

THE EFFECT OF STUDENTS' SELF-REPORTED INFORMATION AND INFORMATICS LITERACY ON FINANCIAL LITERACY AND THE USE OF ONLINE PAYMENT

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ABSTRACT

In today's world, where almost everything takes place in the virtual world, information and informatics, as well as financial literacy are becoming increasingly important. Although most of the university students are considered to be sufficiently information and informatics literate, the Covid-19 pandemic has confirmed how necessary it is to possess the skills and knowledge related to these literacies in order to maintain quality of life by using new financial technologies and be effective in various spheres of life. This study investigated whether there is connection between these two literacies and financial literacy of university students. Also, students' demographic data, Internet use, agreement with statements concerning information and informatics literacy as well as the use of payment services before and after the Covid-19 pandemic was explored. In addition, the research aim was also to see if acceptable neural network model could be made for distinguishing students based on their reported financial literacy. Monte Carlo exact test showed that there is statistically significant association at the 0.05 level of significance between the self-reported informatics literacy and information literacy ($p = .000$, two-sided), age ($p = .027$, two-sided) and by making payments via digital wallets in 2021 ($p = .007$, two-sided) and 2020 year ($p = .024$, two-sided). Also, Monte Carlo exact test showed that there is statistically significant correlation at the 0.05 level of significance between respondents' information literacy and their work experience ($p = .005$, two-sided) and who covers their life expenses ($p = .019$, two-sided). The Monte Carlo test also showed that both of these literacies have statistically significant relationship with financial literacy ($p = .000$, two-sided), but statistically significant relationship was not found between financial literacy and payments via digital wallets. Concerning the neural network approach, the obtained multilayer perceptron (MLP) neural network model gained overall efficiency of 97.5% in distinguishing students based on their level of financial literacy.

Keywords: *financial literacy, informatics literacy, information literacy, neural networks, university students*

Introduction

21st century competencies can be divided into three categories: conceptual, practical, and human, with practical competencies including media and information literacy (with computer and digital literacy as a key component) and learning literacy (Lee, 2013). In the new teaching, the literacy approach is not monolithic, but literacy is divided into several more specific competencies that feed into the concept of multiliteracy, including information literacy, informatics literacy, media literacy, computer literacy, electronic literacy, financial literacy, etc., with different competencies, goals, and acceptance of new, often digital, tools. (Tao, 2002; Tyner, 2014; Tafazoli et al. 2017). All of these competencies are important to navigate today's dynamic and virtual environment. There is a large body of research that focuses on identifying the achieved level of different competencies and, more specifically, the impact of competencies on people's behaviour and well-being, such as the impact of financial literacy on payment behaviour (Fernandes, Lynch, Netemeyer, 2014, Lusardi, 2015; Allgood, Walstad, 2016). This paper analyses the effect of students' self-reported information and informatics (computer) literacy on their financial literacy and online payment behaviour as they become increasingly important in daily life, especially since the emergence of the COVID-19 pandemic. It is predicted that digital payments will reach US\$7,860,739 million in 2022 and will continue to grow at 10.88% annually (Statista, 2021). Apart from the volume of digital payments, the importance of this topic is also reflected in the number of studies dealing with online payments (Heikkinen, Välimäki, 2021) and in the fact that even more specific indices have been developed recently, such as the payment-related literacy index by Trütsch and Nikolaus (2021) and the TIAA Institute-GFLEC Personal Finance Index (P-Fin Index) by Lusardi, Yakoboski and Oggero (Lusardi, Yakoboski, Oggero, 2017). An OECD survey of 117,000 teenage students in 20 countries found that students are very active users of online shopping and payments, with online purchases associated with better financial literacy in most countries. (OECD, 2020a) Yet only minority of students (10%) achieve the best results in a financial literacy (OECD, 2020b) that raises a question of the need of designing contemporary educations in the field of financial literacy related to the use of financial technologies.

On the other hand, the number of papers dealing with the interdependence of information, informatics, financial literacy, and their collective influence on use of online payments is scarce. With this study, the authors aimed to find out whether there is a relationship between self-reported informatics (computer) literacy and information literacy, and a relationship between informatics (computer) literacy and information literacy with financial literacy and digital wallet payments among university students.

