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ICTs and Digital Risk in Purchase Transactions

ICT i ryzyko cyfrowe w transakcjach zakupowych

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Abstract. The phenomenon of digital risk accompanies today's consumers every day, at the execution of every purchase transaction. Today's customers (so-called the Customers 4.0), who use ICTs on a large scale and are very prone to exploiting the potential of ICTs in purchasing processes, are usually aware of the digital risk, but do not give to it a high enough priority. In order to explore the peculiarity of the digital risk and customer use of ICTs, the CATI survey was conducted – on a sample of 320 consumers (from Poland). The research aimed to assess the complexity and importance of digital risk in customers' opinions, and the complexity of the use of ICTs in purchasing processes. The research process involved the statistical methods as follows: factor analysis (i.e. Principal Components Analysis method – PCA), as well as cluster analysis (k-mean method). In the study, three composite indexes were constructed – i.e. the Digital Risk Complexity Index – DRCI, the Digital Risk Importance Index – DRII, as well as the Consumers' Use of ICTs Complexity Index – CUICI. In particular, the study showed that the digital risk complexity is at a moderate level, the digital risk importance is at a moderate level too, as well as the consumers' use of ICTs complexity is at a relatively high level throughout the research sample.

Keywords: ICTs, digital risk, customer, purchase transaction

Abstrakt. Zjawisko ryzyka cyfrowego towarzyszy dzisiejszym konsumentom każdego dnia, przy realizacji każdej transakcji zakupowej. Współcześni klienci (tzw. Klienci 4.0), którzy korzystają z ICT na dużą skalę i są bardzo skłonni do wykorzystywania potencjału ICT w procesach zakupowych, są zwykle świadomi ryzyka cyfrowego, ale nie nadają mu wystarczająco wysokiego priorytetu. W celu zbadania specyfiki ryzyka cyfrowego i wykorzystania ICT przez klientów przeprowadzono badanie CATI – na próbie 320 konsumentów (z Polski). Celem badań była ocena poziomu złożoności i znaczenia ryzyka cyfrowego w opinii klientów oraz poziomu złożoności stosowania ICT w procesach zakupowych. Proces badawczy obejmował następujące metody: analizę czynnikową (tj. metodę analizy głównych składowych – PCA), a także analizę skupień (metoda k-średnich). W badaniu zbudowano trzy indeksy kompozytowe: Digital Risk Complexity Index – DRCI, Digital Risk Importance Index – DRII, jak również Consumers' Use of ICTs Complexity Index – CUICI. Badanie wykazało przede wszystkim, że złożoność ryzyka cyfrowego jest na umiarkowanym poziomie, znaczenie ryzyka cyfrowego również na umiarkowanym poziomie, a złożoność zastosowania ICT przez konsumentów jest na stosunkowo wysokim poziomie w całej próbie badawczej.

Słowa kluczowe: ICT, ryzyko cyfrowe, klient, transakcje zakupowe

Introduction

The modern world is changing rapidly, affecting people's behavior, including purchasing processes. The systematic increase in the potential of Information and Communication Technologies (ICTs) gives consumers the opportunity to make changes in the way the purchasing processes are carried out. The modern customer does not think of a shopping process as a visit to a stationary store, but rather as the online shopping (von Leipzig, 2017). For many years, the e-commerce market has been developing both globally and nationally (E-Commerce Industry, 2020; Statista, 2020) – which can be seen as a kind of the human progress and streamlining one of the key areas of people's lives. Nevertheless, the development of ICTs has various consequences (both negative and positive). A particularly important example is the evolving phenomenon of the digital risk. For today's consumers, this type of risk should be extremely important. It is worth remembering that the digital risk can be a source of both risks and benefits for customers who shop online. Actual researches are focused primarily on the issues of the identification of factors that may affect the complexity of the digital risk (Curran, 2016; Buckner, 2016; Zaki, 2020), as well as the degree of its perception by customers (Drenten, Zayer, 2018). Attention is also drawn to the propensity of customers to use ICTs in purchasing processes and the benefits of this (McLean, Wilson, 2019) – but the assessment of the complexity and importance of digital risk in customers' opinions, and the complexity of the use of ICTs in purchasing processes have not been tested yet. This publication attempts to fill in this cognitive gap.

