Artificial neural network analyses were conducted in five studies (8.19%), and regression or multiple regression analyses were used in four articles (6.55%). In contrast, a few studies used other techniques such as MADM (multiple attribute decision-making), k-means clustering, ANOVA (analysis of variance), MANOVA (multivariate analysis of variance), t-tests, and IPMA (importance-performance map analysis). It is essential to mention that the cross-sectional data design is the most used approach. Longitudinal and panel designs are nonexistent, signifying the potential difficulties of these methods to be carried out in the marketing discipline in general and in the financial sector. As for the qualitative approach, none of the studies were found using it.

What is the theoretical basis that supports the studies of MFS?

Earlier studies examining consumers' adoption of mobile financial services often rely on well-established models to explain consumers' behavior or behavioral intention. Among these models, the unified theory of acceptance and usage of technology (UTAUT/UTAUT2) was one of the main theoretical frameworks in 25 articles (40.98%), followed by the technology acceptance model (TAM) used in 23 studies (37.70%). The remaining are the task technology fit model (TTF) adopted by 5 studies (8.19%), the theory of planned behavior (TPB)/the decomposed theory of planned behavior (DTPB) adopted in 5 studies (8.19%), and the innovation diffusion theory (IDT)/diffusion of innovation (DOI) considered by 4 articles (6.55%). Additionally, other behavioral models were considered either solely or combined with the innovation adoption models to explain consumers' adoption of mobile financial services. Among these models, we can indicate the theory of reasoned actions (TRA), the initial trust model (ITM), the expectation confirmation theory (ECT), the IT continuance model of Information systems success (ISS), the model of transaction cost economics (TCE) theory, the social-cognitive theory (SCT), and the regret theory.

Factors affecting behavioral intention of mobile financial services

The factors affecting behavioral intention to adopt mobile financial services can be viewed in Table 6 as considering the total of significant columns. For example, the most studied variable was performance expectancy (14 times, i.e., 22.95%) (Oliveira et al., 2014), (Raza et al., 2019), (Moorthy et al., 2020). It is followed by social Influence (21.31%) (Khalilzadeh et al., 2017), (Farah et al., 2018), (Hussain et al., 2019), (Koenig-Lewis et al., 2015), attitude (14.75%) (Francisco Liébana-Cabanillas et al., 2015) and along with others. Additionally, just a few studies found a significant impact of task technology fit (Wu et al., 2021), initial trust (Wu et al., 2021), gamification impact (Goncalo Baptista & Oliveira, 2017), and perceived enjoyment (Kalinic et al., 2019) on behavioral intention.

WEIGHT ANALYSIS

This study uses the vote-counting method (M. Rhaiem, 2017), which reports the number of times a concept is used and the number of times it is statistically significant to demonstrate its relevance. In particular, the study focus on weight analysis, which examines the strength of a predictor (independent variable) on the outcome (dependent variable). This analysis enables for investigation of the predictive power of an independent variable in a studied relationship (Jeyaraj et al., 2006). Table 6 briefly describes the 33 most frequently used relationships towards behavioral intention to use mobile financial services. This involves the number of significant and non-significant relationships, the number of relationships examined by earlier research between each pair of dependent and independent variables, and the weight calculated for each of these relationships. Therefore, most studies used behavioral intention as a dependent variable (33 times). To perform weight analysis, the number of significant relationships was divided by the total number of analyzed relationships between an independent and dependent variable (Ismagilova et al., 2020). The weight 1 (one) indicates that the relationship between the two constructs is significant in all studies, whereas 0 (zero) indicates the opposite, that it is non-significant across all (Jeyaraj et al., 2006). For example, the weight for the relationship between performance expectancy and behavioral intention is calculated by dividing 14 (the number of significant relationships) by 16 (the total number of relationships), which equals 0.875. According to (Jeyaraj et al., 2006), predictors can be categorized into "well utilized" (studied more than 5 times) and experimental (examined less than 5 times). A well-utilized predictor is regarded as the best predictor if its weight equals more than 0.8. A predictor is viewed as

promising if examined less than five times (experimental), and its weight equals 1.

Following the weight analysis, it was found that well-utilized predictors for behavioral intention are social influence (examined 19 times), performance expectancy (examined 16 times), effort expectancy (examined 14 times), facilitating condition (examined 9 times), hedonic motivation (examined 12 times), habit (examined 8 times), perceived risk (examined 7 times), trust (examined 6 times), perceived ease of use (examined 8 times), perceived security (examined 5 times), perceived usefulness (examined 6 times), social norms (examined 7 times), and attitude (examined 9 times). Out of these well-utilized predictors, six predictors, namely attitude (weight equals 1), perceived ease of use (weight equals 1), performance expectancy (weight equals 0.875), habit (weight equals 0.875), social norms (weights equals 0.857), and perceived usefulness (weight equals to 0.833), are considered as the best predictors of behavioral intention.

There are 18 predictors of behavioral intention, which are experimental: Perceived Value (examined 4 times), Price Value (examined 4 times), Trust (examined 4 times), to mention few. Out of 18 experimental predictors, except trust, seventeen are considered promising with a weight of1. Social Influence, Hedonic Motivation, Effort Expectancy, facilitating condition, and perceived risk, are considered the least effective predictors of behavioral intention, as they were examined more than five times with a weight less than 0.8.

Table. 6
Result of weight analysis

Independent Variable	Dependent Variable	Total of significant	Total of non-significant	Total number of test	weight
Performance Expectancy	Behavioral Intention	14	2	16	0.875
Social Influence		13	6	19	0.684
Attitude		9	0	9	1
Hedonic Motivation		8	4	12	0.667
Perceived Ease-of–Use		8	0	8	1
Habit		7	1	8	0.875
Effort Expectancy		6	8	14	0.429
Subjective Norms		6	1	7	0.857
Facilitating conditions		5	4	9	0.556
Perceived Risk		5	2	7	0.714
Perceived security		5	0	5	1
Perceived Usefulness		5	1	6	0.833
Perceived Value		4	0	4	1
Price Value		4	0	4	1
Trust		4	2	6	0.667
Innovativeness		2	0	2	1
Relative advantage		2	0	2	1
Perceived financial cost		2	0	2	1
Perceived credibility		2	0	2	1
Perceived behavioural Control		2	0	2	1
Personal Innovativeness		2	0	2	1
Usage Intention		1	0	1	1
Task Technology Fit		1	0	1	1
Initial Trust		1	0	1	1
Visibility		1	0	1	1
Institution-based trust		1	0	1	1
Lifestyle compatibility		1	0	1	1

External influences		1	0	1	1
Gamification impact		1	0	1	1
Knowledge		1	0	1	1
Perceived self-expressiveness		0	1	1	0
Perceived Enjoyment		0	1	1	0
Individual Mobility		0	1	1	0

Source: own calculations

THE CRITICAL TECHNOLOGICAL DRIVERS OF MOBILE FINANCIAL SERVICES

The Technological – Personal – Environmental (TPE) framework mapping

Table 7 presents the 38 drivers (factors) influencing humans using mobile financial services (MFS). The ten (10) most studied drivers of MFS are perceived usefulness, perceived ease of use, facilitating condition, social influence, performance expectancy, effort expectancy, attitude, trust, habit, and social norms. Based on Table 7 (i.e., the column of number (No)), Figure 1 displays the mapping of the Technological – Personal – Environment framework, which entails 38 factors mapping to the three significant area variables. Added areas represent the various intersection between technological – personal, technological – environment, personal – environment, and all of the variables (see Figure 1). The numbers used in Figure 1 refer to the list of factors in column number (No) in Table 7 (e.g., 1 is perceived usefulness, 2 is perceived ease of use). Researchers adopt no fewer than 21 factors to assess mobile digital financial services. The critical technological factors of mobile financial services adoption proposed as one of the objectives for the research can be deduced from Figure 1.

As such, the personal factor is the prevalent factor supporting mobile financial services' existence. In addition to personal factors, the second most significant factor is technological, with as many as six factors. Even there are 5 factors included in the technological-personal area. The small factor that researchers employed is the environmental factors. This is because the environmental factors are located at the research site, so they cannot generally be changed. Three environmental factors are structural assurances, rural dwellings, and social influence. The situation can be of concern for the development of technology, especially mobile financial services when considering the factors found in the technological factor, namely 6 factors: facilitating condition, Perceived Security, Technology Characteristics, Task technology, Perceived credibility, and Firm reputation. Apart from these 6 factors, there are factors that, together with personal factors, are 7: compatibility, value, services, accessibility, system quality, agreement, and usability. In addition, there are 2 factors related to technological, personal, and environmental factors are considered in the development of technology: structural assurances and knowledge. These 13 factors are, therefore, very beneficial for technological development, particularly in mobile digital financial services when developing and improving the services.

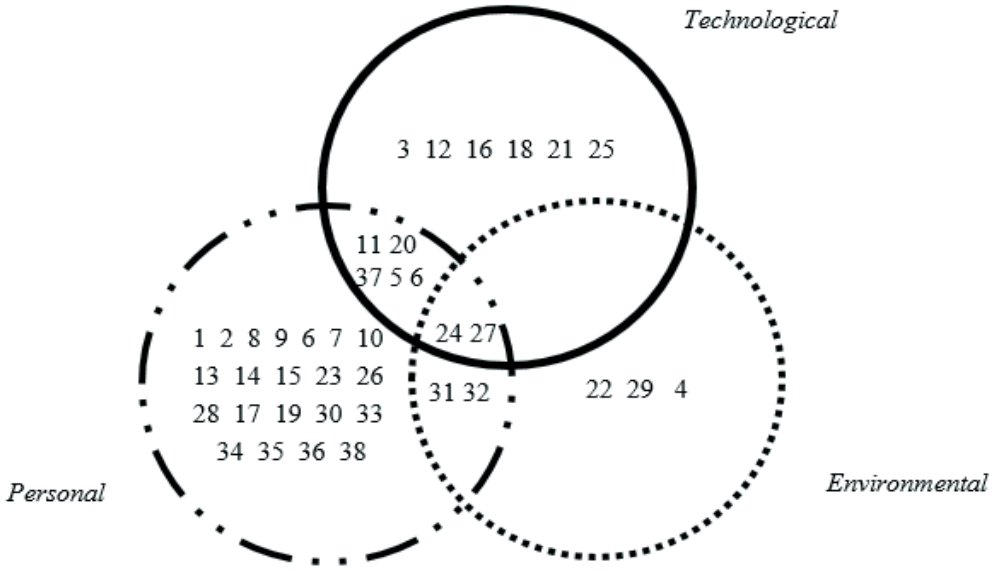
Table 7
Occurrences of mobile financial services factors

No.	Considered variables as drivers of MFS adoption	Frequency	Reference
1	Perceived Usefulness	24	(Alhassan et al., 2020), (Sharma, 2019), (Bailey et al., 2017), (Suhartanto et al., 2019), (Yen & Wu, 2016), (Goh & Sun, 2014), (Giovanis et al., 2021), (Giovanis et al., 2019), (Baabdullah et al., 2019), (Kalinić et al., 2019), (Rafdinal & Senalasari, 2021), (Purohit & Arora, 2021), (N. Singh et al., 2020), (Francisco Liébana-Cabanillas et al., 2014), (Alalwan et al., 2016), (Al Khasawneh, 2015), (Kalinic et al., 2019), (Talwar et al., 2020), (Peng et al., 2012), (Zhang & Mao, 2020), (Koenig-Lewis et al., 2015),

			(Francisco Liébana-Cabanillas et al., 2018), (Francisco Liébana-Cabanillas et al., 2015),(Di Pietro et al., 2015)
2	Perceived Ease of–use	23	(Alhassan et al., 2020), (Sharma, 2019), (Bailey et al., 2017), (Suhartanto et al., 2019), (Yen & Wu, 2016), (Johnson et al., 2018), (Giovanis et al., 2021), (Zhou, 2012), (Giovanis et al., 2019), (Baabdullah et al., 2019), (Kalinić et al., 2019), (Purohit & Arora, 2021), (N. Singh et al., 2020), (Lin, 2011), (Francisco Liébana-Cabanillas et al., 2014), (Alalwan et al., 2016), (Al Khasawneh, 2015), (Peng et al., 2012), (Zhang & Mao, 2020), (Koenig-Lewis et al., 2015), (Francisco Liébana-Cabanillas et al., 2018), (Francisco Liébana-Cabanillas et al., 2015), (Di Pietro et al., 2015))
3	Facilitating Conditions	20	(Khalilzadeh et al., 2017), (Oliveira et al., 2014), (Patil et al., 2020), (Jadil et al., 2021), (Raza et al., 2019), (Wei et al., 2021), (Wu et al., 2021), (Oliveira et al., 2016), (Gonçalo Baptista & Oliveira, 2015), (Thusi & Maduku, 2020), (Giovanis et al., 2021), (Giovanis et al., 2019), (Farah et al., 2018), (Hussain et al., 2019), (Moorthy et al., 2020), (Alalwan et al., 2017), (Goncalo Baptista & Oliveira, 2017), (Yu, 2012), (Owusu Kwateng et al., 2019), (E. Slade et al., 2015)
4	Social Influence	20	(Khalilzadeh et al., 2017), (Oliveira et al., 2014), (Patil et al., 2020), (Jadil et al., 2021), (Raza et al., 2019), (Wei et al., 2021), (Wu et al., 2021), (E. L. Slade et al., 2015), (Oliveira et al., 2016), (Gonçalo Baptista & Oliveira, 2015), (Thusi & Maduku, 2020), (Farah et al., 2018), (Hussain et al., 2019), (Moorthy et al., 2020), (Alalwan et al., 2017), (Goncalo Baptista & Oliveira, 2017), (Yu, 2012), (Owusu Kwateng et al., 2019), (E. Slade et al., 2015), (Koenig-Lewis et al., 2015)
5	Performance expectancy	19	(S. Singh, 2020), (Alhassan et al., 2020), (Oliveira et al., 2014), (Patil et al., 2020), (Raza et al., 2019), (Wei et al., 2021), (Wu et al., 2021), (E. L. Slade et al., 2015), (Oliveira et al., 2016), (Gonçalo Baptista & Oliveira, 2015), (Thusi & Maduku, 2020), (Farah et al., 2018), (Hussain et al., 2019), (Moorthy et al., 2020), (Alalwan et al., 2017), (Goncalo Baptista & Oliveira, 2017), (Owusu Kwateng et al., 2019), (E. Slade et al., 2015),(Zhang & Mao, 2020)
6	Effort expectancy	18	(Khalilzadeh et al., 2017), (Oliveira et al., 2014), (Patil et al., 2020), (Jadil et al., 2021), (Raza et al., 2019), (Wei et al., 2021), (Wu et al., 2021), (E. L. Slade et al., 2015), (Oliveira et al., 2016), (Gonçalo Baptista & Oliveira, 2015), (Thusi & Maduku, 2020), (Farah et al., 2018), (Hussain et al., 2019), (Moorthy et al., 2020), (Alalwan et al., 2017), (Goncalo Baptista & Oliveira, 2017), (Owusu Kwateng et al., 2019), (E. Slade et al., 2015)
7	Attitude	16	(Alhassan et al., 2020), (Patil et al., 2020), (Bailey et al., 2017), (Giovanis et al., 2021), (Giovanis et al., 2019), (Gupta & Arora, 2017), (Rafdinal & Senalasari, 2021), (Purohit & Arora, 2021), (N. Singh et al., 2020), (Lin, 2011), (Francisco Liébana-Cabanillas et al., 2014), (Al Khasawneh, 2015), (Changchit et al., 2017), (Zhang & Mao, 2020), (Francisco Liébana-Cabanillas et al., 2015), (Di Pietro et al., 2015)
8	Trust	14	(S. Singh, 2020), (Khalilzadeh et al., 2017), (Sharma, 2019), (Patil et al., 2020), (E. L. Slade et al., 2015), (Zhou, 2012), (Farah et al., 2018), (Kalinić et al., 2019), (Alalwan et al., 2017), (Francisco Liébana-Cabanillas et al., 2014), (Owusu Kwateng et al., 2019), (Al Khasawneh, 2015), (Kalinic et al., 2019), (E. Slade et al., 2015)
9	Habit	10	(Raza et al., 2019), (Wu et al., 2021), (Yen & Wu, 2016), (Gonçalo Baptista & Oliveira, 2015), (Thusi & Maduku, 2020), (Farah et al., 2018), (Hussain et al., 2019), (Goncalo Baptista & Oliveira, 2017), (Owusu Kwateng et al., 2019), (E. Slade et al., 2015)
10	Subjective Norms	10	(Goh & Sun, 2014), (Verkijika, 2020), (Kalinić et al., 2019), (Purohit & Arora, 2021), (Moorthy et al., 2020), (Lin, 2011), (Kalinic et al., 2019), (Zhang & Mao, 2020), (Francisco Liébana-Cabanillas et al., 2018), (Francisco Liébana-Cabanillas et al., 2015)
11	Price Value	4	(Wu et al., 2021), (Oliveira et al., 2016), (Gonçalo Baptista & Oliveira, 2015), (Hussain et al., 2019), (Alalwan et al., 2017), (Goncalo Baptista & Oliveira, 2017), (Owusu Kwateng et al., 2019), (E. Slade et al., 2015)

12	Perceived Security	7	(S. Singh, 2020), (Johnson et al., 2018), (Moorthy et al., 2020), (Changchit et al., 2017), (Peng et al., 2012), (Francisco Liébana-Cabanillas et al., 2018), (Francisco Liébana-Cabanillas et al., 2015)
13	Satisfaction	6	(S. Singh, 2020), (Tam & Oliveira, 2016b), (Suhartanto et al., 2019), (N. Singh et al., 2020), (Al-Jabri & Sohail, 2012), (Kalinic et al., 2019)
14	Self-efficacy	6	(Bailey et al., 2017), (Verkijika, 2020), (Giovanis et al., 2021), (Giovanis et al., 2019), (Yu, 2012), (Alalwan et al., 2016)
15	Personal Innovativeness	6	(Patil et al., 2020), (Zhou, 2012), (Kalinić et al., 2019), (Kalinic et al., 2019), (Francisco Liébana-Cabanillas et al., 2018) ,(Francisco Liébana-Cabanillas et al., 2015)
16	Technology Characteristics	4	(Tam & Oliveira, 2016b), (Oliveira et al., 2014), (Wu et al., 2021), (Baabdullah et al., 2019)
17	Relative Advantage	4	(Johnson et al., 2018), (Lin, 2011), (Al-Jabri & Sohail, 2012), (Zhang & Mao, 2020)
18	Task Technology	3	(Tam & Oliveira, 2016b), (Oliveira et al., 2014), (Wu et al., 2021)
19	Anxiety	3	(Patil et al., 2020), (Bailey et al., 2017), (Verkijika, 2020))
20	Risk	3	(Khalilzadeh et al., 2017), (Wei et al., 2021), (Gupta & Arora, 2017)
21	Perceived Credibility	3	(Goh & Sun, 2014), (Yu, 2012), (Al Khasawneh, 2015)
22	External Influence	3	(Giovanis et al., 2021), (Giovanis et al., 2019), (Francisco Liébana-Cabanillas et al., 2014)
23	Cost	2	(Alhassan et al., 2020), (Yu, 2012)
24	Structural Assurances	2	(Oliveira et al., 2014), (Wu et al., 2021)
25	Firm Reputation	2	(Oliveira et al., 2014), (Wu et al., 2021)
26	Privacy Risks	2	(Wei et al., 2021), (Oliveira et al., 2016)
27	Knowledge	2	(Purohit & Arora, 2021), (Koenig-Lewis et al., 2015)
28	Perceived Enjoyment	2	(Yen & Wu, 2016), (Koenig-Lewis et al., 2015)
29	Rural Dwelling	1	(Alhassan et al., 2020)
30	Education	1	(Alhassan et al., 2020)
31	Religiosity	1	(Suhartanto et al., 2019)
32	Institution-based Trust	1	(Thusi & Maduku, 2020)
33	Anticipated Regret	1	(Verkijika, 2020)
34	Reasons for Adoption	1	(Gupta & Arora, 2017)
35	Reasons against Adoption	1	(Gupta & Arora, 2017)
36	Optimism	1	(Rafdinal & Senalasari, 2021)
37	Gamification Impact	1	(Goncalo Baptista & Oliveira, 2017)
38	Individual Performance	1	(Tam & Oliveira, 2016b)

Source: Own work



Source: own work

Figure 1. Mapping of TPE Framework

CONCLUSION

This study aimed to offer a comprehensive literature review and weight analysis. In order to achieve this aim, 61 studies that focused on mobile financial services methods published during the last decades (2011-2021) were collected and assessed. Based on the results, the following implication for research and practice and conclusions can be drawn.