The aim is also to gather information about the level and interconnection between analysed literacies in selected categories and to create efficient neural network model for uncovering students based on their perceived financial literacy in order to draw conclusions about the exigency to adapt university educational programmes to the needs of the increasingly important topic of personal financial management in the digital environment. Authors have already used neural networks in researches concerning different financial management topics and confirmed their usability, such as in research conducted by Sood and Bhushan (2017) who “concluded that neural networks have the capability of forecasting financial performance at the least cost” (p. 7), Zacharis (2016) who used multilayer perceptron neural network (MLP) to predict students’ learning success on their web-based blended learning courses, Huang, and co-authors (2007) for analysing the financial literacy of youth in the Australian society, Jain (2021) who used MLP neural network to recognize the financial literacy of the women employed in Higher education sector, Leong and co-authors (2020) who used two-staged structural equation modeling neural network for prediction mobile wallets innovation resistance.

The work is structured as follows. The next subchapter is explaining the importance of research and understanding of interconnection between financial, information and informatics (computer) literacy as well as the role of education and different stakeholders in increasing financial literacy. Following chapters are giving presentation of methodology and results of the research. The last chapter is giving concluding remarks with recommendations for improvements in the field of a unified approach to addressing information, informatics and financial literacy, limitations of this research and recommendations for future research.

Interconnection of Financial, Information and Informatics literacy

Remund (2010) notes that understandings of financial literacy are inconsistent and proposes a definition of financial literacy that states that it is “a measure of the degree to which one understands key financial concepts and possesses the ability and confidence to manage personal finances through appropriate, short-term decision-making and sound, long-range financial planning, while mindful of life events and changing economic conditions” (p. 234). There is a positive connection between financial literacy and payment behaviour (Fernandes, Lynch, Netemeyer, 2014) and adoption of online payment services (Akbar et al., 2021) this is even more emphasized with the growth of digital payment methods share in total number of transactions (Heikkinen, Välimäki, 2021) as where the lack of

literacy is an obstacle in adopting new cashless instruments (Wisniewski et al., 2021). More specifically, Trütsch and Nikolaus (2021) found that payment literacy, not financial literacy, influences payment behaviour and adoption of payment instruments.

Education is considered important in the issue of adoption of different cashless and digital payment methods, with researchers suggesting different methods to increase financial literacy, such as: mandatory education programmes and information and education campaigns (Lusardi, 2008), development of online portals for users of financial services (Zaslavskaya, Usova, 2019), timely education programs (Fernandes et al., 2014), different workshops and seminars, the establishment of financial counselling centres on campus, and peer education (Cude et al., 2006). Krizek and Ing (2012) conducted a survey on specific areas of financial education to define a standard and guide for university lectures. They consider its application necessary because students generally do not meet the requirements of the financial literacy standard for university educated people. It is necessary to emphasise that wrong financial decisions of individuals cause costs for the whole society, i. e., costs of support that has to be covered by taxpayers. Therefore, the government should be actively involved in implementing financial literacy programmes (Lusardi, 2008) In addition to the government, the university, colleges, and parents also have a significant impact on students' financial behaviour (Cude et al., 2006). The role of banks is also highlighted as they can, by providing financial literacy advice, influence their customers' decision to become users of digital financial services (Akbar et al., 2021) and actively manage their finances. It is clear, then, that numerous organisations can influence students' adoption of online and other digital payments and improve their digital financial literacy.

At the same time, financial literacy is not only important for individuals, but also for businesses and the economy. Herdinata (2020) found that regulation and collaboration between companies have a significant impact on financial literacy, but on the other hand, employee financial literacy and regulation do not have a significant impact on financial technology adoption. Both financial literacy and digital literacy are associated with higher use of digital payments, especially in countries with higher digital literacy and higher Gross domestic product (GDP) per capita. It was also found that digital literacy does not help in managing personal finances, but only in acceptance of digital payment methods. (Lo Prete, 2021).

Through the literature terms of digital literacy, informatics (computer) literacy, digital capabilities and digital naiveness are interwoven. In the frame of this work, the concept of computer (informatics) literacy was used as described by Horton "as the knowledge and skills necessary to understand information and communication technologies (ICTs), including

the hardware, the software, systems, networks (both local area networks and the Internet), and all of the other components of computer and telecommunications systems” (Horton, 2004 according to Lau, 2006, p. 7).