Definition of the digital risk

According to the standard and generally accepted definition, the digital risk covers various situations in which certain entities are exposed to potential losses, e.g. as a result of the use of electronic equipment (e.g. computers) and the processing

of information resources in virtual reality (Śliwiński, 2018). The digital risk may be linked e.g. to the online activity of people, as well as the storage of data (including personal data) (Olsen, 2013). It is worth stressing that today digital risk – as a kind of socio-economic and technological phenomenon – covers basically every area of people's lives, including the implementation of purchasing processes. Digital-natured risks, in the context of e-shopping, i.a. include: identity theft as a result of a security breach, interruption of the trading portal by a hacker, costs related to data corruption, theft of valuable digital assets, including customer lists and trade secrets, introduction of malware, as well as human error leading to the inadvertent disclosure of confidential information (see: Clark, 2019; Research and Markets, 2020; Zaki, 2020; Marriott, Williams, Dwivedi, 2017; Bornschein, Schmidt, Maier, 2020).

Methodology

Research model and hypothesis development

The hypothesis was evaluated to achieve the goal of the study: the digital risk complexity, the digital risk importance, as well as the consumers' use of ICTs complexity are at a high level. In order to verify the hypothesis three composite indexes were constructed – i.e. the Digital Risk Complexity Index – DRCI, the Digital Risk Importance Index – DRII, as well as the Consumers' Use of ICTs Complexity Index – CUICI. What more, in order to verify the hypothesis the cluster analysis (*k*-mean method) was implemented.

The aim of the study is to bring together two main issues: (1) the peculiarity of the phenomenon of digital risk, and (2) the use of ICT, in purchasing processes. In other words, the primary aim of the study is to assess the complexity and importance of digital risk in customers' opinions, and the complexity of the use of ICTs in purchasing processes. The research problem is as follows – At what level are the complexity and importance of digital risk in customers' opinions, as well as the complexity of the use of ICTs in purchasing processes?

Sample and data collection procedures

The subject of the study is specificity of the use of ICTs in purchasing processes in the conditions of development of the phenomenon of digital risk in the opinion of Polish consumers. Respondents' opinions were used to assess the level of complexity and importance of digital risk, as well as the complexity of consumers' use of ICTs in purchasing processes.

The empirical study was conducted in the CATI form (i.e. the Computer Assisted Telephone-Interviewing) on a sample of 320 Polish customers who regularly make

online purchases (at least 5 purchases in electronic form in the last 6 months). The empirical study was conducted between March 2020 and April 2020. The research covered customers operating throughout Poland (16 voivodships). The study was carried out by the research institute “Instytut Badawczy IPC Sp. z o.o.” located in Wrocław (Poland). The study used a random systematic selection (taking into account the voivodship/administrative region in which the consumer resides) in layers (layers were determined taking into account the age of respondents, which reflects the structure in the age of Polish consumers making electronic purchases). Specification of the research sample is presented in Tab. 1.

Table 1. Structure of the research sample – CATI study (N = 320)

Basic criteria for specification of the research sample	N*	%**
Sex		
Female	168	52.5
Male	152	47.5
Total	320	100.0
Age (years)		
18-20	16	5.0
21-39	104	32.5
40-49	53	16.6
50-74	118	36.9
75 and more	29	9.1
Total	320	100.0
Number of IT devices used in purchasing transactions		
Small – up to 2 devices	103	32.2
Big – at least 3 different devices	217	67.8
Total	320	100.0
Number of social media and ICTs used in purchasing transactions		
Small – up to 5 media and ICTs	206	64.4
Big – at least 6 media and ICTs	114	35.6
Total	320	100.0

* Number of customers in the research sample.