Most studies emphasized factors impacting the intention to adopt mobile digital financial services employed UTAUT and TAM as theoretical foundations. Specifically, our study makes theoretical contributions: It provides a deep insight into the theories and methods utilized by earlier scholars. For instance, it reveals that the unified theory of acceptance and usage of technology (UTAUT/UTAUT2) is the most popularly applied theory for consumer behavioral intention in the existing literature on mobile financial services and payment methods, followed by the technology acceptance model (TAM) and the task technology fit model (TTF). These findings can help in the development and enrichment of theory-based study by patronizing academicians to ascertain the theories and frameworks that have proven validity and are valuable enough to be taken forward for investigating the adoption of various digital financial innovations.

The most used constructs in literature were acknowledged, and their relevance was underlined, providing an update on current state-of-the-art knowledge. For researchers, this study offers strong support and a complete vision of the most significant variables already investigated at the individual level on mobile financial service adoption. It presents an integrated theoretical model that may be employed as a basis for further improvement of individual acceptance models as a starting point for future study. For practitioners, understanding the leading constructs and relationships between variables is essential for designing, refining, and implementing mobile financial services that can achieve high consumer acceptance, reinforcing current levels of adoption.

Out of 16 well-utilized predictors affecting intention to adopt, which were investigated through weight analysis, only six performed satisfactorily for the best predictors (i.e., attitude, perceived ease of use, performance expectancy, habit, social norms, and perceived usefulness). Further, the approach used in the systematic literature review found 33 critical factors for human influences using mobile financial services in financial institutions. Within the 38 keys, 11 critical technological factors can be used to design, improve and adjust current mobile financial services with technology conditions. It can therefore become tools to help customers meet the requirements of financial institutions. Therefore, researchers can deduce the variables to be chosen for analyzing consumers' intention to adopt and use behavior toward mobile financial services and payment methods.

LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

While this study summarizes and extends knowledge focus on mobile financial services and payment methods, there are some limitations. The first ascends from the failure of an initial plan to assess the relations between dependent and independent constructs of the reviewed studies and offer prediction strengths for each. However, in most studies, the data analysis section only

involved tests of those paths that the authors had examined, making it challenging to perform the further analysis needed to attain the planned purpose. For future literature reviews, it is advised that authors consider this issue during their screening process if they wish to carry out a comprehensive meta-analysis. Second, the studies for this research were collected only from Scopus, which limited the number of studies accessible for review and weight analysis. Future research should use a broader range of databases. Third, we followed a robust study search protocol grounded on relevant keywords, yet, probably, some studies associated with mobile financial services and payment methods could have been missed on account of the absence of our keywords in their title, author keywords, and abstract. Despite these limitations, this is the first comprehensive study of factors affecting the adoption and use of mobile financial services and payment methods focused on the last decades, which provides theoretical and practical directions.

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Digitalization and Its Impact on Business

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SUMMARY

We are now in a new era of business management, where companies have understood that the sustainability and survival of their activities is based on mastering and adapting new technologies to their strategies. The result of the integration of technological power in the management of companies gives rise to digitalization that disrupts business strategies, contributing significantly to the creation of new business models. This profoundly affected the strategic context; changing the structure of competition, business conduct, and ultimately, performance across industries. This paper is a descriptive literature review of recent works discussing the impact digitalization has had on business. In this work, firstly, a theoretical overview of digitalization and its development is presented. Afterwards, the digitalization of business as well as its impact is discussed. The result of this review is a summary of the advantages and disadvantages that digitalization brings to businesses.

Keywords: Business; Covid pandemic; digitalization; small and medium-sized enterprises.
Journal of Economic Literature (JEL) codes: L26, M10
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INTRODUCTION

Technological revolutions are causing tremendous changes in the economic sectors of the 21st century, just as the industrial revolution did in the 19th century (Xu et al., 2018). The economy has drastically evolved. Technical progress, which opens up new economic prospects, gives rise to new products, services and working methods (Song & Wang 2019). In just a few years, a new component has emerged as the engine of economic growth: digitalization (Foster et al. 2020). Economic success no longer rests on the wealth of raw materials, as was the case before, but rather on intangible capital as a source of competitive advantage (Tambe et al. 2019). Foster had already predicted in the eighties, when computerization began to spread in economic and social life, that the production industries, and a large part of the service industries, would experience a major technological change in the 2000s (Foster 1986). Digitalization is considered the source of globalization, transforming therefore the nature of products, the processes to produce them, the definition of skills and jobs, the form of competition, the balance of the market and the relationship between nations (Putilov et al. 2018; Jeske et al. 2021).

In the history of mankind, the introduction of new general-purpose technologies has spread like a wave, even if a large-scale introduction of technology sometimes takes time. Productivity growth comes from the useful uses of this technology spreading across different sectors of the economy (Carlsson 2019). The QR code now makes it possible to sell everything on a single small screen, spreading everywhere in online commerce. Thus the technique of banknote dispensers also made it possible to issue – after little technical adaptations – train or metro tickets. Everything hangs together; each novelty leads to another, even if this disrupts professions and certainties.

When the greatest benefits of new technologies have been exploited, productivity growth wanes (Carlsson 2019). Suddenly, something must again be invented to restart the machine. This is well known: it is innovations that create demand and grow trade (Sbarcea 2019). The high-speed trains created a demand for travel that did not exist before them.

Despite the social criticism to which it was subjected. Ryanair's economic model put a not only well-off population on planes who had traveled very little or not at all. The smartphone created needs that we did not know about in the ’90s, such as online shopping. The needs of humanity are infinite – in theory, but how far? – and, therefore, products and services are not limited in their evolution and innovation. Consequently, digital technologies can be, according to some authors, considered as an advantage because they constitute an important source of future productivity gains.

METHODOLOGY

The secondary research method was followed for this descriptive review to be prepared. The main objective of this paper is to present a theoretical overview of digitalization in business and to explore its impact. A thorough analysis of the secondary research papers gave shape to the discussed themes. Digitalization has touched all aspects of life and therefore is discussed in various disciplines. This resulted in the fact that various journals from different disciplines contained relevant information. Therefore, various databases, including among others Science Direct, Emerald Library and Google Scholar, were used to browse available articles. Since the trends and approaches immensely depend on the period of research, only recent articles (2019 to 2022) were taken into account and older resources were only used in the theoretical overview (definitions and history of development).

Taking into account the dynamic nature of the topic, the following keywords were used for searching: “definition of digitalization”, “digitalization vs. digitization”, “history digitalization”, “development digitalization”, “digitalization business”, “advantages disadvantages digitalization”, “SME digitalization”, “COVID digitalization business”, “pandemic SME digitalization”, “challenges digitalization” and “entrepreneurship and digitalization”, as well as different combination of these terms. In total, this search yielded 133 publications that were considered relevant. Each publication was studied and even the articles that did not have digitalization as the main topic were not eliminated if they presented relevant information in one of their sections. Even papers with mainly a technical focus were not excluded and relevant information was used in the study of the history of digitalization. After reviewing, it turned out that the sources were divided as follow: 99 journal articles (73.88%), 4 conference proceedings (2,98%) and 31 (23.14%) other scientific documents including academic theses, reports, books, etc.

Basis for the concept of digitalization

The development of digitalization technologies has revolutionized businesses by reducing time and canceling distances. In fact, the period of production of the same amount of data at the level of the entire world decreased to 20 seconds in 2016, while it was 24 hours in 2012 (Bechary 2020). A precise definition of the phenomenon is given, followed by the origins and a brief overview of the history.

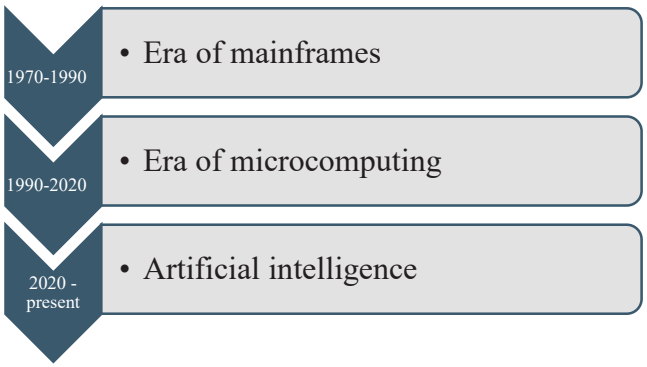
Digitalization vs. digitization

Even though the words digitalization and digitization are considered synonyms by a wide number of researchers, a debate in the academic field about an exact definition for these terms (Ross 2017; Frenzel-Piasentin et al. 2021). In fact, various academics have been using the two terms without distinction (e.g., Lyytinen et al., 2016). However, a consensus has emerged as the confusion and a need for clarification grew bigger. In fact, while digitization is considered as the technical process of converting, generating, storing or processing data, digitalization mainly refers to a socio-technical phenomenon resulting from using digital technologies and their impact on societies, businesses, and individual lives (Frenzel-Piasentin et al., 2021). Digital transformation involves technological innovation without leaving the human factor aside (Ross et al., 2019). In other words, digitalization is the process that aims to transform an object, a tool, a process or a profession into computer code in order to replace it and make it more efficient, taking into account the socio-technical impact of the adoption of digital technologies on the society, organizations, and individuals (Legner et al. 2017; Ritter and Pedersen 2020). Digitalization therefore completely transforms a company's business model or its entire value chain in a sector, by configuring its products, procedures, and customer experiences, with a fair balance between costs and benefits given to consumers or industrial buyers (Parida et al., 2019).

History of digitalization

In 1945, John von Neumann introduced a standardized script for writing instructions for data processing and the data itself. Instructions and data were thus handled in the same way by a machine, paving the way for the modern computer (Macrae 2019). John Bardeen, William Schockley and Walter Brattain, three researchers from the American Bell Laboratories, invented the transistor in 1947 (Amiri et al., 2019). The microprocessor concept dates back to 1969 (Shima 2005). However, it was not until 1974 that Intel marketed its 8080 model, which was used in the very first PCs such as the Altair 8800

from MITS and the Imsai 8080 (Crossman & Williams 1978; Shima 2005; Johnson 2014). The synergy between these components, becoming cheaper and more miniaturized as time went by, and the brilliant idea of Steve Jobs and later of Microsoft to make an application out of it that was accessible to all, caused an explosive growth of computing (Yang et al. 2021).



Source: Own processing

Figure 1. Development of digitalization

The development of digitalization can be summarized in three stages (Figure 1). The first is the era of mainframes (1970–1990). These were large mainframe computers used to perform a very small number of repetitive tasks, such as company payslips or other administrative tasks (Kaufmann-Buhler 2021). After that came the era of microcomputing (1990-2020), where computers became accessible to everyone and offered the user a graphical interface to manage different tasks (Mazor 1995; Power 2000). This era made IT user-friendly and did not require a group of trained staff (Barnes 2010). Open source was first introduced in the 2000s, i.e. "open source code", which applies to software whose license respects criteria are precisely established by the Open Source Initiative, i.e. the possibilities of free redistribution, access to source code and creation of works (Johnson-Eilola 2002). This novelty upset the traditional business of large firms, such as IBM, as well as that of software publishers (Hars & Ou 2014). Social networks have for their part shaken up the business of the media, in particular by putting access to and filtering of information in the hands of the masses.

A cluster of emerging companies and innovations transformed the way people and machines communicated, created, collaborated and thought. First, there was Steve Jobs, who unveiled a revolutionary little object that you put in your pocket: the iPhone (Garcia-Swartz et al., 2019). A little earlier, in the fall of 2006, a social network reserved for university students, Facebook, opened up to all individuals around the world over the age of thirteen and with an e-mail address (Facebook News Room 2006). Also in 2006, a microblogging platform called Twitter was created (Twitter Inc. 2012), while Google launched its Android operating system, popularizing smartphones other than the aforementioned iPhone and its iOS system (Elgin 2005). In an apartment in San Francisco, Airbnb was born while Amazon marketed the Kindle (Dudley 2007; McCann 2015). And it was in 2007 that an IBM team began developing a cognitive computer named Watson (Chen, Argentinis & Weber 2016). Finally, Intel reinvented the building block of the digital age, paving the way for a new generation of faster, more energy-efficient processors.

The final era is that of artificial intelligence, making it possible to solve complex tasks with a high degree of uncertainty: to translate a human question, evaluate the probability of correct answers, among the choice of several million, in a millisecond, and provide the appropriate answer in an understandable form (Helm et al. 2020). With this technological development that has crossed all borders, companies are adopting strategies increasingly dependent on information and communication technology in order to predict various customer expectations (Tang & Gekara 2020).

Development of digitalization

The invention of the Web and related new technologies have changed the means of communication in general. This had forced companies to change their operating methods to be more competitive (Hinings et al., 2018; Leonardi 2019). The integration of digitalization became crucial to meet customer expectations (Leonardi & Treem 2020). To ignore such an evolution could lead to the disappearance of a company, giving way to a new generation of companies called start-ups (Urbach & Röglinger 2019). Significant changes

appeared in 2010, when the Web already offered new possibilities for exchanging information and encouraged the design of new communication tools (Hilbert 2020). In fact, two powerful vectors have accelerated the digitalization of society: mobile phones and the web. After being developed separately in the 2000s, they merge by making the digitalization process deeper and faster (Musik & Bogner 2019). Boosted by the fall in the price of computer components, mobile phones and the web have enabled the emergence of new consumer and worker behaviors. The digital wave in society has had a major impact on the way companies produce goods and services, going beyond the simple fact of equipping themselves with computers in order to automate processes. It disrupted structures, jobs, impacting all stakeholders: employees, customers, suppliers, shareholders, as well as actors in the external environment, such as legislators. This major change, which upset the usual view of the economic world, undeniably affected many customer behaviors (Blštáková et al. 2020).

To keep up with society and sell better, businesses had to meet with what customers were looking for while communicating with them in a timely manner. The digital transformation began at the beginning of the Internet, as mail was replaced by emails, trade fairs by web forums, stores by e-commerce websites (Hilbert and López 2011). Another example of the digital transformation is customer relationship management tools. In order to predict customer expectations, companies are counting on customer relationship management tools to store and analyze their data, but the digitalization of customer relations is encountering a major difficulty such as convincing all the businesses that they must update and pool their data, a dynamic that involves a profound reconsideration of traditional organizational models (Aloulou 2019; Westerlund 2020; Gavrila Gavrila & de Lucas Ancillo 2021). The digital revolution is also apparent in the proliferation of mobility tools (Smartphone, tablets) and digital communication channels (social media, websites, etc.) which Attie (2019) claims have transformed the customer into a digital customer. The more the consumer is connected, the more he is informed and demanding, sharing his opinions on social networks and commenting live on his online purchases. Thus, the link between companies and their customers is undergoing major transformations, which means that the digitalization of the customer relationship is now perceived as a necessity. The company must anticipate the changes of the world of tomorrow, its constraints and its requirements by analyzing the actions of its customers.

Digitalization in relation to the business

The use of the Internet, and even more particularly of the smartphone, is growing every year, among both young and older audiences and becoming therefore a real strength for businesses (Ma et al., 2020). Buying, working, managing daily life, communicating or getting information from a smartphone has become a convenience for everyone. This general observation shows that the integration of digitalization in a company is necessary in its strategy (Guan et al. 2020). Not taking into account the evolutions of the market can compromise the future of a company in the long term. Nowadays, it is more than being present online. It is above all a question of maintaining activity, improving relations with customers and optimizing processes, which is essential for businesses (Gavrila Gavrila & Lucas Ancillo 2021).

Digitalization generates a network, carried by complementary goods and services, which give rise to digital innovations, such as bankcards and vending machines. Businesses become therefore increasingly immaterial. In fact, business competitiveness is based more on the experience expected by the consumer rather than on the actual product (Rekettye & Rekettye, 2019). That is why competitive logics and strategies rely mostly on information technologies and networked systems, first and foremost the Internet (Allen et al. 2021). Such an information-based business model results in information management processes replacing the physical product and taking on different constraints (Kerpedzhiev et al., 2021). Another important aspect of the new digitalized business models is the new forms of intermediation. In fact, traditional intermediaries, where consumers go directly through service providers, are starting to disappear. Thanks to the Internet, the relationship between companies and customers is facilitated, allowing the company to collect information on the tastes of current or potential customers (Bacher and Manowicz, 2020). With a click, a customer can compare the prices of different suppliers, resulting in a dynamic price: the price is constantly adjusted according to supply, demand and the remaining life of the good or service, so it varies in real time according to the motivations of the buyer(s) compared to those of the seller(s) (Friedrich & Selcuk 2022). The direct link with the supplier informs customers about the evolution of sales (Hennelly et al. 2020). This real-time information reduces or removes inventory from many industries; factories only produce according to customer orders (for example the print-on-demand businesses). It is therefore inevitable that the offer is personalized. This can be in two forms. It is either implicit where a commercial proposal is made to the Internet user, taking into account his centers of

interest without him being aware of it (Gleißner 2020). Alternatively, it can be explicit: some customization software can build the pages of a website according to the customer's profile, by analyzing their online behavior. This practice achieves substantial savings on promotional costs (saving of catalog expenses, for example) (Saura, 2021).

Impact of digitalization on business

The impact of digitalization on production processes can be summarized in removing the barriers of distance, making it possible for companies to relocate their production facilities to countries with low production costs, while having control over access to information in real time (Butollo 2020). In addition, digitalization has greatly changed the world of work. New technologies make it possible to automate the most basic and repetitive tasks. Processes become simpler and steps can be eliminated. Admittedly, the technology requires a significant financial investment, but companies make it profitable by saving costs afterwards. It is, after all, saving companies time in the process. An example of this in the retail industry is Zara (fashion store), which sells more on its online store than in its brick-and-mortar stores. Moreover, digitalization has made it possible to minimize transport costs up to 50 times thanks to the automation of loading and unloading (Ferhane 2019). Financially, digitalization has allowed banks to simultaneously access financial markets around the world with the possibility of carrying out transactions in real time thanks to powerful algorithms (Zhou et al. 2021).

In finance, the digitalization of several processes allows financial services to be more efficient (Mosteanu 2020). In fact, thanks to online banking services, the customer, can do a variety of tasks such as money transfer, checking their balance or applying for loans (Carbó-Valverde et al., 2020). Using the right digital tools therefore enabled financial advisors to have more time to execute more complex tasks such as advise clients. In manufacturing, digitalization manifests as the automation of several tasks such as inventory control, monitoring of manufacturing processes, storage, etc. (Björkdahl 2020). A great example of this is the food industry. Several crop and field monitoring processes are carried out more efficiently thanks to digitalization, such as digital tools that improve soil parameter control (Buklagin & Goltyapin 2021). Within insurance companies, digitalization makes it easier to carry out many processes: the assessment of insurance applications, filing, etc. 2019). Digital transformation has enabled customer self-service in various sectors. Broader and more efficient digitalization is now taking place in situations such as automatic checkouts, automated answering machines, and communication via social networks. Digitalization has become a natural phenomenon that combines the appearance of the Internet and daily advances in computing (Schneider et al.2019).

Another example is coaching. Nowadays, most coaches use electronic means to communicate, to organize or modify appointments. But coaching goes further in this process, with the Internet and online tools being used strategically in the coaching relationship (Carlsson 2019). Some e-coaches say they practice “distance coaching”, “remote mentoring” or “telementoring”, when coaching is done only online using instant messaging software and video conferencing. This method has several advantages: saving time and money, eliminating geographical borders, flexibility, etc. For example, the coachee can receive advice and assistance directly, without having to travel. E-coaching can also be extremely collaborative, as professionals from all over the world can, through online discussions, work together to pool their skills (Helal 2020). It is also a way to provide resources, build relationships, solve problems, motivate and create interactions between coach and coachee. Face-to-face coaching can entail several costs such as the service itself, travel, and absence from work. Online coaching reduces all these costs. Despite all these advantages, not all coaches believe in e-coaching. Some believe that the relationship of trust and credibility cannot be built from a distance. For them, using only emails and instant messages can lead to misunderstandings because you cannot see the other person reaction or hear his voice. The compromise would be coaching using digital means of communication but with at least one face-to-face meeting or a video-conference (Busch et al., 2022).

Moreover, the impact of digitalization on railway companies is quite impressive. The tens of thousands of bytes that can pass through optical fibers make it possible to monitor or order railway interlocking for dozens of kilometers in diameter, in a few milliseconds (Du et al. 2020). Besides, various sectors are already impacted by the arrival of AI and promise to be largely reinvented in the coming years, in particular by the progress of research in key areas: machine learning, computer vision, robotics, automatic language processing, collaborative autonomous systems, crowdsourcing, game theory, Internet of things, and neuromorphic electronics (artificial imitation of neuro-biological networks) (Winfield et al. 2019; Callister 2020; Chamola et al. 2020; Jiménez-Crespo 2021). Moreover, quantum computing will allow us to achieve great breakthroughs in science using computers which will no longer be attached to the simple binary digits 0 and 1 (Gyongyosi & Imre 2019).