According to Choi et al. (2021) education and income are positively affecting the level of digital literacy and skills (i. e., techno-capital) where financial independency (income) is not as relevant as education. Only surrounding students with digital devices and Internet connection will not ensure their digital literacy (OECD, 2021) but higher level of its presence in education system could be found beneficiary. Therefore, and taking into consideration other benefits it brings, there is a global trend to include digital literacy (Tekale, 2018), information literacy (Hammons, 2020) and financial literacy (Björklund, Sandahl, 2021) in the curriculum. In observing the problem of financial inclusion among the population, Shen, Hu and Hueng (2018) found that by enhancing the financial literacy and online activities (as a sub-element of computer literacy) the financial inclusion could be advanced through the use of digital financial services. Šorgo and coauthors (2017) found that students’ digital nativeness (ICT connected activities as ICT ownership and experiences, as well as number of ICT oriented university courses and internet confidence) do not affect information literacy and that new university courses should be developed to promote information literacy (Šorgo et al., 2017).

Regarding the development of digital literacy, the availability of ICT technology is not sufficient for development of information literacy (OECD, 2021). Although there is a need to include information literacy, as well as digital literacy, education in curriculum programmes (Jackson, 2005), as students are facing difficulties in accessing, evaluating and using information, there is a lack of strategic approach by schools to change this situation (Julien and Barker, 2009, Jackson, 2005), and a general non-understanding of the importance of information literacy (Bušelić and Banek Zorica, 2017). The change in this field is necessary as only half of the students from OECD survey (2020b) claimed to have school training about recognising nonbiased information fact and only 47% of them can recognize fact from opinion. This makes it thus one of the most important elements of reading in a digital environment that needs to be developed. (OECD, 2020b). It is clear that in today’s world the information literacy should be recognized as one of the basic skills (Gendina, 2013), along with informatics (computer) and financial literacy.

Methodology

This research was conducted in the academic year 2020/2021 at the Faculty of Education and the Faculty of Economics of the University of Osijek.

An online questionnaire was used to collect data and it consisted of general data (7 variables), data on students' self-reported levels of informatics, information, and financial literacy (3 variables), data about their Internet access (2 variables), 11 statements about their informatics and information literacy, where students had to express their agreement with each statement on a Likert scale from 1 to 5 (1 means they completely disagree and 5 means they completely agree) and the questions about online payment. Participants were offered 9 payment options and they had to indicate how they paid before and during the pandemic. Multiple years were offered as answers for each option (2019 and earlier, 2020 and 2021) and participants could also choose as an answer that they never used that option.

A convenience sampling was used. A total of 409 students participated in this study of which 40.34% ($n = 165$) were enrolled at Faculty of Education and 59.66% ($n = 244$) at the Faculty of Economics. The majority of the participants were female (86.31%), the highest number of the participants were younger than 18 years old (47.68%), more than one-third of them lived in a rented flat or room during their studies (37.41%), the highest number of them never worked during their studies (40.83%), and for slightly more than three fifths of them (60.99%) their parents or other close family members pay for their studies.

Data were analysed with Statistica 13 and SPSS software. Informed consent was obtained from all participants, and they could quit the study at any time without consequence. The study was anonymous, meaning that no unique identifier was collected and individual participants' responses could not be linked to their identity.

Results

Regarding the behaviour of participants in terms of their Internet access, the results revealed that the majority of participants most often use a smartphone to access the Internet (84.84%) and most often access it from home (96.33%). When it comes to their perceived level of informatics literacy, more than half of the participants (52.32%) think that their informatics (computer) literacy is very good, and the same number of students (52.32%) think the same about their information literacy. A little less than two fifths of participants (39.12%) assessed their financial literacy as good (see Figure 1).