** Percentage share of the number of customers in the research sample.

Source: Own elaboration

The main research tool was the CATI questionnaire. The data analyses were supported by the IBM SPSS Statistics version 25. The questionnaire applied a screening question if customers had successfully made at least 5 electronic purchases in the last 6 months. During the CATI interview, respondents assessed specific factors (Tab. 2) on a 5-point scale. If the respondent assessed the factor at “1”, this meant that there was a lack of implementation of the factor (or its importance was very low), and if it assessed at “5” – the factor was fully implemented (or its importance was very high). In the following parts of this work, the results of the study of the use of ICTs in the development of the digital risk phenomenon – using the analysis of basic descriptive statistics and correlations, factor analysis (i.e. Principal Components Analysis method – PCA), as well as cluster analysis (*k*-mean method) – are described.

Measures

The empirical study took into account 30 specific factors that could have a potential impact either on the complexity and importance of digital risk, or the complexity of using ICTs in purchasing processes (Tab. 2). These factors were detailed on the basis of the studies conducted by: Banyt et al. (2008), Rudnicki (2017), Idzikowski and Cieśliński (2017), Lee et al. (2014), Polo Peña et al. (2013), Rasool et al. (2020), Fernández-Rovira et al. (2021), Matarazzo et al. (2021), Curran (2018), Bamberger (2010), and Donning (2019). Specific factors are included in three groups: (1) factors determining the complexity of digital risk in customers’ opinion, (2) factors determining the importance of digital risk phenomenon for customers, as well as (3) factors determining the complexity of customers’ use of ICTs in the electronic purchasing process. The first two groups of factors refer to the same 14 factors – assessed by respondents in terms of their prevalence in shaping both the complexity and importance of digital risk. This approach is determined by the desire to meet the basic principles of the systemic analysis (Zaskórski, 2012), as well as to identify those factors that can most strongly determine complexity and importance of digital risk, as well as the complexity of using ICTs in purchasing processes.

Table 2. Specific factors in areas of determining the complexity and importance of digital risk, as well as determining the complexity of customers' use of ICTs (N = 320)

Specific factors
GROUP I: Factors determining the complexity of digital risk in customers' opinion
f1: Ability to share data, including personal data and other sensitive data
f2: No direct communication with the seller/contractor
f3: Virtual money circulation (card, wire transfer, online consumer credit, etc.)
f4: Lack of detailed and important information in the purchasing process (hiding information by the seller and creating a so-called information asymmetry between customer and seller)
f5: Lack of reliability of the seller
f6: Hard-to-estimate time of order fulfillment
f7: Poor quality of order fulfillment (lack of completeness of the package, destruction of goods, etc.)
f8: Hidden costs of the purchase transaction (courier fee, insurance, duty, etc.)
f9: Difficult complaint process
f10: Make purchases and look at the entire store offer on one website
f11: Ability to check online reviews about the seller and increase in the consumer awareness
f12: Ability to influence the seller's rating and image
f13: Ability to contact other consumers and exchange information
f14: Ability to influence the seller's commercial offer and the quality of commercial transactions
GROUP II: Factors determining the importance of digital risk phenomenon for customers
f1: Ability to share data, including personal data and other sensitive data
f2: No direct communication with the seller/contractor
f3: Virtual money circulation (card, wire transfer, online consumer credit, etc.)
f4: Lack of detailed and important information in the purchasing process (hiding information by the seller and creating a so-called information asymmetry between customer and seller)
f5: Lack of reliability of the seller
f6: Hard-to-estimate time of order fulfillment
f7: Poor quality of order fulfillment (lack of completeness of the package, destruction of goods, etc.)
f8: Hidden costs of the purchase transaction (courier fee, insurance, duty, etc.)
f9: Difficult complaint process
f10: Make purchases and look at the entire store offer on one website
f11: Ability to check online reviews about the seller and increase in the consumer awareness
f12: Ability to influence the seller's rating and image
f13: Ability to contact other consumers and exchange information
f14: Ability to influence the seller's commercial offer and the quality of commercial transactions