Digitalization is no longer a choice for businesses but rather a necessity. Currently 70% of the major companies listed in the Fortune 500 no longer exist. Some have lost their place in the top 500 or have literally disappeared because of the digital revolution (Ferhane 2019). Since 2011 the digital revolution has affected large companies, as start-ups and agile competitors find ways to transform their business (Bernoff et al. 2011).

Digitalization and entrepreneurship

Entrepreneurs creates value by transforming existing markets. However, profit is not the only motivation. They are creative adventurers, explorers who takes pleasure in creating and countering their competitors (Daspit et al. 2021). Cacciotti et al. (2020) go so far as to say that the financialization of the economy and the growing rise of control and profitability systems have eliminated the daring entrepreneur who exploited his intuitions in an uncertain environment. He was replaced by a director, team manager, analyzing all the proposed projects in order to ensure their short-term profitability. The human interface only gives its "Go" if all the indicators are favorable (Argento et al. 2018; Koudstaal et al. 2019). But in reality, the future cannot be predicted, it is necessarily uncertain and unpredictable, it is realization, in the sense of adaptation.

The decisions made by entrepreneurs may seem surprising or even incoherent, which is explained by the fact that they decide the allocation of resources using information to which others do not have access (Koudstaal et al. 2019). These creative entrepreneurs thus favor exceptional periods of sustainable expansion. Without entrepreneurs, the traditional business world is doomed to stagnation or decline. They identify an unsatisfied market and develop it using their business network (Ivanović-Đukić & Stevanović 2019; Kan et al. 2019). The effectual character of this approach is therefore framed by a causal logic allowing the results of the entrepreneur to be to optimized and maximized.

Digitalization has created business models described as holomorphic, where the entrepreneurial model would dominate and where each individual would become the actor of his project (Olsson & Bernhard 2021; Omrane 2020; Varenne 2020). In this emerging ecosystem, business opportunities have never been so numerous; this is partly due to the increased information available to everyone. It is a permanent invitation to entrepreneurship. Man is forced to become an entrepreneur, not only in the narrow sense of start-up creator, but also from the perspective of coordinating collective action, which is a source of value creation (Fossen & Sorgner 2021).

The entrepreneur is at the heart of the digital transformation of organizations. Digitalization promotes the emergence of a mode of growth where the economy would constantly reshape its criteria of efficiency and its markets (Hervé et al. 2020). The new growth is marked by the dematerialization and the opening of the perimeter of the company to the various actors and partners. The emergence of new sources of wealth, such as data or collective intelligence, is disrupting traditional business models (Kraus et al. 2019). Digitalization allows access to better quality services to a greater number of people at a lower price. It challenges a large number of sectors (Awe & Ertemel 2021). Rent markets are disappearing and historical monopolistic regulations are being called into question. The digital transformation model follows the fundamental ideas of the Lewis model (1954) and the entrepreneurial character identified in Nelson and Pack (1999), Ciccone and Matsuyama (1996) and Dias and McDermott (2006) (see Varenne, 2020). Although the model of Lewis (1954) can be classified among the traditional archetypes of growth, the innovative element of digitalization is the emergence of entrepreneurial capacity in the modern sector. This new sector is conducive to new business start-up opportunities (Ben Youssef et al. 2021). The significant change in the number of start-ups can be considered an identical indicator to that of the 2000s. In this new growth model, effectuation highlights the entrepreneurial spirit as a driver of growth and of structural change. Entrepreneurial capacity is an important dimension of human capital. Some work focuses on human capital and the identification of business opportunities that support the link between information and identification of these opportunities (Varenne, 2020).

The entrepreneur is at the heart of digital transformation: in an effective logic, the entrepreneur imagines and builds future business opportunities. For this business model to be digital, the company must have a real digital maturity of the information systems. As this model evolves in an uncertain and complex environment, the company must adapt and adjust to the vagaries of daily life. This model therefore integrates an entrepreneurial dynamic. The company adjusts on a daily basis through changes that promote learning, strategic changes being identified by entrepreneurial decisions. These entrepreneurial changes are only a direction indicated by the entrepreneur, who leaves the means available to the operational staff to improve and optimize the operational processes (Rosin et al. 2020).

The impact of digitalization on entrepreneurship is tremendous. In fact, scaling up has never been easier. It is the spearhead of the startup nation. Digital technologies allow companies to scale up more easily, i.e. to generate revenues with increasing returns to scale. The principle of scale is simple: each produced unit costs less than the previous one, thanks to economies of scale. Therefore, in order to

reduce unit costs, production volumes are increased, aiming to spread fixed costs over a greater number of produced units (Vadana et al. 2020). Under the impetus of digitalization, everything is going drastically faster: connections, information sharing, massive collection and processing of data, decision-making processes, collection of feedback, interaction with users, etc. Digitalization completely created short cuts in the entrepreneurial process (Ben Youssef et al. 2021). In addition, it gives companies a dynamic, very flexible organization, allowing them to constantly and easily adapt their infrastructure to market requirements. Finally, in addition to giving new scope to alliances and strategic partnerships, digital technologies create "network effects": the more the number of users of the product/service increases, the more the value of this same product/service increases. Therefore, the scale makes it possible to aim for a growth curve that is no longer linear, but exponential. This is facilitated by digitalization (Rosin et al. 2020).

Moreover, digitalization provides a tenfold strategic reach. Creating value is good; but delivering this value proposition to its customers is even better. Digital technologies make it possible to involve an ever larger, more diverse and constantly evolving set of actors. Implementing an effective digital strategy is a great way for businesses to reach more prospects. Digitalization implies the creation and mobilization of different networks, which bring together all the material and immaterial resources that entrepreneurs share by creating connections and relationships (information networks, personal entourage, technological resources, networks of alliances, networks of investors, social networks, etc.). Digital technologies multiply connections, allowing one to easily reach previously inaccessible markets, customers or partners (Aloulou 2019). Another important aspect of digitalization that has impacted entrepreneurship is a particularly fast operational speed. It has never been faster to bring a product or service to market than in the digital age. Digital technologies impact the speed of business strategy in four aspects: they accelerate the speed of product launches, they enable faster decision making, they accelerate the orchestration of the supply chain. and they greatly accelerate the creation and mobilization of different networks (Rosin et al. 2020).

Digitalization in small and medium-sized enterprises

The literature shows that traditional marketing theories are not applicable in small and medium-sized enterprises (SMEs), as the informal and sometimes chaotic nature of marketing done in SMEs can be radically different from the marketing guidelines offered in textbooks (Ahlame 2019). In general, the marketing techniques used by SMEs are informal, reactive and spontaneous. SMEs tend to be sales- and networking-centric, unlike larger companies, which are more structured and have formal processes like systematic market research and sales and market development planning (Sadiku-Dushi et al., 2019). Such flexibility and fast adaption to the changing factors of the market has been a rather important advantage for SMEs during digital transformation. In fact, even though the literature based on digital marketing shows that SMEs generally lack knowledge about practices of digital marketing (Amin 2021), digitalization has made acquiring knowledge and learning new skills quite accessible for SMEs (Ballestar et al. 2020; Thrassou et al. 2020). Business networking and expanding to new markets has been made easier by the digital transformation (Rivza et al. 2019).

Tarutė and Gatautis (2014) analyzed the literature to explore the impact of information and communication technologies on companies and more particularly. Dumitriu et al. (2019) confirm the positive effect of Information and Communication Technologies (ICT) on business performance in terms of productivity, profitability, market value and market share. This study also found that ICT had some impact on intermediate performance measures: process efficiency, service quality, cost reduction, organizational and process flexibility, and customer satisfaction (Eller et al. 2020). All dimensions of strategic performance could be considered indirectly affected by ICT (Tarutė & Gatautis 2014; Delahaye 2019).

With all the advantages that digitalization offer to SMEs, various challenges face them when going through a digital transformation. In fact, SMEs do not exploit the full potential of digital marketing tools (Ahlame 2019). Consequently, they do not take advantage of the opportunities offered by digital technology. This is the result of various factors such as financial investment, human and managerial resources, short time and especially the underdeveloped innovation culture (Thrassou et al., 2018). When it comes to managerial and innovative vision, many SMEs seem to fail to understand the repercussions of digitalization on the level of organization, operation and strategies (Rivza et al. 2019; Thrassou et al. 2020). This generally causes problems when choosing the right tool to fulfill their business needs (Bouwman et al.,2019).

Digitalization and the impact of the Covid pandemic on business

For the past couple of years, the world has been facing a health crisis, the Covid-19 pandemic. This pandemic, through its manifestations, has brought

about profound change at all levels. This crisis is transforming the geopolitical configuration of the world and the balance of power between states. In many ways, the pandemic has brought to light the weaknesses and fragilities of current business policies and systems (Abodohoui 2020). The use of home offices to keep global economies afloat and to provide education, teaching and other services on all sides has been mobilized differently among countries around the world and has also revealed inequalities in access to these means within the same countries, even in the most developed ones (Boudedja et al. 2020). Digitalization has proven to be crucial for the global economy to continue to function in this period of crisis (Shkalenko & Fadeeva 2020). It has also allowed people to continue to work and keep in touch during quarantine. Digitalization has also enabled telemedicine, which changed from being the exception to a perfectly accepted or even indispensable practice, especially in developed countries (Contreras et al. 2020). Online commerce has experienced a historic boom as well (Holland & Hennessy 2019).

The Covid crisis has had an accelerating effect on the digital transformation strategy of industrial companies. Decision-makers have become aware of its benefits, particularly in terms of agility in dealing with risks (Harianto & Sari 2021). In the future, companies in the industry sector should equip themselves with more digital tools in order to prevent risks, particularly related to their supply chain (Lichtenthaler 2021). This is the observation made based on the results of a study on the effects of the health crisis on the digital transformation of companies in the industry, conducted by Infopro Digital, with 207 industry decision-makers (Décision Achats, 2021). Overall, the health crisis has been beneficial for the digital transformation of companies in the industry: in fact, it is believed that it has made it possible to accelerate the digital transformation of companies working in certain sectors such as digital communication (Wieringa 2020). Unsurprisingly, decision-makers from large companies are more likely to think that the crisis has had an accelerating effect on the digitization of their company, unlike professionals from VSEs/SMEs, who are more likely to not have seen any change in this level. However, organizational difficulties were noted in the deployment of these changes (Harianto & Sari 2021). Difficulties were experienced related to data, in particular to their collection and use (Nielsen et al., 2018). Some companies, particularly from VSEs/SMEs, also expressed the lack of financial means, as well as a difficulty in justifying the Return on Investment (Bai et al., 2021).

The level of investment in digital tools to manage companies' supply chain has increased since the health crisis (Lichtenthaler 2021). However, there is low satisfaction with the digital tools currently used, such as business intelligence/reporting tools, data analysis, internal/external collaborative tools, supplier management and production and planning (Schrage 2020; Srinivasan & Eden 2021). Digital tools are therefore necessary to manage supply issues. Among the main difficulties that the current crisis has highlighted in the supply process for companies in the industry, we can see that the lack of suppliers' transparency comes first, followed by lack of business agility due to a lack of internal skills or resources (Quayson et al., 2020; Zhu et al., 2020). The relocation of the company's activities, the lack of equipment in purchasing/logistics management tools, the lack of connections between the management of the supply chain and that of purchasing, the just-in-time delivery of goods as well as the poor management of the supplier relationship are also noted (Iyengar et al. 2020; Zhu et al., 2020).

RESULTS

Digital technologies are considered a driver of development (Table 1). In fact, all experts agree that digital technologies have greatly reduced costs and created new products and services (Ribeiro-Navarrete et al. 2021). They facilitate the search, comparison and sharing of information, contributing to the strengthening of relations between businesses and customers, with an increased influence on the way businesses operate, and consumers interact with these technologies (Met et al. 2020). Digital technologies offer therefore new opportunities for creating business models in a wide range of industries (Urbach & Röglinger 2019). Moreover, digitalization drives efficiency. By making transactions faster thanks to digitalization, companies are automating a large part of their activity, resulting in a better return on human capital and better control of tasks, and de facto better profits for customers and consumers (Urbach et al. 2018). Furthermore, digitalization fosters innovation, since the Internet promotes new service delivery models such as e-commerce platforms; even if their cost of deployment is relatively high, the cost of a transaction or of adding a user is relatively low, which allows companies to have better returns, competing with conventional competitors (Apostolov & Coco 2021).

However, alongside the opportunities made possible through digitalization, various threats are also to be noted (Table 1). In fact, the frenetic pace of change driven by digital technologies is having a disruptive impact on doing business, threatening existing business models (Pemer 2020). Such disruptions can take place at various levels. On the individual level, life practices are deeply disturbed by digitalization. The most evident example of that is how mobile connectivity disrupts social life.

Professional practices can also be disrupted, as was noted during the Covid pandemic, where working from home was favored to working in offices (Nöhammer & Stichlberger 2019). As for businesses, typical practices such as the way information flows through the organization and induces changes in power relations were disrupted by digitalization in the forms of social media or cybernetic attacks in the workplace (Luo 2022). Furthermore, digitalization of media content and user-generated content is disrupting traditional content production and delivery value chains in industry structures. Disruptions on the level of societal systems can be seen in social media involvement, which disrupts traditional practices of forming public opinion.

Table 1:

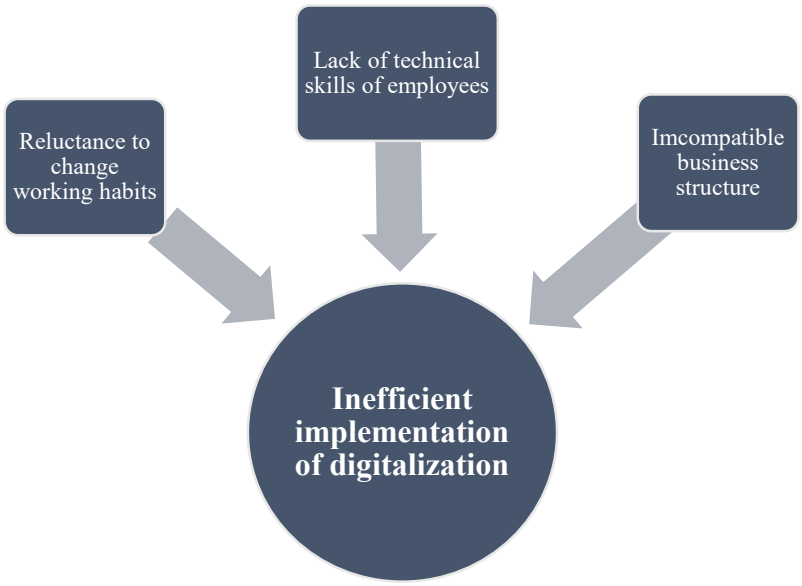
Advantages and disadvantages of digitalization

Advantages of digitalization	Disadvantages of digitalization
Reduction of costs and creation of new products (Ribeiro-Navarrete et al. 2021)	Disruptive impact on existing business models (Pemer 2020)
Ease of search for, comparison of and sharing of information (Met et al. 2020)	Disturbance of life practices both on individual and professional level (Nöhammer & Stichlberger 2019)
Strengthening of relations between businesses and customers (Met et al. 2020)	Change of information flow between business and customer (Luo 2022)
Creation of new business models (Urbach & Röglinger 2019)	Social media involvement in forming public opinion (Luo 2022)
Efficiency (Urbach et al. 2018)	
Innovation (Apostolov & Coco 2021)	

Source: Own processing

DISCUSSION

Even though digitalization is a great asset for companies, its implementation poses major challenges (Figure 2). Indeed, change seems hard to embrace, especially within a company. The change does not only concern the improvement of its working tools but also involves changes in habits and mentality (Almeida, Duarte Santos & Augusto Monteiro 2020). Some employees may be reluctant to change. Others fear job losses (Krutova et al. 2021). To guarantee the success of the digitalization, the company must be transparent with its employees informing them of the benefits of such changes both for them and for the company. This requires personalized support to facilitate the assimilation of new work processes. Besides, the use of new tools may be rather challenging. In any given company, the implementation of an effective digital strategy remains essential to guarantee its sustainability. This seems difficult for some companies and is considered a source of blockage. An update of technological trends is essential for a successful digitalization (Sbarcea 2019). However, mastering digital channels makes it possible to adopt effective digital marketing strategies. Moreover, technology must be handled skillfully to ensure successful digitalization (Gjellebæk et al. 2020). Most business leaders do not have the skills required to handle digital tools properly (Moşteanu 2020). This is a major obstacle to digital transformation. Some technologies may also be incompatible with the current business structure. Selecting the right digital tools adapted to its structure and the needs of its customers remains crucial for business leaders and managers (Bai, Quayson & Sarkis 2021). To deal with this, an outside intervention, such as a specialist agency, becomes essential. This will facilitate audits, proposals and the application of new processes. Errors and delays will therefore be avoided.



Source: Own processing

Figure 2. Challenges for the implementation of digitalization

CONCLUSION

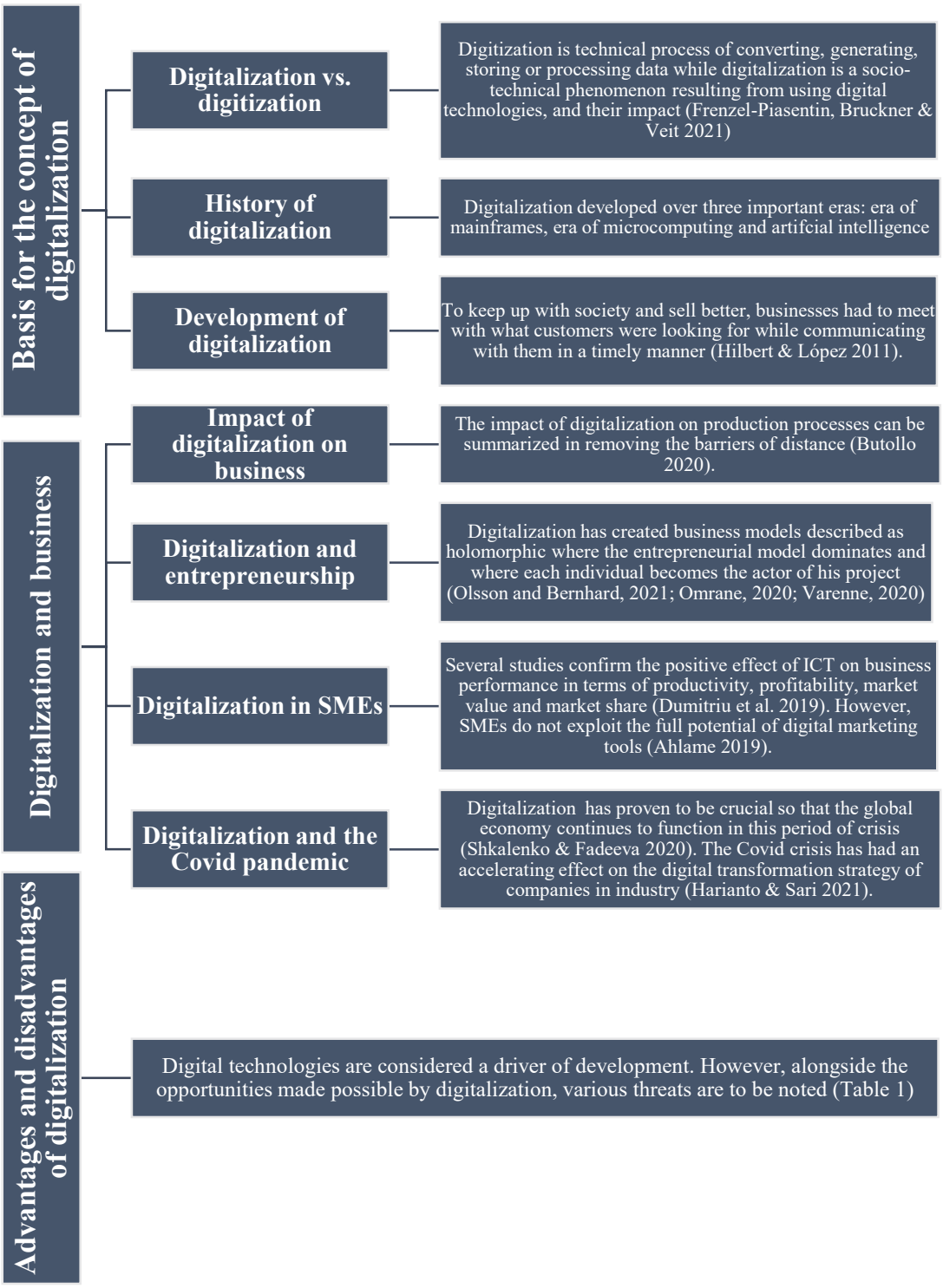
The diffusion of digital technologies can differ greatly across industry categories or regions, and the speed of potential changes is not easy to assess. Development can be as evolutionary as it is disruptive, as some technologies such as robotics might not be feasible in economic terms and might not be accepted due to national cultures (Telli & Aydın 2021). We can already observe nations that are more advanced than others, by the simple fact of their willingness to move forward (Sbarcea 2019). Former industrial regions and "old-fashioned" industries – such as the railways – are struggling to convert due to the skepticism of their workers and the fear of changing habits.