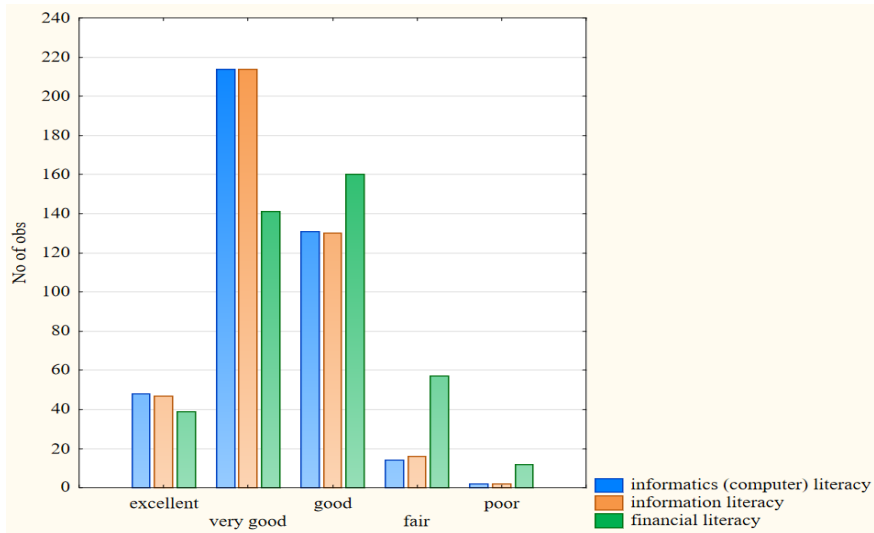


Figure 1. Self-assessment of informatics, information and financial literacy.

The Monte Carlo exact test showed that there is a statistically significant association at the 0.05 significance level between self-reported informatics literacy and information literacy ($p = .000$, two-sided), age ($p = .027$, two-sided), and making payments via digital wallets in 2021 ($p = .007$, two-sided) and 2020 ($p = .024$, two-sided). The Monte Carlo exact test also showed that there is a statistically significant association at the same significance level between respondents' information literacy and their work experience ($p = .005$, two-sided) and who pays their living expenses ($p = .019$, two-sided). Also, the Monte Carlo test showed that these two literacies are statistically significantly related to financial literacy ($p = .000$, two-sided).

For the neural networks, the random sampling method was used and the sample was divided into a training sample (70% of the total sample), a test sample (20%), and a validation sample (10%). Statistica 13 software was used for NN modeling. The output variable was a binary variable in which all students who assessed their financial literacy as very good or better were categorized as students with high level of financial literacy and this category was labeled 1 (44.01% of participants). The others are classified in category labeled 0 (55.99% of participants)

Self-reported levels of informatics and information literacy and other variables that showed a statistically significant association at 5% level of significance with the selected output variable of the NN model were removed from the modeling process.

A multilayer perceptron was selected as the neural network type, the minimum number of hidden units was set to 7 and the maximum to 23, sum of squares and cross entropy were used as error functions, 4 functions

were used as activation functions (logistic, tangent hyperbolic, exponential, and sine), and 200 neural networks were trained, tested and validated. The best NN model was obtained with the hyperbolic tangent activation function. This model had an overall accuracy of 97.5% and was able to detect 100% of students who did not have high level of financial literacy and 94.12% of students with high level of financial literacy.

Conclusions

Information, informatics, and financial literacy are becoming increasingly important given the constant changes in all areas of life that are leading to greater digitization of activities, including online financial activities. Therefore, the aim of this research was to gather information about the level and interconnection between the analysed literacies in the student population in order to draw conclusions about the exigency to adapt university educational programmes to the needs of the increasingly important topic of personal financial management in the digital environment.

At 5% level of significance, the Monte Carlo exact test showed that there was a statistically significant relationship between self-reported informatics ($p = .000$) and information literacy ($p = .000$) with financial literacy and informatics literacy and making payments via digital wallets in 2021 ($p = .007$) and 2020 ($p = .024$). On the other hand, no statistically significant relationship was found between financial literacy and making payments via digital wallets, which is consistent with the findings of Herdinata (2020) and Trütsch and Nikolaus (2021).

The MLP model had a high ability to detect students with high financial literacy (94.12%) and detected all students who did not have high financial literacy. This suggests that the model is very effective in uncovering hidden information and may be suitable for educators as another approach to identifying students with low or high financial literacy.

The research findings indicate that financial literacy development alone is not sufficient, but that a multidisciplinary approach to the education system is needed to prepare the young population to understand and actively use financial technology innovations in the future. Therefore, the importance of education in improving information, informatics and financial literacy is highlighted and a comprehensive approach to its development in the younger population is needed to develop their abilities to understand and deal with advances in financial technologies and the digital world. Therefore, it is important to develop educational programmes aimed at introducing students to the digital financial world, developing critical thinking skills while constantly monitoring current trends and digital advances.

The limitations of the research lie in the fact that the results of this study are limited to the youth population only and the study was conducted in a limited geographical area. Therefore, suggestions for future research include increasing the sample size and reviewing and expanding the number of parameters related to digital financial services.

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