The speed at which technological progress spreads also depends on legislation, itself dependent on the social and political context of a given region, which speeds up or slows down the speed of innovation. Different types of opportunities or risks may arise for the parties involved. Companies may require new forms of flexibility as well as new types of skills, which can create social tensions.

The difficulty of understanding the digital phenomenon therefore shows that technological progress is both an opportunity and a threat – everything depends on the cultural context. It may be a threat for some and an opportunity for many. The ten countries that rely the most on innovation are mostly European (Sbarcea 2019), including Switzerland, Germany, and the Scandinavian countries.

In this review, the difference between digitalization and digitization was addressed in the literature. Even though some researchers use these two terms interchangeably, it was established that digitization is the mere transfer of data to digital form while digitalization includes the socio-economic consequences. The history of digitalization and its development in businesses were examined. It was found that the phenomenon started with the beginning of the Internet and was massively accelerated by the pandemic. The impact of digitalization on businesses was studied. It was found that digitalization is no longer an option for business but rather a necessity to survival. In fact, businesses have to adapt their business models and business strategies to go along with the digitalization that the entire world is going through. Digitalization was expected to be an advantage for SMEs, thanks to their flexibility and a quick reaction but it was frequently reported that it was overwhelming for them from a financial and cultural point of view. A graphic summary of the review is shown in Figure 3.

At the end of this review, it is worth mentioning that this research work is not without limitations. The main limitation concerns the absence of an empirical framework. It would also have been interesting to conduct a quantitative analysis of the literature treating the subject of digitalization in business.



Source: Own processing

Figure 3: Graphic summary of the review

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Changing European Energy Policy – The Challenge of the Energy Price Storm

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SUMMARY

This paper examines the roots of the European energy crisis within the period of 2021–2022, the reasons for the European gas shortage, the effect of the Russian invasion of Ukraine, and the potential EU responses. The current crisis is a result of several factors, starting from the Covid-19 pandemic in 2020 and amplified severely by the current conflict between Russia and Ukraine. In addition, five reasons were identified as worsening the EU energy situation. These include market-based gas prices, external dependency, global imbalances, the EU's climate policies, and low European energy stocks. The Russian invasion of Ukraine put pressure on the oil and gas supplies to the EU. This situation led the EU to introduce sanctions and measures that target increasing the share of renewable energy while reducing the dependence on Russian gas. Finally, we shed light on the energy transition as an opportunity to deal with climate change and limited energy resources while also showing the challenges that would hinder a just transition.

Keywords: energy prices, volatility, energy transition, war
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INTRODUCTION

The energy sector is cyclical, and history has often demonstrated that a severe market collapse follows growth. However, the energy crisis of 2021–2022 will differ from earlier ones. The recent hike in energy prices may lead to an improper transition to a low-carbon economy that is not managed against scarcity and volatility and might result in market crunches (Popkostova, 2022).

The current global energy crisis is one outcome of several problems. Covid-19 lowered the global demand for oil and other energy sources, limiting their output. However, the world's unexpectedly quick recovery from the epidemic has resulted in a rapid spike in energy needs, leading to inflation that doubled the price of coal and crude oil. Also, central banks intend to maintain low-interest rates and a wave of low-cost cash, despite record levels of consumer spending and a 30% increase in Chinese exports. Both are stressing supply systems already strained by the epidemic (Helman 2021). In addition, the globe has witnessed severe weather conditions. Heavy rains in South and Southeast Asia have made coal mining difficult in nations like India and China, resulting in a coal shortage in these countries. The energy situation in Europe has been exacerbated by

a cold winter in 2021-2022 as it depleted its gas reserves. We can add in Russia's failure to provide nearly as much gas to Europe as promised, possibly as a tactic to push the approval of Nord Stream 2.

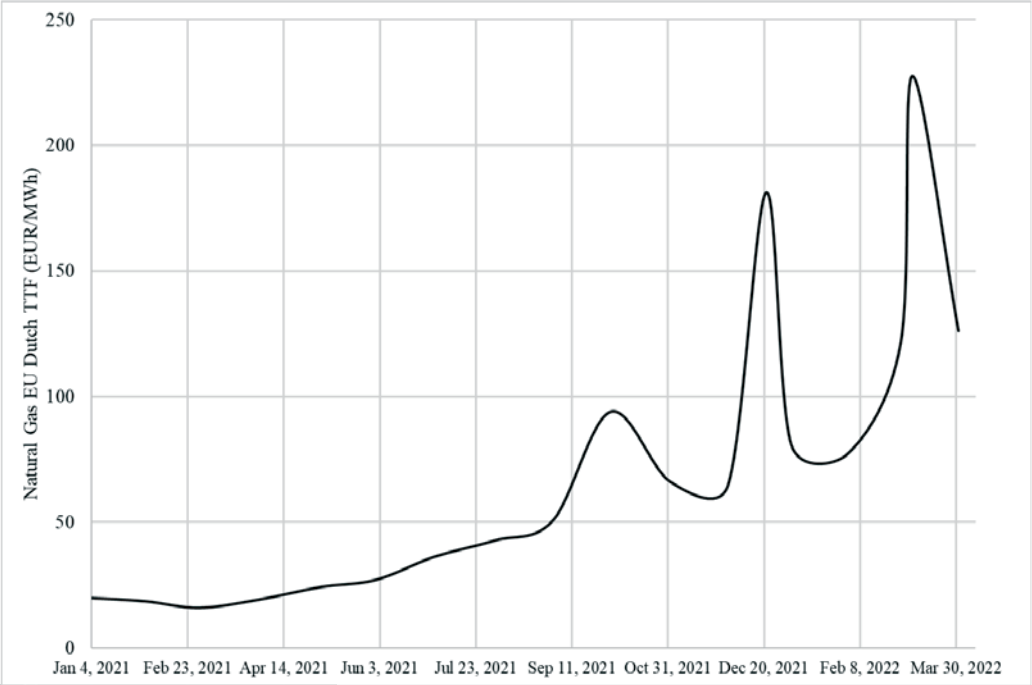
However, there are other reasons as well. Fossil fuels have been so demonised by the greenhouse gas emission-cutting movement that institutional investors and governments have removed them from their portfolios, directing capital to more socially appropriate low-carbon substitutes. The substitute for these fuel types, renewable energy, is still insufficient to fill the gap. This is why Germans are now rethinking the decision to shut down their nuclear power plants in recent years, and the Dutch are reconsidering closing the Groningen gas field. In the US, for instance, according to the US Energy Information Administration, renewable energy sources, excluding hydropower, generated a little less than 10% of total electricity output in July 2021, while gas generated 42% (Helman 2021).

Nevertheless, we should admit that our existing energy system is vulnerable due to its reliance on fossil fuels. The fight against climate change necessitates a dramatic shift in global energy sources requiring billions of dollars in investment. If world leaders do nothing to address the climate danger, depletion will continue to eat away at the world's oil, gas, and coal supplies. The quality of today's fossil fuel supply is worse than it was decades before. If it is a must to move away from our current reliance on fossil fuels, in what ways will we make the transition to renewable energy? A switch to renewable energy for power generation suggests a potential for increased efficiency. Generally, the transition will involve an exchange between the costs of having a renewable energy system function almost identical to the current one and the costs of adjusting our energy consumption patterns to the characteristics of renewables ("The Energy Crisis" 2022).

This paper examines the roots of the European energy crisis in 2021, the reasons for the European gas shortage, the effect of the Russian invasion of Ukraine, and the potential EU responses. Also, it recommends short, medium, and long-term strategies to combat the crisis.

THE EUROPEAN ENERGY CRISIS EXPLAINED – REVEALING THE MAIN CAUSES

Natural gas prices have risen in Europe as worldwide demand increases. While this is true of most commodities, natural gas has been a particular concern. The prices have reached record highs across the continent. From January 2021 to March 2022, European gas prices rose by 1100%. In 2021, U.S. natural gas futures volatility increased to a record level due to the global energy crisis that has driven up prices. In September 2021, implied volatility reached a record high of 122.5%, breaking the previous high of 117.5% in November 2018. The market has become more unpredictable as competitiveness for the few liquefied natural gas (LNG) shipments from the United States grows between Europe and Asia. Manufacturing activity has been restricted in Europe, and power issues have occurred in China as a result of this competition, which helped in the price increase. With the escalation of the Ukrainian war, energy price volatility and supply uncertainty increased in Europe (Disavino 2021). Similar pressures have been seen for coal. Coal prices increased from 56.57 USD/tonne in January 2021 to 402.68 USD/tonne in March 2022 (Markets Insider 2022). With natural gas and coal being key to flexible power generation, price spikes have translated into record electricity prices. In some countries, European average monthly electricity wholesale prices increased up to 500%. In Germany, the price rose from around 50 to more than 250 EUR/MWh (Statista, 2022). Figure 1 shows the prices of European natural gas, daily TTF (the Dutch hub price, a European benchmark), during the energy crisis and before the Russian invasion of Ukraine (4 January 2021−30 March 2022).



Source: Authors' compilation based on ("EU Natural Gas 2022 Data," 2022)

Figure 1. The European natural gas prices, daily TTF (the Dutch hub price, a European benchmark), 4 January 2021 – 30 March 2022 (EUR/MWh).

As coal, an environmentally harmful fuel, is gradually phased out, many nations turn to natural gas as a bridging fuel until green alternatives can be implemented. Furthermore, gas is utilised for household cooking and heating, making the price increase even more evident in customers' final costs. In 2021, citizens in many EU member states also suffered record-high energy costs. Governments are on high alert, with ministers trying to develop emergency measures to soften the effects. To consumers' dissatisfaction, the equilibrium between the three components of the energy trilemma – security, affordability, and sustainability – has deteriorated. If not handled properly, the issue may jeopardise the EU's overall net-zero emissions goal and fuel an anti-transition attitude, destroying support for the flagship European Green Deal (EGD) and threatening the EU's global climate leadership (Popkostova, 2022).

The energy situation in Europe has been worsening since 2021, and the reasons are complicated and linked. In this section, the five main reasons will be presented; namely, 1) market-based gas prices, 2) external dependency, 3) global imbalances, 4) EU climate policies, and 5) low European energy stocks.

Market-Based Gas Prices

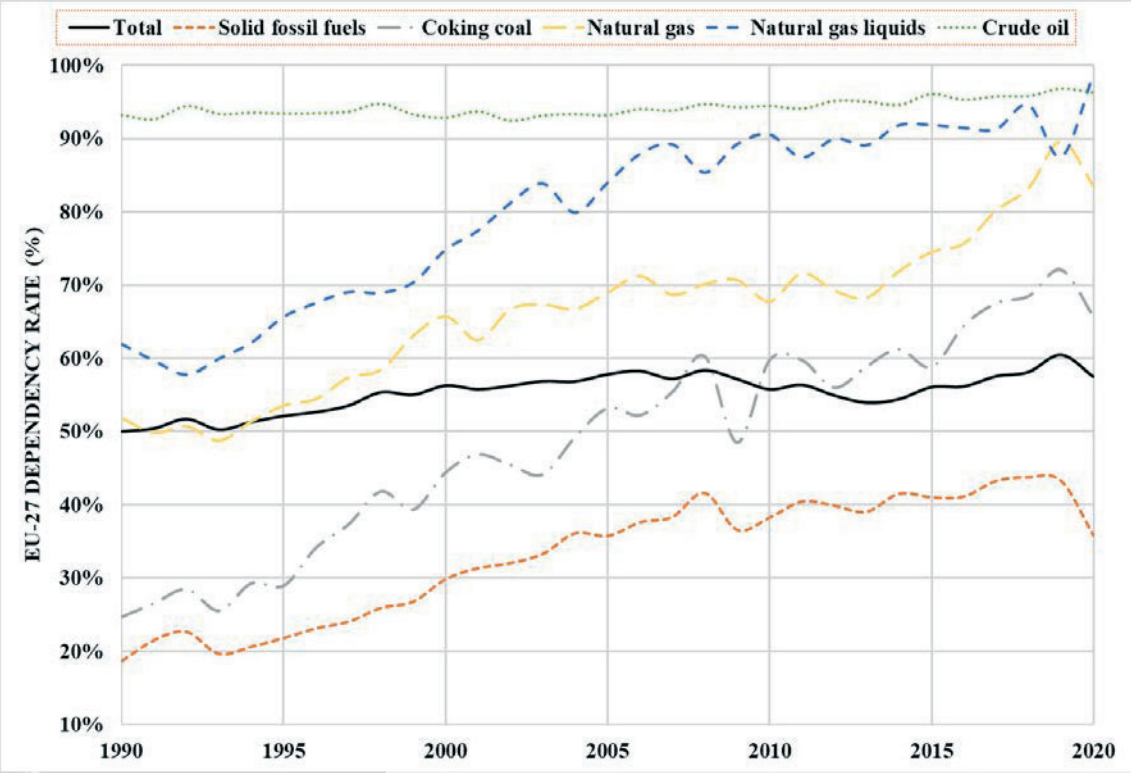
Most of Europe's gas consumed in the 1990s was acquired and sold under long-term contracts based on a percentage of crude oil prices. Because gas prices were based on fluctuations in the oil market, they did not reflect the supply and demand of the gas market. The oil-indexed gas pricing percentage dropped from 92% in 2005 to 20% in 2020 (Kennedy, 2022); due to liberalisation, deep and liquid gas trading hubs formed, with futures contracts and financial derivatives allowing market participants to manage their exposure to gas market fundamentals while benefitting from price fluctuations. Over the last decade, Europe has saved approximately 70 billion USD (Kennedy, 2022) in lower gas import expenditures by moving away from oil indexation toward market-based gas prices. However, in the second half of 2021, rising worldwide gas prices wiped out a significant portion of those savings. The IEA predicted in October 2021 that "EU countries would spend about 30 billion USD more for natural gas in 2021 than they would have remained with oil-indexation" (Kennedy, 2022). This resulted in long-term contract holders gained a vast sum of money by reselling comparably low-priced oil-indexed gas into illegal markets in the winter of 2021.

External Dependency

In 2019, the EU's energy dependency rate was 61%, implying that net imports provided more than half of the EU's energy requirements. This percentage varies widely, from over 90% in Malta, Luxembourg and Cyprus to 5% in Estonia. Since 2000, when it was just 56%, the EU's reliance on energy imports has risen. Figure 2 shows the EU-27 energy dependency rate for different fuel types from 1990 to 2020. For all fuel types, the dependency rate increased throughout the period. It increased the most for coking coal with 41%, followed by natural gas liquids with 37%, and 32% for natural gas. Crude oil rose the least at 3% only. In 1990, crude oil was the most relied on fuel by the EU-27, with a 93% dependency rate. However, in 2020, natural gas liquid overtook the value of crude oil with a 99% dependency rate.

The EU's energy supply resilience may be compromised if a substantial percentage of imports is concentrated among a few partners. Figure 3 provides information about the shares and partners of the EU solid fuel, natural gas, and crude oil imports in 2019. Russia is the leading EU supplier of crude oil, natural gas and reliable fossil fuels. It was the source of 47% of fossil fuels, followed by the United States (18%), Australia (14%), and Colombia (8%). Regarding natural gas, 41% of it was exported by Russia, followed by Norway (16%), Algeria (8%), and Qatar (5%) in 2019. While accounted for nearly two-thirds of the crude oil imports came from Russia, Iraq (9 %), Nigeria and Saudi Arabia (both 8 %) and Kazakhstan and Norway (both 7 %) in the same year.

The external dependency is not limited to the fuels mentioned above but to liquified natural gas (LNG). Regarding LNG, Europe mostly depends on the United States, Qatar, and Russia. According to the EIA, the US became Europe's top LNG supplier in 2021, with 26% of all LNG imported by EU member countries and the UK, followed by Qatar (24%) and Russia (20%). As a result of the high natural gas prices and supply issues in Europe, the United States supplied more than half of all LNG imports into the continent in January 2022 (Wright, 2022).



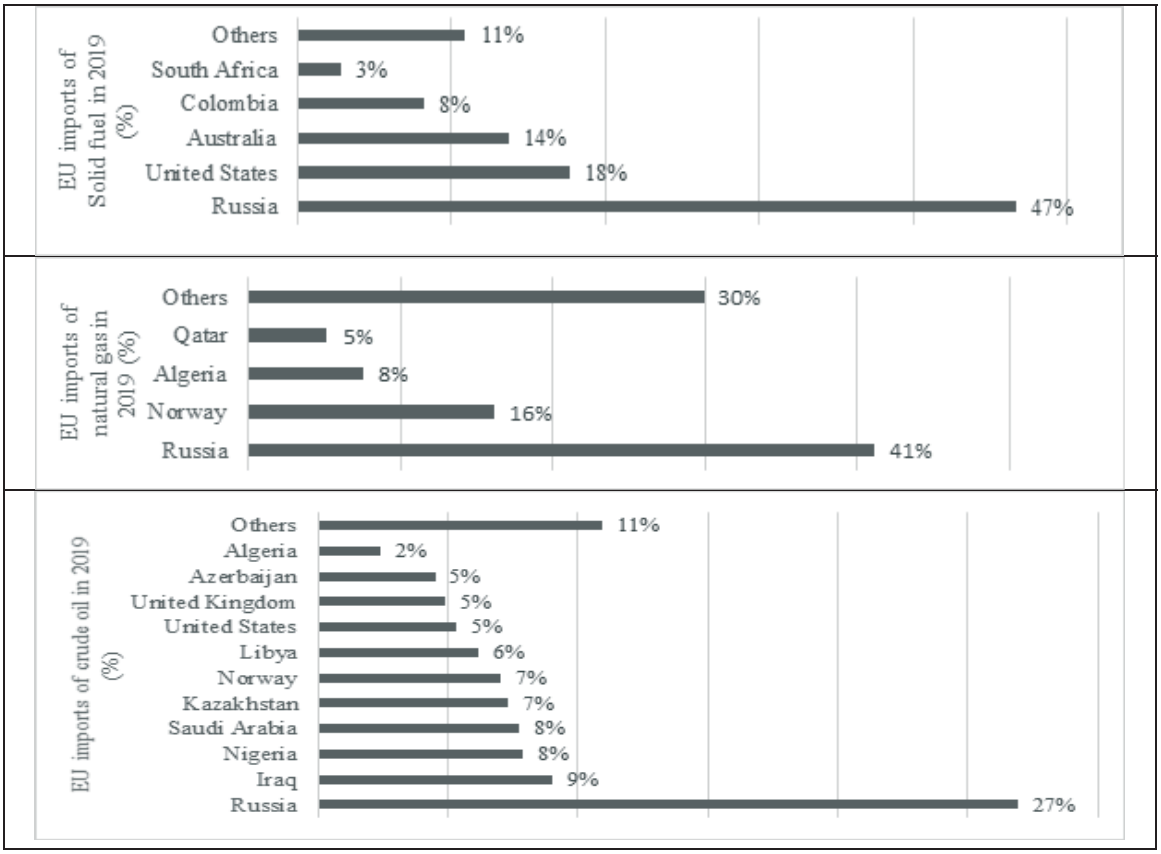
Source: Authors' compilation based on Eurostat (2022b)

Figure 2: The EU-27 energy dependency rate for different fuel types from 1990 to 2020.

Nonetheless, in terms of energy, the EU mostly depends on Russia. The Russian supply to the EU was down from 2019 levels in 2021. Already in 2020-2021, there have been fears that Russia may be exploiting the situation to agitate for the Nord Stream 2 pipeline by refusing to supply more natural gas to Europe's storage facilities (Euronews, 2022). Nord Stream 2 was completed in September 2021 but has not yet been certified by the German government. Since the pipeline's announcement in

2015, the United States and several European countries have opposed it, fearing the project would boost Russia's influence in Europe. Germany tried to keep the pipeline out of politics. Still, after the invasion of Ukraine, it was difficult to stand up for the project (Horowitz, 2022). Russia recently has been reducing gas supplies into Europe, sometimes by two-thirds, then raising them unreasonably after the harm has been done – increasing them to keep markets unstable and the future uncertain (King, 2021). Because prices were lower before the war, Russia limited gas exports to Europe. It predicted that once the Russian-Ukrainian conflict started, gas prices would jump, so it increased exports. Russian gas deliveries to Europe hit their greatest level since December 2021 in the 48 hours following the commencement of the war (Bloomberg, 2022).

Moreover**,** Ukraine was once a vital link in the European energy system, but its significance has declined. Most of Russia's gas shipments to Europe in the 1990s travelled through Ukraine. Russia, on the other hand, has widened its horizons since then. It began construction on the Yamal–Europe pipeline in 2006, which goes through Belarus and Poland. Russia built the Blue Stream pipeline to Turkey in 2003, the Nord Stream pipeline to Germany in 2011, and the TurkStream pipeline to Turkey in 2020. These initiatives have reduced Ukrainian transit from 1998 to 2021 by 70% (Tsafos, 2022). While Ukraine has not purchased gas from Russia since 2015 and has underground storage of the commodity, its domestic gas supply is intertwined with the transit gas pipelines that go from Russia to Europe; if these were to shut down, the pressure in the system would drop, leaving Ukraine unable to provide the gas it requires for internal use. Europe, indeed, would confront gas shortages as a result (The European Institute for International Law and International Relations, 2022).



Source: Authors' compilation based on Eurostat (2022a)

Figure 3. The shares and partners of solid fuel, natural gas, and crude oil imports to the European Union in 2019

Global imbalances - China is to Blame

China is the world's top generator of greenhouse gases. As a response, the world requires the Chinese government to take bold, immediate action to decrease emissions (Lewis & Edwards, 2021). In accordance with its climate and energy policies, China prohibited coal shipments from Australia when Australia urged that China conduct a thorough inquiry into the sources of Covid-19 in Wuhan (Oriental News Nigeria, 2021). Due to coal scarcity, the country has witnessed its most significant power crunch in years. In September 2021, most of northeast China experienced power outages regularly. At least 17 provinces throughout China have experienced blackouts, including Guangdong, Zhejiang, Shandong, Anhui, and Jiangsu. In the provinces of Jilin and Liaoning, traffic lights and medical facilities have been without electricity at times. Electricity cutbacks are projected to "occur often" until March 2022, according to one Jilin utility company, and will most likely be irregular, unscheduled, and unannounced (Turland, 2021). It has tried to increase imports from Indonesia, Russia, South Africa and even the United States to meet its demands. Indonesia supplied roughly half of China's thermal coal demand between January and August 2021 (Chattopadhyay, 2021). China also imported around 3.7 million tons of thermal coal from Russia in September 2021. This is up 28% from August and more than 2300% from a year ago. This is not a one-time event. Since May 2021, China's thermal coal imports from Russia have quadrupled or tripled from 2020 (Cheng, 2021).

In addition, China witnessed soaring imports of liquefied natural gas (LNG). China has been declared the world's giant LNG importer in 2021. Government policies to reduce air pollution and meet emissions targets triggered China's move from coal to natural gas. A rapid increase in LNG import capacity has assisted China's growth in LNG imports. Between 2013 and 2020, China's LNG import capacity increased from 164 million m^3/day to 331 million m^3/day. China's LNG imports were the world's most extensive in the first ten months of 2021, overtaking Japan. They averaged 292 million m^3/day from January to October 2021, up 57 million m^3/day (24%) over the same period in 2020. In comparison, Japan's LNG imports averaged 272 million m^3/day (Weetch, 2021). China being the largest importer of LNG affects many countries, mainly in Europe, as the Asian and European markets are linked to the same gas suppliers. This resulted in increased gas demand on Europe.

It could have been a good idea to switch from coal to natural gas from an environmental standpoint. Still, the market price quadrupled when China, Japan and South Korea imported large amounts of (LNG). Then, floods in China's eastern coal mines suspended much of the country's coal output, limiting energy generation and causing acute power shortages. China ordered several industries to cease or reduce production, resulting in global shortages of many essential products. As a result, East Asia has become a profitable market for LNG producers, and Europe was cut off from its standard LNG spot market supply. Prices on the spot market increased nearly twenty times (Staff, 2021).

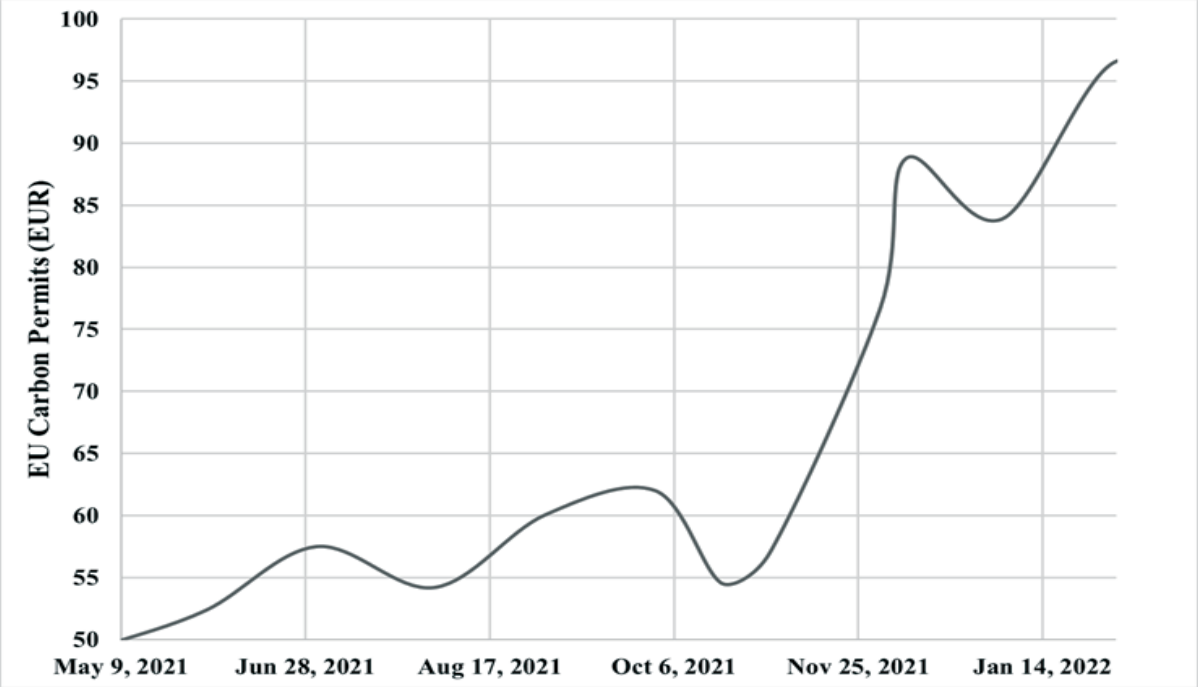
EU's Climate Policies

The Emission Trading Scheme (ETS) covers over 10,000 power plants and industrial facilities across the EU and is based on a "cap and trade" approach. Over time, the cap is tightened, and carbon permit prices steadily rise. This trend encourages the energy sector to abandon fossil fuels, favouring sustainable alternatives. The post-pandemic economic recovery and energy crisis have increased the carbon price by over 76%, from EUR 34 in mid-January 2021 to nearly EUR 60 in late October 2021. Consumers, particularly in coal-dependent countries, are in danger of bearing the cost of the additional expense (Liboreiro & de Filippis, 2021). Figure 4 shows the EU carbon permit price increase through the energy crisis, up to the 7th of Febreuary 2022___. Mateusz Morawiecki, the Polish Prime Minister, has stated that the EU's climate policy is to blame for the current energy price issue. The European Commission, a strong proponent of the ETS, is fighting back, claiming that the global economic recovery and strong demand from Asian countries are the driving forces behind the pricing problem. According to Brussels, ETS permits account for only a tiny fraction (about 20%) of the increase (Liboreiro & Filippis, 2021).

Moreover, before the 2021-2022 energy crisis in Europe and in line with the climate goals, European governments have recently moved away from fossil fuels. As a result, domestic natural gas and coal capacity will be reduced. For instance, Europe's top producer of natural gas, the Netherlands, started to phase out its gas field in 2018 (*The EU's Energy Crisis Explained - TLDR News - YouTube* 2021). Europe in 2021 is running out of natural gas. Therefore, despite its climate and energy goals, the region sometimes turns to coal to fulfil rising electrical demand. Coal use in Europe increased from 10% to 15% from the beginning of the year until June 2021 after a colder and longer-than-usual winter depleted gas storage sites. Countries like Germany, the Netherlands, and Poland have resorted to coal to keep the lights on while their economies recover and people return to work (Countercurrents 2021). Moving away from coal production in Europe puts more pressure on natural gas and increases

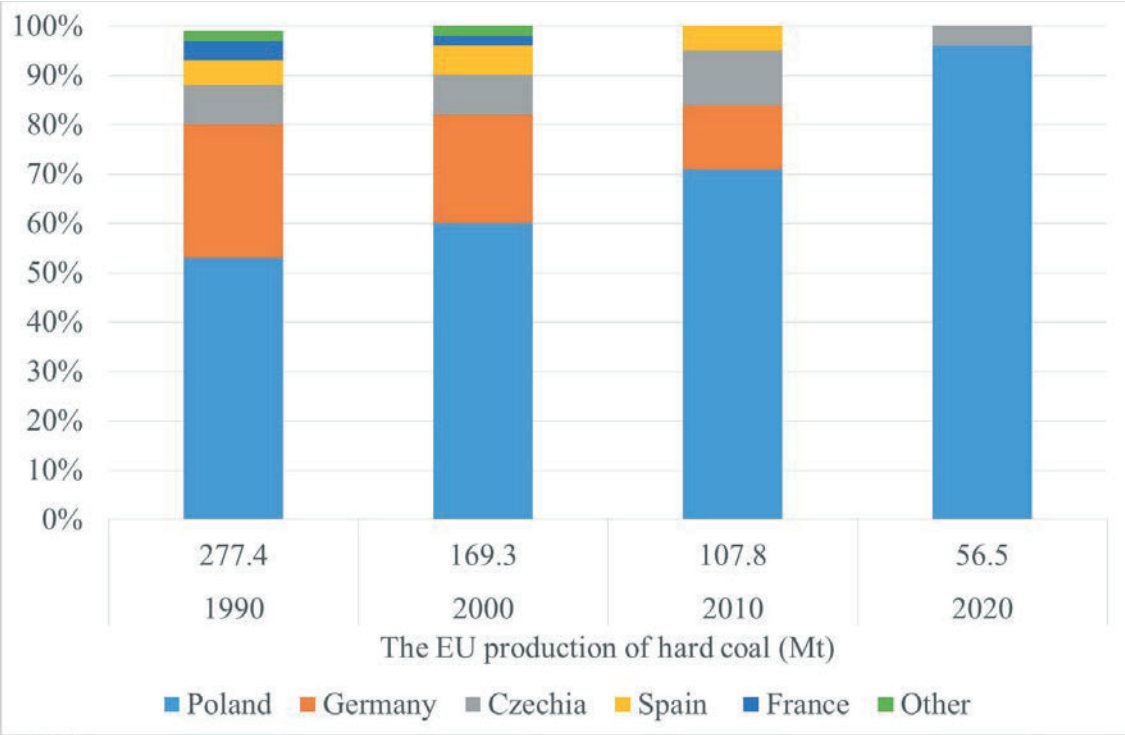
demand. Europe reduced its hard coal production dramatically during the last few decades. Figure 5 shows the EU production of hard coal from 1990 to 2020. In 2020, the EU production of hard coal was just 46 million tons, 80% less than the 277 million tons in 1990. Poland increased its production share from 53% in 1990 to 96% in 2020, showing that it was almost the only EU country producing hard coal (Eurostat 2021).

Having said that, the incorporation of nuclear and renewable energy into the energy mix of EU member states contributed to stabilising the user energy price. The short-term stability of the energy supply, which significantly affects price stability, will be aided by the existing nuclear power plants and renewable energy sources in EU member states. Without the current nuclear capability, the crisis' impact on the energy sector would undoubtedly be far more significant. To support the leadership role of renewables in the shift to energy systems with net zero emissions, nuclear power is a source of low-emission electricity that is accessible on demand. The marginal costs of nuclear power plants, like those of renewable energy sources, do not include any CO_2 fees because they do not emit a substantial quantity of CO_2 when operating. Thus, they are not impacted by the fluctuating price of carbon which mainly affects the price of coal and gas (Vocasek 2022).



Source: Authors' compilation based on "EU Carbon Permits - 2022 Data,"

Figure 4. The EU carbon permit price increased during the energy crisis (EUR)



Source: Authors' compilation based on Eurostat (2021)

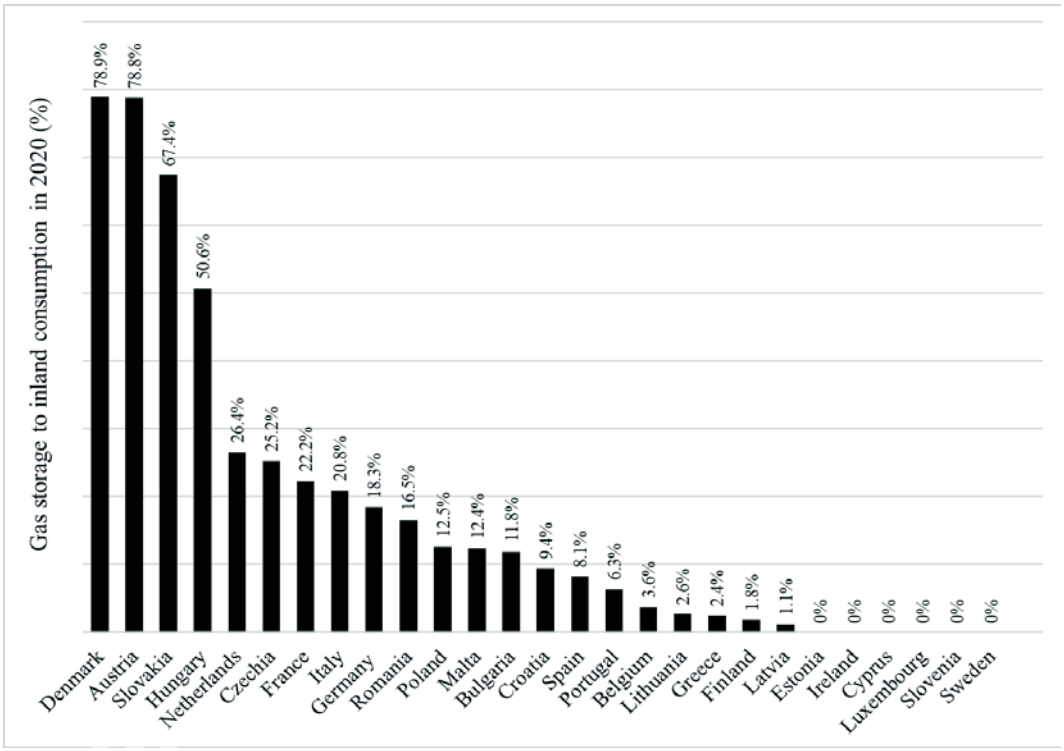
Figure 5. The EU production of hard coal from 1990 to 2020 (Mt)

Low European Energy Stocks

In Europe, the winter gas season runs from October to March and the summer gas season starts in April. Wholesale gas costs and demand are frequently lower in the summer, and more gas is stored. However, this did not happen in 2021. Due to high demand in the first half of 2021, there was insufficient time to build up gas reserves in storage facilities before the winter. As a result, Europe has become increasingly reliant on imports. As of December 2021, storage levels were lower than any of the prior five years' minimum volumes at this time of year. Europe had 690 TWh of gas in storage as of mid-December 2021. From 2016 to 2020, it took until the third week of January, on average, for reserves to fall to this low level (Zachmann et al. 2021). Gas output has dropped in recent years because of the shutdown of gas sources in Europe. As a result, production capacity has decreased. Furthermore, domestic gas fields were utilised for 'swing production', which meant ramping up supplies during the winter to meet increasing demand. Thus their disappearance is felt more acutely during the winter. Figure 6 shows the percentages of natural gas storage volume to inland consumption for the EU member states in 2020.

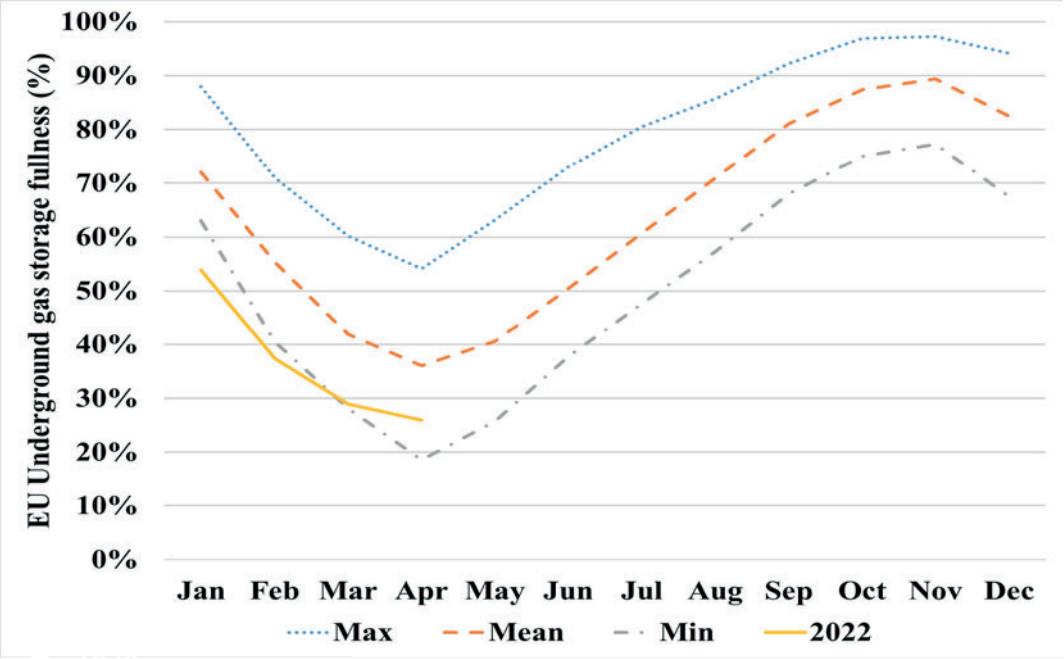
Additionally, global LNG supply was limited due to increased Asian demand and lower-than-normal Russian gas pipeline flows. Wholesale prices were exceptionally high throughout the summer, restricting gas injections into storage. As a result, as winter came, Europe's gas storage levels were at their lowest in at least ten years (Buli 2022). Figure 7 shows the EU underground gas storage fullness levels compared to the historical observed average, minimum and maximum data. It is noteworthy that the gas storage level at the beginning of 2022 is less than the minimum historical value.

In June 2022, Russian gas deliveries to Europe dropped short of demand again, aligning with an early heat wave hitting the continent's south and raising benchmark prices on fears that the continent would not have enough storage in time for winter (Chestney 2022a). Because of issues with fixing turbines in Canada, Russia indicated that Nord Stream 1 pipeline flows might be totally interrupted. It stated that the supply cuts were not planned and were due to maintenance concerns, a reference to prior statements in which Russia stated that it could not ensure the return of equipment transferred to Canada for repairs. Germany said that Russia's reason was "technically unfounded" and was instead intended to raise gas costs. According to Italy, Moscow may use the situation to apply political pressure (Chestney 2022b). Leaders in the European Union want to take advantage of the warm summer to build gas stores in preparation for winter and any more instability in energy markets caused by the Russia-Ukraine conflict. To improve European energy security, the European Commission's plan required EU member states to attain a minimum of 80% gas storage capacity by November 2022, with the goal of increasing to 90% in the following years (Beaman 2022).



Source: Authors' compilation based on Eurostat data

Figure 6. Gas storage to inland gas consumption ratio for the EU-2 member states in 2020 (%).



Source: Authors' compilation based on Kyos (2022)

Figure 7. EU underground gas storage fullness compared to historical observed average, minimum and maximum data (%)

THE RUSSIA-UKRAINE WAR AND THE EU'S RESPONSE

In February 2022, the world witnessed the Russian invasion of Ukraine (CNN, 2022). It is an issue that is not new; the conflict dates back to 2014, when Russia annexed the Crimea region (Biersack & O'Lear 2014; Grant 2015). The current conflict's implications not only affect Russia and Ukraine but also extend to the rest of the world, starting from the EU countries. Russia and Ukraine are significant exporters of oil, natural gas, coal, and wheat, among other vital commodities (Mbah & Wasum 2022). However, some tried to underestimate the influence of Russia on the global economy, describing it as "unimportant to the global economy and only serves as a huge gas station" (Cohen & Ewing 2022). The escalation of the situation pushed the EU to declare sanctions on Russia, which was a way to impair the Kremlin's ability to finance the war, impose costs on Russian elites, and diminish the economic base ("EU sanctions against Russia following the invasion of Ukraine" 2022). In return, Russia claimed some demands against the sanctions, which included that all gas payments should be made using the Russian Ruble (Davies & Roth 2022). Later, Russia decided to halt gas supplies to Bulgaria and Poland as they refused to meet the demands to pay in RUB (Abnett 2022). The Russian invasion of Ukraine has global economic impacts; this is evident through both energy and trade shocks which mainly led to a rising of commodity prices, including energy and food; a direct cause of the rise of the current global inflation (Ozili 2022). While nearly half of natural gas imports come from Russia, it is clear that the EU needs to reconsider its current energy plans, including energy transition and also fulfilling its climate pledges.

The European energy policy

Diversifying energy sources is one of the critical issues countries face to enhance their energy security status. Energy security became necessary after the first significant energy crisis in 1973, when some Arab and OPEC countries decided to start an oil embargo on the United States (Bielecki 2002; Vitošević et al. 2021). An event brought the idea of "energy diplomacy" into the scene because the world's political influence is strategic and economic development-oriented (Vitošević et al. 2021). Back to the definition of energy security, the International Energy Agency (IEA) defines it as "the uninterrupted availability of energy at an affordable price." (Soysal & Soysal 2020). As mentioned before, natural gas prices increased dramatically since the second half of 2021, more than 600% until April 2022, two months after the Russian invasion of Ukraine ("Commodity Markets" 2022).

Energy security is only one side of the story; it is accompanied by two other essential components, energy equity and sustainability. Together, these three components form the energy trilemma. The World Energy Council (WEC) publishes an annual report on the status of the energy trilemma; it also provides in-depth details for each partner country (*World Energy Trilemma Index 2021*, 2021). Europe as a continent shows a leadership position on the trilemma index. The newly published index report shows that the EU has made vast steps toward achieving sustainability. In addition, the region scores high in terms of equity, showing improvement primarily due to the subsidy system. Finally, it indicates that the region's political and economic stability affects the efforts toward energy transition ("World Energy Trilemma Index" 2022). Achieving the three dimensions produces a healthy energy system (Khan et al. 2022).

The EU has already taken immediate and medium-term measures to deal with the increase in energy prices in 2021. The European Commission launched a communication on energy prices, including a toolbox that aims to face the prices rise and strengthen the resilience against future shocks (European Commission, 2021). The introduced toolbox applies both short- and long-term measures; those measures target the protection of vulnerable consumers and small businesses. The immediate measures included income support to energy-poor consumers; temporary deferrals of bill payments, applying several precautions to avoid disconnection from the grid; reductions in taxation rates for vulnerable households; support for companies and industries; improving international energy outreach to ensure transparency; investigating possible anti-competitive behaviour in the energy market; and facilitating more comprehensive access to renewable power purchase agreements. On the other hand, the medium-term measures stressed issues related to energy resilience and decarbonisation.

The EU can benefit from accelerating its renewable energy transition to achieve energy independence in the long term. Energy independence means relying on national or local energy sources (Clifford 2022). As mentioned before, the EU acted according to the current conflict. In addition to the current sanctions, some interventions had to be made to regulate energy prices while considering people's welfare. The EU launched the REPowerEU programme. It stated that although every EU country is free to decide its

energy mix, it should follow the internal EU energy market while considering the EU's climate ambitions ("EU energy prices" 2022). The strategy focuses on four key areas: investment and reform, energy supplier diversification, renewable energy transition acceleration, and energy efficiency and savings. This strategy aims to phase out the reliance on Russian energy by 2027 (Tagliapietra 2022). Member states can use €250 billion from The Recovery and Resilience Facility (RRF) alongside other sources of funding such as private investment, The European Investment Bank and Cohesion Policy funds, among others ("REPowerEU" 2022). Two pillars were introduced to enhance the resilience of the EU energy system, first, by increasing the imports of liquified natural gas (LNG) from non-Russian suppliers, and second by boosting energy efficiency, enhancing infrastructure, and increasing renewables. In collaboration with the IEA, the "Playing my Part" report was published to guide individuals in taking action. The action steps are meant to help people reduce their energy use, save money, reduce fossil fuel consumption, while at the same time support Ukraine (IEA, 2022).

CONCLUSION

There are several energy security and development issues facing the EU. Climate change is also one of the urgent topics in the region. Climate change and environmental degradation were highlighted and centred in the European Green Deal, described as an existential threat to the world and the EU. Within the new European Green Deal, the European Commission prioritises sustainability by including sustainable development goals (SDGs) and citizens' well-being (European Commission, 2019a). The EU is aware of the global dimensions of climate change; that is why the EU will utilise its influence to help neighbouring countries and partners to join the sustainability track. The new deal included nuclear energy as a "green energy source". Fit for 55 was launched in 2021, with the purpose of ensuring that EU policies are in accordance with the climate targets agreed upon by the Council and the European Parliament, the Fit for 55 package is a bundle of measures to modify and update EU legislation as well as to put new initiatives into place, and with a mid-term goal of implementing the European Green Deal by 2030 ("Fit for 55," 2021). A major plan is to make the EU the first neutral continent by 2050 (LaBelle et al. 2022). A significant challenge may arise from improving the equality between old member states and post-communist member states to ensure continuous development while reducing greenhouse gas (GHG) emissions.

In 2018, the International Renewable Energy Agency (IRENA) published a study on renewable energy prospects for the EU. The study findings indicated that the EU has a cost potential for utilising more renewables, and renewable share in the energy mix could double from 17% in 2015 to 34% in 2030 (International Renewable Energy Agency and European Commission, 2018). To reduce their GHGs emissions by 55% by 2030, the EU seeks to increase the share of renewable energy resources in the overall energy mix to 40% ("Renewable energy targets" 2022). The progress toward achieving the targets is well observed; the EU had already reached 22.1% of its gross energy consumption from renewables in 2020, compared to 2004, when the share was only 9.6% ("Renewable energy statistics" 2022). It is worth noting here that Sweden and Croatia exceeded their targets by +11 percentage points, followed by Bulgaria (+7 pp), whereas France failed to meet the target (-3.9).

The European Green Deal emphasises the importance of clean energy transition. 75% of the emitted GHGs are from the energy sector. The EU want to ensure a secure, efficient, and fully integrated energy supply. The deal aims to build interconnected energy systems, promote a modern infrastructure, boost eco-design and efficiency of the products, decarbonise the gas sector, empower consumers, globalise the EU's energy standards, and develop the full potential of offshore wind energy ("Energy and the Green Deal" 2019).

Phasing out coal in the EU poses a challenge. Countries such as Poland, Germany, and the Czech Republic, among others, rely on coal as one of their energy sources and provide thousands of jobs in these countries (Hafner and Raimondi 2020). By 2018, the coal industry employed about 237,000 (Alves Dias et al., 2018) Achieving the energy transition means most of those working in this sector will lose their jobs in return. Those countries must address the impacts on employment and their economy soon. Addressing labour market needs and possible shifts can serve as a base for the process of coal phase-out. Conflicts may arise between those who live in communities that rely on coal mining and industry vs governments and environmental groups.

While achieving a safe energy transition, energy poverty is one of the significant challenges in the region. Policies targeting air pollution can affect fuel prices, choices, and energy efficiency requirements. Coal-burning furnaces are a source of pollutants and smog, a significant source of deaths in Poland. A transition to natural gas will decrease the deaths related to air pollution, but it will increase energy poverty rates (Karpinska & Śmiech 2021). A household's energy expenditure that exceeds 10% of

its disposable income is considered a fuel/energy-poor household (Boardman 1991). Unlike the involuntary past energy transitions, the current movement is led by policies aided by timely goals. This transition is "just" and centred around the effects on the shift's labour and income distribution to a sustainable energy mix (García-García et al. 2020). In the long term, the energy transition will benefit both societyand the environment, but in the short run, it may amplify the problem of energy poverty (Middlemiss et al. 2020).

As of June 2022, with Russia's threat of cutting gas supplies, Germany, Austria, and the Netherlands announced that they would restart coal power plants. A decision came due to the alarming threat of not meeting energy needs in European countries (Frost 2022). European countries were left with little choice concerning enhancing their energy security during the crisis era. Such a decision will affect years of progress and policies toward reducing emissions and achieving climate ambitions.

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Digital Economy: A Comparative Study in ASEAN

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SUMMARY

The Association of Southeast Asian Nations (ASEAN) is an area with the rapid adoption of technology, the growth of internet and mobile phone users, region-wide digital initiatives to increase connectivity between markets, and the drastic acceleration of digitalization across practically all aspects of the economy. Currently, especially in the Covid-19 pandemic period, the digital economy is a key factor driving the growth of the region's economy. Based on the Networked Readiness Index (NRI), the study will analyze and compare the differences between ASEAN countries in terms of the digital economy. The purpose of the study is to understand the strengths and weaknesses of each country, thereby giving an overview of the potential of ASEAN countries in the period of digital economy readiness. The study results clearly show the digital economy gap and many differences in terms of the people pillar across countries. Singapore and Malaysia are among the top digital economies in the region; however, only Thailand made substantial progress from 2019–2021. Although ranked the lowest in the digital economy, Lao PDR and Cambodia have many positive improvements. Although ASEAN countries have strengths in digital technology, applying digital technology toward sustainable development is still a challenge for most countries in the region.

Keywords: ASEAN; Digital economy; NRI
JEL codes: E66, O57, P52
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INTRODUCTION

The term digital economy was used by lane (1999), who wrote that the digital economy is "the convergence of computing and communications technologies on the internet and the resulting flow of information and technology that is stimulating all of electronic commerce and profound organizational change" (lane 1999, p. 317). it is not clear when the digital economy was first mentioned; however, most acknowledge that the focus of the digital economy is the emergence of the internet technology, which has combined the application of digital information, personal computers, and information publishing (on websites) (Dahlman et al. 2016; Lane 1999). As a result, the internet has had a big impact on organizations and society. Moreover, the quick diffusion and adoption of information and communication technologies (ICTs) have opened the emergence of products/services that we usually call digital products/services (Ayres & Williams 2004).

To distinguish between a traditional economy and a digital economy, Valenduc & Vendramin (2017) identify common characteristics of the digital economy: "the irrelevance of geographical location, the key role played by platforms, the importance of network effects and the use of big data" (p.7). To develop a clearer concept of the digital economy, Bukht & Heeks (2017) suggest that this portion of the economic output is derived exclusively from digital technologies with business models based on digital goods or services. In

particular, the digital economy will differ from the traditional economy in terms of resources, process, structure, and business model. For example, resources in a digital economy include technologies, content, and human resources.

At the birth of the digital economy, the application and emergence of digital products/services had just begun and depended heavily on the development of technologies; the role and impact of the digital economy were still uncertain, and there were many question marks (Ayres & Williams, 2004). In the past twenty years, the global economy has witnessed a strong rise in the digital economy. The digitalization waves supported by technological innovation have created sweeping changes across many fields, strongly influencing traditional fields and opening up new ones. For example, Airbnb and Booking.com are mostly the rulers of the hospitality industry. The financial and banking sector is witnessing the mass emergence of fully digital banks such as Revolut and N26. In the entertainment sector, Netflix is dominant. In education, it is Edx and Coursera. Transportation is Uber or Grab car. The carmaker is Tesla, a self-driving car. It is not hard to name a digital player with groundbreaking technology that creates and meets more and more new user needs. Eight out of the ten largest companies by market capitalization globally are tech giants. More precisely, as Baller et al. (2016) note, the future of nations, businesses, and individuals will depend more than ever on their adoption of digital technology.

The benefits that the digital economy brings to countries are huge, contributing to the comprehensive development of each country, but the growth of the digital economy is not without challenges (Dahlman et al. 2016).

Countries also need to shape and develop digital economy development strategies to catch up with the trend of competing with other economies. The challenges that developing countries face in the digital economy include protecting personal/user data, building information infrastructure, investing more R&D activities in core technologies, and developing qualified human resources (Petrenko et al. 2017).

In order to measure the readiness towards the Digital Economy, the World Economic Forum 2001 suggests using the Networked Readiness Index (NRI). This index refers to "how well the economy of a country uses digital technology to improve competitiveness and welfare" (Petrenko et al. 2017, p.97) and also assesses the components of the NRI of each country (Petrenko et al. 2017).

This study aims to add more knowledge to the digital economy of ASEAN countries. The main goal of this research is to uncover the similarities and differences between these countries in the path to the digital economy by using hierarchical cluster analysis. The overall structure of this study is divided into five parts. The first part is the introduction. The second part deals with the literature review and the third section is concerned with the materials and methodologies used in this study. The fourth part analyzes the hierarchical cluster analysis results. Finally, the fifth part is the conclusion.

LITERATURE REVIEW

Previous studies have investigated the digital economy. In particular, many studies have used official digital economy indicators to show differences between countries. For example, Nagy (2019) used the Digital Economy and Society Index 2017 to compare the digital economy development between Hungary and Ukraine. In the ASEAN region, Box & Lopez-Gonzalez (2017) reviewed the importance of digital technology in the future development of the digital economy, and the authors suggested a variety of aspects – technology, human skills, infrastructure, and regulation policy – that ASEAN countries need to pay attention to developing in the digital era. Through reviewing the opportunity and challenges from digital transformation, Avirutha (2021) highlighted the importance of digital skills and government policies in the ASEAN region on the path to the digital economy. A few studies have delved into different aspects of the digital economy in ASEAN countries. Pitakdumrongkit (2018) proposed policy solutions to address digital protectionism issues in ASEAN. In a study on digital literacy, Kusumastuti & Nuryani (2020) found no difference between digital literacy levels among eight countries in ASEAN. Studies on innovation, the participation of women, and one country's situation in the digital economy have also been conducted (Marsan, 2022; Nengsi, 2019; Cameron et al., 2019). Most agreed that countries' reactions to the digital economy orientation differ according to each country's culture, policy and conditions, so the status of digital economies in this region will change year by year. This study adds to the research line by classifying countries in ASEAN by groups, thereby highlighting and comparing differences between countries in terms of technologies, people, governance, and impacts that have received scant attention in previous studies.

The Association of Southeast Asian Nations (ASEAN) was officially founded on August 8, 1967, in Bangkok, Thailand, with the five founding members of Indonesia, Malaysia, the Philippines, Singapore, and Thailand. After nearly 55 years, ASEAN is an intergovernmental cooperative organization with ten members in Southeast Asia (Brunei Darussalam, Vietnam, Lao PDR, Myanmar and Cambodia have joined the original members) and it has become an increasingly important political and economic partner in the Asia-Pacific region. One of the main aims and purposes of ASEAN is to "promote regional cooperation…..to toward peace, progress and prosperity in the region" (The ASEAN Declaration 1967, p.1). ASEAN has an area of 4.46 million km^2 (approximately the area of the European Union, which is 4.475 million km^2), with a population of about 600 million (the EU has

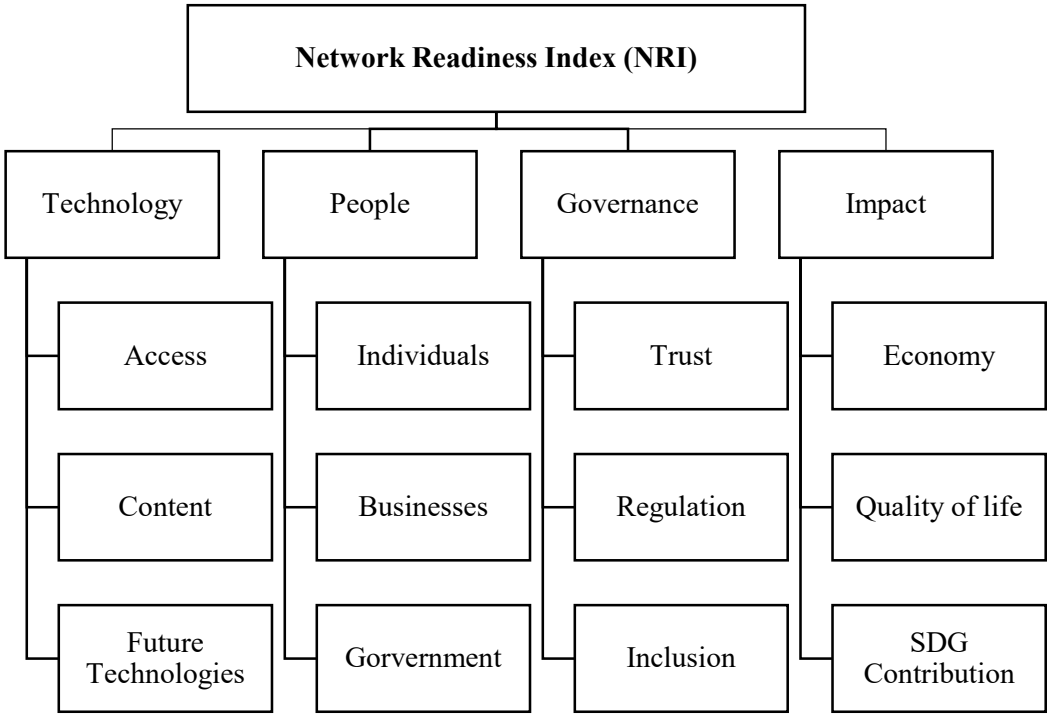
447 million). According to the IMF's statistical data, the ASEAN GDP growth rate in 2021 was 2.9%. ASEAN countries have established many working frameworks for the digital economy. For example, in Hanoi in 2019, ASEAN countries formally signed an e-commerce agreement that came into effect in December 2021. The principal goal of this agreement is to implement the latest rules for managing e-commerce in the region and to stimulate a regionally integrated digital economy. With its entry into force, especially since the Covid-19 pandemic, the implementation of the e-commerce agreement has been very important in the economic recovery. Besides that, other projects include the AEC Blueprint 2025, the Masterplan on ASEAN Connectivity 2025, and the e-ASEAN Framework Agreement. Currently, ASEAN is working with the World Economic Forum on digital economy projects such as the Pan-ASEAN data policy, ASEAN digital skills, ASEAN e-Payment, and ASEAN cybersecurity.

MATERIALS AND METHODS

This study uses data from The Network Readiness Index report for three years, from 2019 to 2021, to analyze the digital economy of eight countries in the ASEAN region. Brunei Darussalam and Myanmar are not included in this study due to the lack of data from NRI reports. In addition, the article also uses reports of the World Bank and International Monetary Fund to have an overview of the economies of these countries.

In terms of methodology, this study mainly uses desk research methods, focusing on analyzing the strengths and weaknesses of countries in the report review, the main and sub-components of the Network Readiness Index. Data from the Network Readiness Index and analysis are performed using hierarchical cluster analysis in SPSS 22. In addition, this study attempts to compare and contrast indicators and readiness for the digital economy development of each ASEAN country.

From 2019, the updated NRI is based on four pillars: technology, people, governance, and impact. Each pillar consists of three sub-pillars (Figure 1).

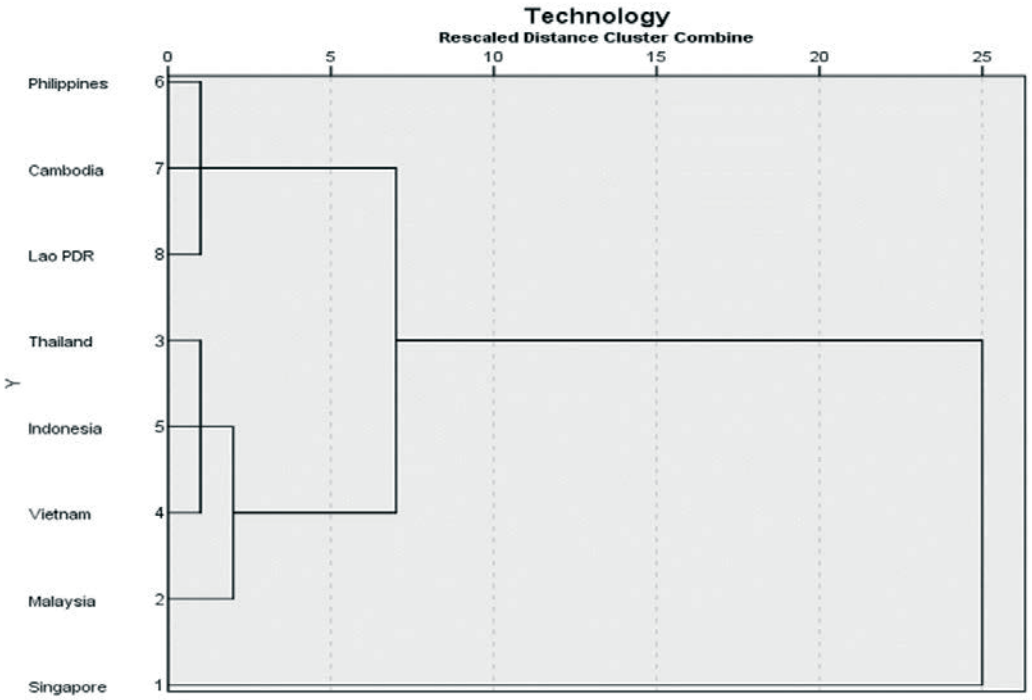


Note: SDG=Sustainable Development Goals
Source: The Network Readiness Index 2019 (Dutta & Lanvin 2019)

Figure 1: The key indicators of Network Readiness Index

ANALYSIS OF THE DIGITAL ECONOMY IN ASEAN

The study uses cluster analysis for the four pillars listed in The Network Readiness Index 2021 report: technology, people, governance, and impact Countries in the ASEAN region are classified by each pillar as follows.

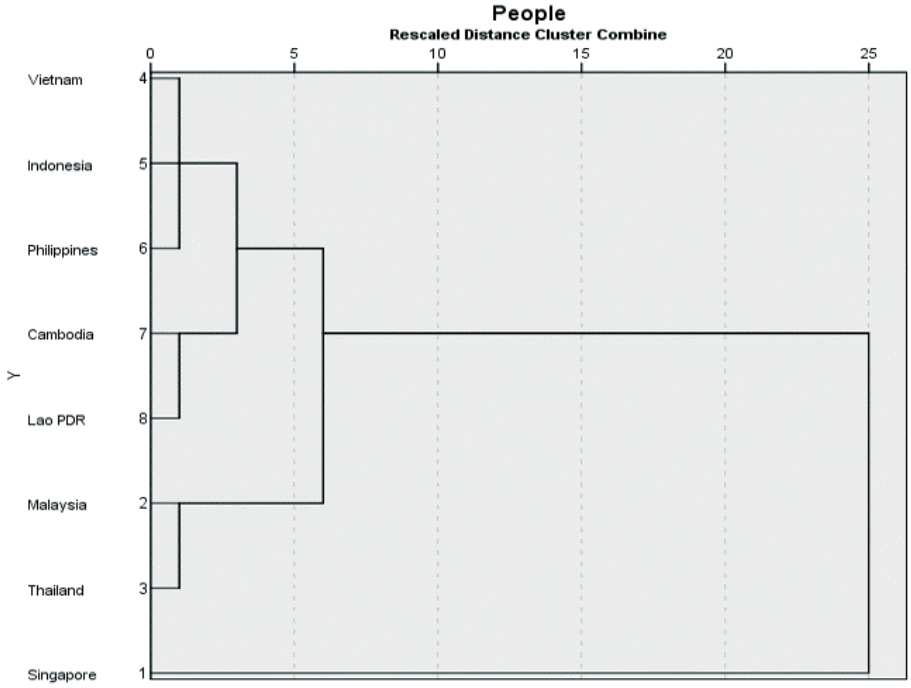


Source: Author's elaboration based on data from the NRI 2021 report

Figure 2. The hierarchical clustering according to the Technology pillar

Figure 2 shows the hierarchical clustering results with three main clusters about the technology pillar. The first level contains the Philippines, Cambodia, and Lao PDR. The second level includes Thailand, Indonesia, Vietnam, and Malaysia. Singapore is top level not just only in ASEAN but also in the world ranking.

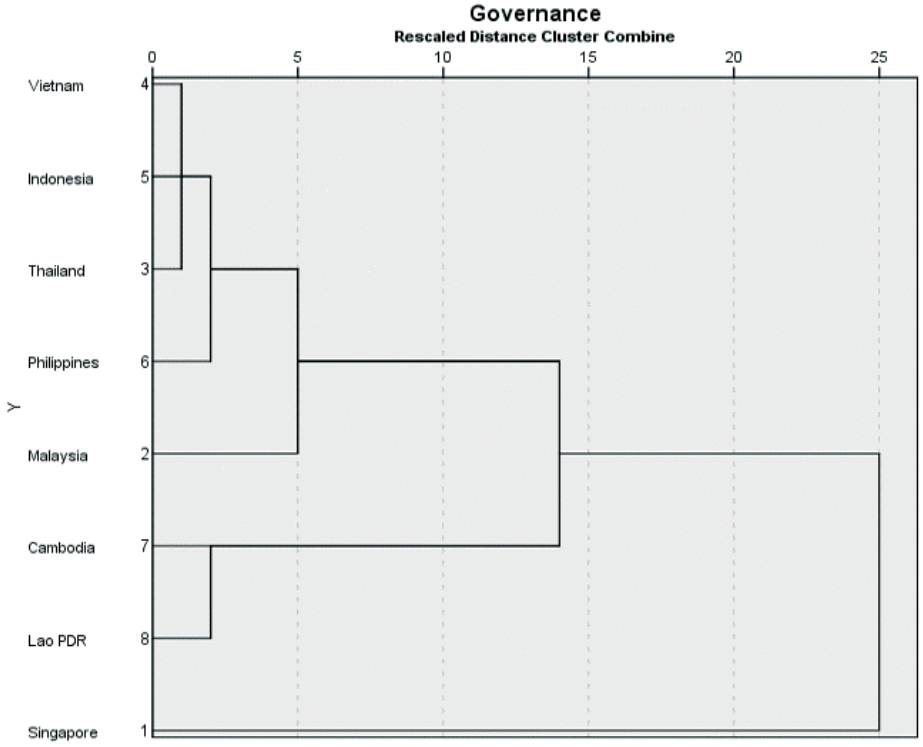
Meanwhile, the cluster analysis result of the people pillar is shown in Figure 3. Singapore continues to be the country with the highest index. The second cluster includes Malaysia and Thailand. Finally, although Vietnam, Indonesia, and the Philippines have higher scores than Cambodia and Lao PDR, these countries are all ranked third.



Source: Author's elaboration based on data from the NRI 2021 report

Figure 3: The hierarchical clustering according to the people pillar

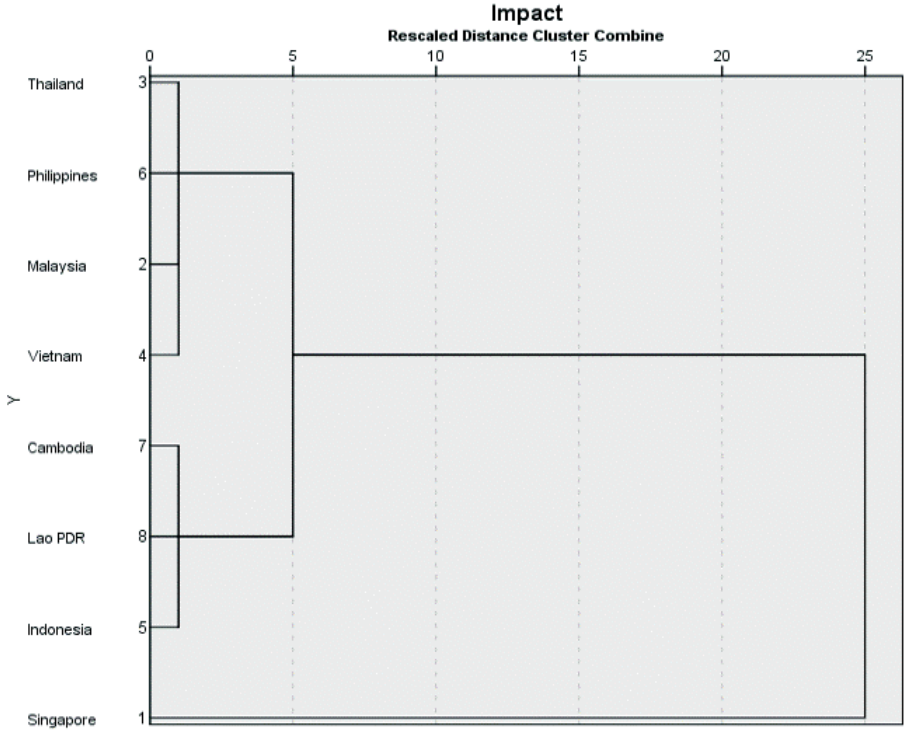
Figure 4 shows hierarchical clustering results for the governance pillar. Cambodia and Lao PDR continue to be in a low level of governance pillar countries. Vietnam, Indonesia, Thailand, Philippines, and Malaysia, with a slightly higher score, are listed in the next level of the governance pillar. Singapore is in the cluster with the highest governance index.



Source: Author's elaboration based on data from the NRI 2021 report

Figure 4: The hierarchical clustering according to the governance pillar

Finally, Figure 5 shows hierarchical clustering results for the impact pillar. Easily recognizable, Singapore is the first cluster with the highest impact index. Vietnam, Malaysia, the Philippines, and Thailand are the second cluster. Indonesia, Lao PDR, and Cambodia are in the third cluster.



Source: Author's elaboration based on data from the NRI 2021 report

Figure 5: The hierarchical clustering according to the impact pillar

Based on the overall NRI score 2021 and the result of cluster analysis, the countries in ASEAN can be divided into three classes. The first class contains Singapore, the second class is made up of Malaysia, Thailand, Vietnam, Indonesia, and the Philippines, and the third class includes Lao and Cambodia.

The first class: Singapore

Singapore is among the top 10 countries globally in terms of the digital economy. However, there is a slight decrease in the NRI index of 80.01 in 2021 compared to 82.13 in 2019 and 81.39 in 2020. One of the strong pillars of Singapore is the impact of digital technologies on society. The impact pillar ranks first in the world in Singapore, contributed to by the Economic and Sustainable Development Goal (SDG) contributions sub-pillar, which ranks on top of the world. This can be explained by the huge investment in the sustainable development of Singapore (Dutta & Lanvin 2021). In addition, Singapore achieves impressive indicators in high-tech manufacturing, healthy life expectancy, high education quality, and sustainable cities. Another strength of Singapore is the technology pillar, which ranks 8th globally. The accessible ITCs and robust financing of future technologies are the most contributive sub-pillar, ranking 3rd and 4th respectively in 2021; this is the sub-pillar for which Singapore has indexes in the 1st place, such as handset prices, 3G mobile network, mobile apps development, and robot density. However, some indicators indicate that Singapore could improve its privacy protection by legislation.

The second class: Malaysia, Thailand, Vietnam, Indonesia, and the Philippines

Compared to countries in the upper-middle-income group economy, Malaysia performed better in every pillar. High technology is a strong point in Malaysia's digital economy, which is ranked 38th globally, contributed to by the future technologies sub-pillar, where Malaysia invests impressively in emerging technologies. The strengths in the technologies pillar are its good international internet bandwidth and scientific publications on artificial intelligence. Besides, another strength of Malaysia's digital economy comes from the impact of digital technologies. Strong high-tech export and high-tech manufacturing and the gig economy's prevalence are the strongest indicators. However, weak performance

in some indicators in this pillar such as income inequality and sustainable cities should be improved.

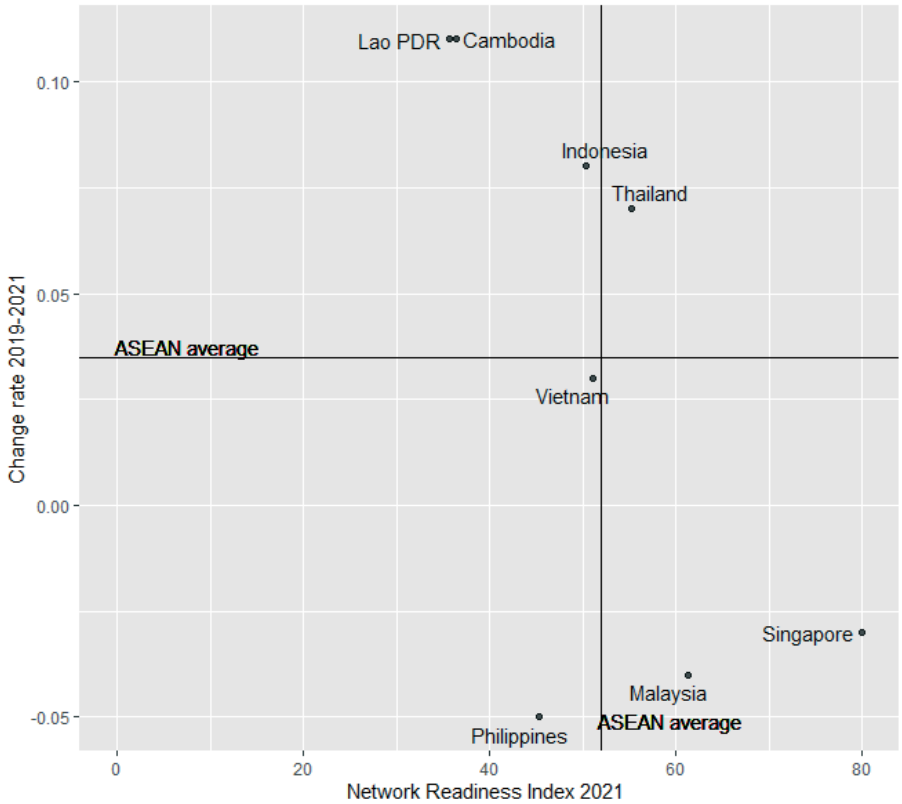
Thailand, Vietnam, and Indonesia are world-ranked 54th, 63rd, and 66th, respectively, for NRI 2021. Out of these three countries, Thailand is superior in many aspects. The point that helps the digital economy in Thailand have a high position is the strength in accessing digital technologies, including use of SMS (ranked 26th), Internet bandwidth (rank 9th), and Internet access in schools (rank 26th). These factors make Thailand a bright spot in the technology pillar. Despite standing behind Indonesia in terms of the technology, people, and governance pillars (rank 61st, 80th, 73rd, respectively), Vietnam has a higher overall NRI thanks to the contribution of the Impact pillar. Mainly, the digital economy in Vietnam relies heavily on bright spots in economic development (GDP growth rate - rank 2nd), high-tech exports (rank 3rd). Indonesia (overall rank 66th) has a bright spot in the contribution from the technology pillar. This is possible thanks to large contributions from indicators such as Internet bandwidth (rank 1st), SMS sent (rank 11th), AI publications (rank 18th), investment in emerging technologies (28th), and computer software spending (27th).

The Philippines is ranked 83rd and ranks behind Thailand, Vietnam, and Indonesia in the three pillars of technology, governance, and people; however, the Philippines has a bright spot in the impact pillar (rank 52nd), where it places higher than all three countries mentioned above. This has been made possible by the contribution of high-tech manufacturing, high-tech and ICT services exports, and a high growth rate of GDP per capita. Typically, high-tech exports ranked 2nd globally with 95.3/100 points.

The last class: Cambodia and Lao PDR

Both Cambodia and Lao PDR rank in the bottom group in terms of the digital economy globally.

Figure 6 indicates the longitude development of the digital economy in ASEAN during the period 2019–2021. The most striking result is that Lao PDR and Cambodia have produced the best improvement during this period, followed by Indonesia. Meanwhile, the Philippines, Malaysia, and Singapore showed negative changes over three years. Singapore, Malaysia, and Thailand are the best countries with digital economies; however, only Thailand could maintain stable digital development during this period. Both Singapore and Malaysia received lower scores in 2021 compared to 2019. Vietnam is very close to the average of ASEAN but stayed relatively unchanged over three years



Source: Author's elaboration based on data from the NRI 2019 & 2021 reports

Figure 6: The changes in Network Readiness Index in ASEAN (2019–2021)

This study contributes to a clearer view of the stage of readiness for the digital economy in ASEAN countries, thereby highlighting the strengths and weaknesses of countries in the area (shown in Table 1). The following trends are recognized.

(1) The ASEAN countries' gap is still large in terms of readiness for the digital economy. For example, while Singapore is always at the top of the world, Lao PDR and Cambodia stand at 110th and 106th.

(2) The countries in the ASEAN region have many strengths in digital technology: most of the countries in the region have good international internet bandwidth, and the countries have focused investment on emerging technologies. Singapore has the best application and development of digital technology in the area and aims to develop future technologies such as AI and robotics.

(3) For the People pillar, there are many differences between countries. For example, while some countries such as Thailand, Singapore, and the Philippines have strengths in ICT infrastructure investment, Singapore has strengths in human resources and digital skills. Some countries, such as Cambodia and Lao PDR, lack state investment support. In addition, Thailand and the Philippines have weak skills and a lack of associated professionals.

(4) Establishing legal frameworks for the governance pillar is a strong point in some ASEAN countries, especially E-commerce. However, except for Singapore, using digital payment is still a big challenge for countries in the region.

(5) For the impact pillar, as a young and dynamic economic region in the world, the digital dconomy in ASEAN is greatly supported by high economic development and high-tech services export. Applying digital technologies toward sustainable development will be a big challenge for most economies.

CONCLUSIONS

Based on the latest data from the NRI, the report analyzes the latest look at the ASEAN region, one of the most dynamically developing regions in the Asia Pacific region.

Overall, some significant implementations from these findings should be mentioned. The current study raises the possibility that government policy has an urgent role in developing the digital economy in the ASEAN region. First and foremost, the digital economy is developed based on advanced technologies, so governments need to focus more on developing new technologies such as AI, big data, and blockchains. Unfortunately, this is the current technological weakness of most countries in the region. Second, governments should promote ICT applications in enterprises, especially small and medium-sized enterprises. At the same time, they should encourage the application of e-government and strengthen cooperation in R&D between universities and enterprises. Thirdly, it is recommended for these regional economies to improve legal frameworks on privacy protection and promote financial inclusion, especially in rural areas. Finally, although ASEAN countries have strengths in economic development, it is a popular place for high-tech manufacturing worldwide. Nevertheless, to create sustainability in digital economy development, governments must pay more attention to developing the quality of life and sustainable cities and communities.

Table 1
The strengths and weaknesses of ASEAN countries

Pillar	Sub-pillar	Indicator	Strength in	Weakness in
Technology	*Access*	International internet bandwidth	MY TH VM IO CB	
		Handset prices	SI	
		Population covered by at least a 3G mobile network	SI	
		SMS sent by population 15-69	TH VM IO	SI CB
		Household with internet access	CB	LS
	Content	AI scientific publications	MY VM IO	
		Mobile apps development	SI	
	Future technologies	Investment in emerging technologies	MY IO PH CB LS	
		Robot density	SI	IO PH
		Computer software spending	IO	
		Adoption of emerging technologies	LS	
People	*Individuals*	Use of virtual social networks	MY TH PH CB	
		Active mobile broadband subscriptions	TH VM IO CB	SI
		ICT skills		TH PH
	Businesses	Technician and associate professionals	SI	

		GERD financed by business enterprise	TH VM	IO
		Annual investment in telecommunication services	TH IO PH CB	VM LS
		Firms with a website		MY IO
		Professionals		TH CB
	Government	Government promotion of investment in emerging tech	SI	
		Publication and use of open data	PH	
		R&D expenditure by governments and higher education		CB
		Government online services		LS
Governance	*Trust*	Cybersecurity	MY IO	
		Secure internet servers	SI	
		Online access to the financial account		CB
	Regulation	Legal frameworks adaptability to emerging tech	MY SI LS	
		E-commerce legislation	MY SI TH VM IO PH	
		Regulatory quality	SI	
		Privacy protection by law content		MY SI VM CB
		ICT regulatory environment		IO
	Inclusion	Rural gap in use of digital payments	SI	MY VM PH LS
		Gender gap in internet use	CB	
		Availability of local online content	LS	
		Socioeconomic gap in use of digital payment		VM PH
Impact	*Economy*	High tech and medium high-tech manufacturing	MY SI TH PH	
		High-tech exports	MY TH VM PH CB LS	
		Prevalence of gig economy	MY VM IO LS	
		GDP growth rate per person engaged	VM PH CB	SI
		ICT services exports	PH	TH
		PCT patent applications		LS
	Quality of life	Healthy life expectancy at birth	SI	
		Freedom to make life choices	VM PH CB	
		Income inequality	LS	MY
	SDG contributions	Quality Education	SI VM	TH IO PH
		Sustainable cities and communities	SI	MY TH VM
		Good health and well-being	TH	

Note: CB: Cambodia, IO: Indonesia, LS: Lao PDR, MY: Malaysia, PH: Philippines, SI: Singapore, TH: Thailand, VM: Vietnam

Source: Author's elaborate base on The Network Readiness Index report

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Occupational Hazards of the Shipbuilding Industry in Bangladesh

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SUMMARY

The objective of the study is to examine the determinants of occupational hazards of a private shipbuilding industry in Bangladesh. The number of respondents was 190. The study venue and samples were selected purposively. Respondents were interviewed with the help of prestructured questionnaires. Descriptive statistics and multiple regression model have been used to identify the determinants of occupational hazards. Determinants were personal habits, personal protective equipment, residential status, overtime, health status and types of workers. It is found that personal protective equipment and health status have influence to reduce occupational hazards while personal habits and types of workers have no direct association with the occupational hazards. On the contrary, variables like overtime and residential status can increase the occupational hazards. The outcomes of the study will assist to accelerate the shipbuilding industry to expand the economic growth of the country and further research also.

Keywords: Private shipbuilding industry, occupational hazards, regression, Bangladesh.
JEL Code: M19; I19
DOI: https://doi.org/10.18096/TMP.2022.02.06

INTRODUCTION

Ship building industry is a progressive industry of Bangladesh. In Bangladesh,1,50,000 skilled and unskilled peoples are involved in the ship building industry. Besides this, 20,00,000 peoples are also linked with this sector through different channels (Nazrul, 2021). There are some prominent shipbuilding industries in Bangladesh. These shipbuilding industries are able to make ocean going ships which have 10 thousand MT carrying capacity (ibid). Bangladesh had to face many hurdles in the past to make ocean going ships. Once upon a time, Bangladesh was a sea vessels importer country but now it can build ships domestically. The shipbuilding industry of Bangladesh is now a competitor with India, China and Vietnam. The foreign buyers are showing interest to import ocean going ships from Bangladesh. The present economic environment of Bangladesh is favourable to export ships. It is expected that the shipbuilding industry can earn $4 billion by exporting ocean going ships to different countries (Anonyms, 2021). It is noted that the shipbuilding industry is comparatively more prosperous than the readymade garment industries and may be stood as the 2nd major source of foreign currency of Bangladesh. For this reason, the government of Bangladesh is going to establish a slogan “from shirt to ship” in the world (Anonyms, 2020) and economic development of the country. The government of Bangladesh has declared to develop this industry as a “prosperous sector” to meet the future national demand of the country (Nazrul, 2021).

The ship building industry is a risky place and workers of this industry face many occupational hazards. Occupational hazards cause or contribute to the premature deaths of millions of people worldwide and it results in ill health or disablements of hundreds of millions of people. Globally occupational risks have been classified as the 10th leading cause of mortality and morbidity. The burden of disease from selected occupational risk factors accounts to 1.5% of the global burden in terms of disability adjusted life year lost (WHO, 2020). A survey (Odhikar, 2020) statistics showed that there were 20 cases of deaths due to accidents and injuries, 27 workers were seriously ill due to inhalation of toxic agents and workers were suffered from different distant illness. Shipbuilding industry of Bangladesh is a growing up industry and the development of this industry is similar to the readymade garment industry of the country (Anonyms, 2020). Shipbuilding industries in Bangladesh may face difficulties to compete with others in the world ship building market due to the presence of occupational

hazards. As the ship building industry of Bangladesh is a flourish one (Nazrul, 2021), the study of determinants of occupational hazards of workers in the ship building industry of Bangladesh will be helpful for the policy makers to formulate a future human resource policy of the ship making industry in Bangladesh and elsewhere.

LITERATURE REVIEW

The study (Barlas, 2012) considered that occupational health should be integrated with the general health services. It investigated (ibid) the Turkish shipyard fatalities for a span of 10 years between January 2000 and July 2011. The AHP technique was used by the study. Five precautions were determined for each of fatal accident group.

The study of (Hossain and Chowdhury et.al, 2008) conducted their study about the occupational health hazards of ship scrapping workers at Chittagong coastal zone, Bangladesh. Most of the workers were found to suffer from multiple disease and health hazards.

Another study (Yilmaz and Celebi et.al., 2015) has been done for analyzing occupational accidents at Tuzlaq, Turkey. The study revealed that 13 major accidents and 87 minor accidents happened in the shipyard. Both employees and employers should fulfill their respondents for occupational health and safety.

Study of Vaishali (2014) was carried out with an aim to assess the health profile of workers in the ship building industry and assess the occupational health issues related to the ship building. The important observations were those of prevalence of addictions, irregular use of personal protective equipment, presence of hypertension, overweight, hearing loss and poor safe care. Health, hygiene and safety education to the workers regarding occupational hazards and lifestyle diseases along with more emphasis on the use of personal protective equipment with regular health examination needs reinforcement (ibid).

The research works of (Iqbal, Zakaria and Hossain, 2010) discussed the problems and prospects of ship building industries in Bangladesh. It was a descriptive type study based on secondary data. The study found that human resource, marketing policy, delivery, infrastructure, health, safety and environmental problems are the major barriers of the ship building industries in Bangladesh. It was suggested by the researchers to solve those problems as soon as possible to avoid the interruptions of the economic development again and again.

The purpose of the paper (Hossain, Nur and Jaradat, 2016) was to identify and evaluate the hazards of the Khulna Shipyard in Bangladesh. The Preliminary Hazard Analysis (PHA) was developed to find out the potential hazards and hazardous events of workers' health and safety. The study analyzed the risk reduction measures and recommendations were done to strengthen the workplace safety.

Rahman (2017) appraised the ship building prospects of Bangladesh. It observed the ship building opportunities in the context of global facet, regional facet, and national facet including local ship building. The study also demonstrated the deficit and challenges in local ship building industries in the context of financing, absence of linkage industries, maritime policy, inter shipyard rivalry, negligence of safety and welfare, scarcity of site and infrastructure. The study expected that Bangladesh government needs to develop integrated comprehensive maritime policy for the sustainability of the ship building sector meaningfully.

The objectives of the study of (Saki, Ali and Martuza, 2019) were to examine the present condition of ship building industries in Bangladesh. The study also underlined the infrastructure and financial problems of the ship building industry in Bangladesh. They had recommendations for the public and private sectors to improve the ship building industry and create the demand for the "made in Bangladesh ships" in the world market.

It is evident from the above discussions that various studies have been conducted in different countries including Bangladesh from different perceptions. The current study examines the influence of residential status, health status, personal habits, and types of workers, personal protective equipment and overtime on the occupational hazards of the workers in a private shipbuilding industry. There is no such study conducted on this perception. Therefore, the actual results of determinants of occupational hazards of shipbuilding industries were unclear in previous studies which raises a question of research of such studies. Probably, further research was also suggested by Hossain, Nur and Jaradat (2016) for this reason. The current study can fill up the above research gap.

MATERIALS AND METHODS

Place of study

The place of study is Western Marine Shipyard (WMS). The shipyard is located at the Patiya Upazila, 20 km away from the City of Chittagong.

Site selection

There are many private and public shipbuilding industries in Bangladesh. The Western Marine Shipyard is the second largest private ship making industry of Bangladesh (Anonyms 2021). The site of the study has been selected purposively.

Sample size

The number of employees of the shipyard is around 3500 (Anonyms 2021). The size of sample was 190. The selected respondents were twenty years and above aged

workers of the WMS. The selection of the sample was done by following the convenient type of sampling.

Study data

Both primary and secondary data were collected. Primary data came from field survey. The secondary information was gathered from different journals, newspapers and websites.

Research instrument

The study was conducted with the help of pre structured survey form. Data were collected from the respondents by conducting face to face interview. Before the interview, verbal consent was taken from the respondents mentioning the objectives of the study.

Analysis technique

Both descriptive and quantitative methods have been used to analyze data. The analysis was done by SPSS version 23.

The Model

The model which has been considered in this work is that the occupational hazard (Y) as dependent variable and it is dependent on a number of independent factors such as types of workers (X_1), workers 'personal habits (X_2), overtime (X_3), residential status (X_4), personal protective equipment (X_5) and health status (X_6). The proposed model that would determine the impacts of independent variables on the occupational hazards is as follows:

$$LnY = f(LnX_1, LnX_2, LnX_3, LnX_4, LnX_5, LnX_6) \quad \ldots.(1)$$

The present study is based on qualitative data. It is necessary to apply score to convert qualitative data into quantitative for the descriptive and quantitative analysis. In this context, various previous relevant studies and logical expressions have been observed (Yasmin and Alam 2006; Mishra, 2020). It is also seen (ibid) that no consistent rules or concepts were adopted to score the variables for the purpose of such data conversion. It has been thus applied different scores to convert qualitative data into quantitative values on the basis of relevant past studies and logical expressions to reach the objective of the study. Similarly, the procedures of variables' selection and assumptions have been done by acquiring experiences from the related previous studies (ibid). The background of the variables' selection, assumptions and scores are found in Table-1. It has been performed logarithmic converter for the multivariate analysis in the above equation (1) and the reason of use the logarithmic converter in multivariate analysis can be found in (Yasmin and Alam, 2006; Mishra, 2020; Ashraf, Arafin and Kibria, 2016).

Table -1
Background of variables selection, assumptions and measurements criteria

Variables	Describe	Scores	Measurement Criteria	Basis
X_1 (Types of workers)	Employment status seems to be significantly associated with occupational hazards. It is expected that permanently employed workers become more loyal to the organization and also responsible than others. If the permanent work employment increases, the occupational hazards will decrease and vice versa.	3 2 1	Permanent Temporary Part-time	Number of workers
X_2(Personal habits)	Personal habits such as smoking, drug addiction of workers have very close association with the occupational hazards with minor exceptions. If personal habits of the workers	4 3 2 1	No habit Betel leaf & smoking Smoking Betel leaf	Preference of habits

	increase, the occupational hazards will also increase and vice versa.			
X_3(Overtime)	Overtime work is an extra source of income. Workers expect overtime to maintain the living standard smoothly. But overtime work can create mental and physical stress which may cause various accidents. So, if overtime work increases, the occupational hazards will also increase and vice versa.	1 2 3	1-2 hour 2-4 hr. >4 hr.	Preference of higher overtime working hour
X_4(Residential status)	The life style of workers is also effected by residential status. The lives of workers become comfortable if the residence of workers are accommodated with well-structured residence. A comfortable life able to motivate workers to work enthusiastically and attentively. If the residential statuses of workers become comfortable, the occupational hazards will decrease and vice versa.	3 2 1	Dormitory Home Others	Accommodation criteria
X_5(PPE)	The use of Personal protective equipments (PPE) in any industrial work is very important. The proper use of PPE declines the various accidents during the working hours. If the uses of PPE increase, the occupational hazards will decrease and it is inversely true.	6 5 4 3 2 1	Helmets Goggles Gloves Ear plugs Gas masks Aprons	Highest number of PPE used by the respondents
X_6(Health status)	Health is wealth. A healthy worker can take burden of work pressure and move from one work to another without boring and fatigue. These symptoms are inverse in case of unhealthy workers. So health status is an important indicator of occupational hazards. It is assumed that healthiness of workers can decrease occupational hazards where unhealthy workers can increase the occupational hazards. Therefore, if healthy workers increase, the occupational hazards will decrease and vice versa.	2 1	No health problems Health problems	Health status
Y (Occupational hazards)	Shipyards are places where ships are repaired and built. The government of Bangladesh has considered it as the "thrust sector" for the development of economy of the country (Rahman 2017). But the ship building industry is a risky place and it can be faced many occupational hazards such as chemical, physical, psychological and mechanical hazards of the workers. So, occupational hazards have been taken as dependent variable of the study.	1 2	No occupational hazards Occupational hazards exist	Purposively

RESULTS AND DISCUSSION

Descriptive analysis

On the basis of employment status, 47.4% workers were permanent. In this organization, the remaining workers were temporary (40%) and part time (12.6%) respectively (Table 2-1).

Table 2-1
Types of workers

Items		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	PT*	24	12.6	12.6	12.6
	TE*	76	40.0	40.0	52.6
	PE*	90	47.4	47.4	100.0
	Total	190	100.0	100.0	

*PT-Part time, *TE-Temporary, *PE-Permanent

The prevalence of addictions is also responsible for the occupational hazards. It is found that most of the respondents' (44.7%) had smoking habits (Table 2-2). Besides this, consumption habits of betal leaf (18.9%) and smoking and betel leaf (19.5%) were also visible among the respondents (Table 2-2). Similar observations such as alcohol addiction, smoking and tobacco consumption habits were also identified in the study of Vaishali (2014).

Table 2-2
Personal habits

Items		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	BL*	36	18.9	18.9	18.9
	SM*	85	44.7	44.7	63.7
	BS*	37	19.5	19.5	83.2
	NO*	32	16.8	16.8	100.0
	Total	190	100.0	100.0	

*BL-Betal leaf, *SM-Smoking, *BS-Betal leaf & smoking, *NO- No habit

Normally, in the Western Marine Shipyard, the duration of work for workers was 8-10 hours. However, 2-4 hours overtime was done by 74.7% workers while 24.2% and 1.1% workers conducted overtime 1-2 hours and 4 hours^{+} also (Table 2-3).

Table 2-3
Overtime hour

Items		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1-2H*	46	24.2	24.2	24.2
	2-4H*	142	74.7	74.7	98.9
	>4H*	2	1.1	1.1	100.0
	Total	190	100.0	100.0	

*H-hour;

Among the workers, 74.7% lived in their own house, 13.2% lived in dormitories and the rest had other residential facilities (Table 2-4).

Table 2-4
Residentual Status

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	MS*	23	12.1	12.1	12.1
	HM*	142	74.7	74.7	86.8
	DR*	25	13.2	13.2	100.0
	Total	190	100.0	100.0	

*MS-Miscellaneous, *HM-Home, *DR-Dormitory

The negligence of the use of PPE (Yilmaz et. al. 2015) revealed an alarming fact of a previous study. In the Western Marine Shipyard, all the workers use personal protective devices for protection purposes. It is found that majority of the workers wear helmets (20%) which are followed by goggles (18.9%), gloves (16.8%), ear plugs (16.3%), gas masks (14.7%) and aprons (13.2%) respectively (Table 2-5).

Table 2-5
Personal protective equipment(PPE)

Items		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	AP*	25	13.2	13.2	13.2
	GM*	28	14.7	14.7	27.9
	EP*	31	16.3	16.3	44.2
	GL*	32	16.8	16.8	61.1
	GO*	36	18.9	18.9	80.0
	HL*	38	20.0	20.0	100.0
	Total	190	100.0	100.0	

*AP-Aprons, *GM-Gas mask, *EP-Ear plug, *GL-Gloves, *GO-Goggles, *HL-Helmets

It is detected that neurological disease were prevalent more among the workers (10%) while all other forms of diseases like cardiovascular disease (1.58%), respiratory disease (8.42%), gastrointestinal disease (4.74%), skin disease (5.26%) and others (4.21%) etc. were also found among the workers (Table 2-6). However, about 65.8% respondents had no disease (Table 2-6). About 24.8% workers were found hypertensive, 12.8% had diabetes, 9.6% had dyslipidemia and 1.1% had obstructive lung diseases which were observed in a study (Kalyani, Bicholkar, and Cacodcar et. al., 2019). It can be inferred that ship building workers suffer several occupational health problems.

Table 2-6
Health status

Items		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	HP*	65	34.2	34.2	34.2
	NHP**	125	65.8	65.8	100.0
	Total	190	100.0	100.0	

**NHP-No health problem
* HP-Health problem & it includes Respiratory disease (8.42%), Cardivascular disease (1.58%), Neurological disease (10%), GIT disease (4.74%), Skin disease (5.26%), others (4.21%);

About 57.4% of the respondents felt that the working environment was hazardous for them and 42.6% did not fell hazards during work (Table 2-7). Respondents complained during the field survey that they faced physical hazards, chemical hazards, psychological hazards and mechanical hazards in their shipyard. Similarities are also observed in (Yilmaz et. al. 2015; Vaishali, 2014).

Table 2–7
Occupational hazards

Items		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes*	81	42.6	42.6	42.6
	No**	109	57.4	57.4	100.0
	Total	190	100.0	100.0	

*Yes-Occupational hazards **No-No occupational hazards

Results of Regression

The AR^2 value of multiple regression analysis is 0.746 and significant at 1% level of significance (Table 3-1). It indicates that the variables included in the model are reasonably accurate. The corresponding F–statistics is 93.758 (Table 3-2). The positive regression coefficients of the model indicate the direct relation or positive contribution to create occupational hazards of the workers. On the other hand, negative values of regression coefficients indicate no direct relationship or inverse relationship with the occupational hazards of the workers of the shipyard.

Table 3-1
Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.869[a]	.755	.746	.17305

a. Predictors: (Constant), LnX1,LnX2,LnX3,LnX4,LnX5,LnX6

Table 3-2
ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	16.846	6	2.808	93.758	.000[b]
	Residual	5.480	183	.030		
	Total	22.326	189			

a. Dependent Variable: LnY

b. Predictors: (Constant), LnX1,LnX2,LnX3,LnX4,LnX5,LnX6

Table 3-3
Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.785	.034		23.148	.000
	LnX_1	-.493	.108	-.514	-4.550	.000
	LnX_2	-.545	.069	-.711	-7.902	.000
	LnX_3	.515	.081	.454	6.375	.000
	LnX_4	.681	.087	.558	7.832	.000
	LnX_5	-.234	.109	-.396	-2.154	.033
	LnX_6	-.064	.081	-.062	-.794	.428

a. Dependent Variable: LnY

It is seen in Table 3-3 that the regression coefficient of types of workers (X_1) is -.514 which is significant but the coefficient has negative impact on the occupational hazards. It is assumed that there is no direct relationship between types of workers and occupational hazards.

The regression coefficient of personal habits (X_2) has no effect on the occupational hazards (Table 3-3). The regression coefficient (-0.711) is negative and significant at 1% level of significance. It is evident that the shipyard premise is completely smoking free zone and workers always reluctant to take betel leaf and smoking during the working hours. It is, perhaps, this variable could not create any occupational hazards in the area of shipyard.

The factor overtime (X_3) has positive and significant effect on the occupational hazards. The regression coefficient is 0.454 and t-value indicates the 1% level of significance (Table 3-3). This means if overtime increase by 1, occupational hazards will increase by 0.454 and vice versa Overtime is essential to increase income of the workers but it can also induce mental and physical stresses of workers. So occupational hazards can be occurred due to overtime.

The regression coefficient of housing conditions (X_4) is positive (0.558) and significant at 1% level of significance (Tale 3-3). It means that if the regression coefficient of housing conditions increase by 1, occupational hazards increase by 0.558 and vice versa. The infrastructure of residence is an important factor of workers' motivation. A well-structured housing condition ensures workers to enjoy comfortable life which can help workers to perform their works enthusiastically and this is inversely true also. The living conditions of the respondents are assumed to be not comfortable. The housing structures of the respondents are semi structured with minor exceptions which were found during the field study. Therefore, the existence housing conditions of the respondents increased the occupational hazards drastically.

The use of PPE (X_5) is essential factor for the sustainability of industrial working environment. The use of PPE can reduce occupational hazards. It is seen in Table 3-3 which the regression coefficient (-0.396) of PPE on occupational hazards is significant at 5% level of significance and it has negative impact. Thus it can be inferred that if, the use of PPE increase by 1, the occupational hazards decrease by 0.396 and vice versa.

The ill health is the root of many accidents in the working premises. The occupational hazards increase if the diseases of workers increase. It is seen in Table 3–3 that the regression coefficient (-0.062) of the health status(X_6) of workers is negative. It means that if the number of healthy workers increases by 1, occupational hazards may be decreased by 0.062 and vice versa. It is possible since number of healthy workers is comparatively higher than the number of unhealthy workers in the study respondents. However, the magnitude of the regression coefficient is weak since the regression coefficient is not significant

LIMITATIONS

1. The study was conducted on only 190 workers of the shipyard. So, result may not reflect the whole scenario of the occupational hazards of all the workers.
2. Category of work was not fixed. Workers had to perform different types of works according to the needs.

CONCLUSION

The findings of the research work are consistent with the expectations in the context of types of workers, overtime, personal protective equipment and health status. However, personal habits and residential status are found exceptions to the assumptions. The outcomes of personal habits and residential status of workers of the present study may be a scope for the future research work in the context of shipyard industries.

RECOMMENDATIONS

Following suggestions can improve the occupational hazards of the shipyard.

1. The authority of the shipyard should ensure the use of personal protective equipment for all their workers.
2. The employment of permanent workers should be increased.
3. It is found that over time increases occupational hazards. The HR administration of the shipyard should take necessary steps by discussing this matter with the workers.
4. The shipyard can arrange housing complex for the workers of the industry so that workers can improve their living status.
5. The health condition of most of the workers is found good but many workers are found unwell also in the study. It is necessary to moderate the existing health care facilities for the welfare of the shipyard workers.

The above proposals may or may not be the best ones rather it can be explorative. The WMS can consolidate these outcomes with their human resource policy. The WMS will also use other hazard analysis tools for the similar data set to check the validity of the result if necessary. Alternately, they can use the same analysis technique by taking similar data for analyzing the hazards of the workplace to find out the acceptability of the outcomes of the study. In this regard, here it lies a huge gateway for further research by the researchers of HRM, public health and others. Finally, the ship builders can consider this case study to reduce the occupational hazards of their industries to make ships in order to play a big role in the economic development of their countries.

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