cd. tab. 2

Specific factors
GROUP III: Factors determining the complexity of customers' use of ICTs in the electronic purchasing process
f1: Financial benefits and value for consumers
f2: Digital risk resistance
f3: Ethics and control of access to data and their use only by online stores
f4: Integration with the store and the ability to re-make a purchase by creating a customer account
f5: Integrity of ordering, payment and shipment process
f6: Quick online interaction
f7: Trust in a given ICTs' brand
f8: Protection of personal data by shops
f9: No direct contact with the seller
f10: Risk of data theft
f11: Control and security of data determined by stores
f12: Ability to leave store ratings on social media
f13: Liability systems in the form of regulations of online stores
f14: Accuracy of data recorded by a given IT system
f15: Store performance (service speed, resource consumption, product availability)
f16: Usability (human factors, aesthetics, consistency, documentation, responsiveness) and business continuity (availability, predictability, accuracy)

Source: Own elaboration

As it was written above, in order to verify all five hypotheses, three composite indexes were constructed:

- the Digital Risk Complexity Index – DRCI,
- the Digital Risk Importance Index – DRII,
- the Consumers' Use of ICTs Complexity Index – CUICI.

For construction of the DRCI, DRII and CUICI indexes, methodological recommendations for the development of composite indexes, developed by OECD (2008), were used. The adopted DRCI, DRII and CUICI construction methodology included the following stages (Nardo et al., 2005):

- determining the scope of measurement and the legitimacy of using the composite index;
- selection of partial factors;
- evaluation of the quality of empirical data;
- assessment of the relationship between partial factors;
- giving weights to the partial factors and their aggregation to the composite index.

The developed composite indexes adopted the formulas as follows:

$$\text{DRCI} = 0.34(f_5 + f_6 + f_7 + f_8 + f_9)/5 + 0.25(f_{10} + f_{11} + f_{12})/3 + 0.22(f_1 + f_2 + f_4)/3 + 0.19(f_{13} + f_{14})/2. \quad (1)$$

$$\text{DRII} = 0.32(f_4 + f_5 + f_6 + f_7 + f_8)/5 + 0.24(f_1 + f_9 + f_{14})/3 + 0.24(f_{10} + f_{11} + f_{12} + f_{13})/4 + 0.20(f_2 + f_3)/2. \quad (2)$$

$$\text{CUICI} = 0.53(f_1 + f_2 + f_4 + f_5 + f_6 + f_7 + f_8 + f_{15} + f_{16})/9 + 0.27(f_9 + f_{12} + f_{13} + f_{14})/4 + 0.21(f_3 + f_{11})/2. \quad (3)$$

On the basis of the specified formulas, it was possible to estimate the average level of the DRCI, DRII and CUICI indexes in the research sample and, therefore, to attempt to verify the hypothesis.

Data analysis and results

The distribution of DRII and CUICI indexes' values is characterized by left-sided skewness, which means that the majority of values were above mean value. For the DRCI index the skewness is right-sided, which means that the majority of values were below mean value (Tab. 3). Considering the fact that each of the 30 specific factors included in the DRII, DRCI or CUICI structure was assessed on a 5-point scale, the mean value of the DRCI index of 2.8343 indicates that the average complexity of digital risk in the opinion of Polish customers is at a moderate level throughout the sample. Moreover, the dominant value for this index is at the level of 2.00, as well as the coefficient of variation is moderate – 19%. The mean value of the DRII index of 3.2752 indicates that the average importance of digital risk in the opinion of Polish customers is at a moderate level throughout the sample. Moreover, the dominant value for this index is at the level of 3.00, as well as the coefficient of variation is moderate – 18%. The mean value of the CUICI index of 3.5864 indicates that the average complexity of digital risk in the opinion of Polish customers is at a relatively high level throughout the sample. Moreover, the dominant value for this index is at the level of 3.00, as well as the coefficient of variation is moderate – 19% (Tab. 3).

The "limit" (median) value in the 5-point scale is 3.0. Generally, it can be assumed that the low level of the is for the DRII, DRCI or CUICI indexes' values in the range <1; 2,5), moderate level in the range <2,5; 3,5>, and high in the range (3,5; 5>. However, this is a contractual and standardized division, because a precise indication of the level of complexity and importance of digital risk, as well as complexity of using ICTs in purchasing processes requires the identification of the needs and capabilities of the given customer in this respect.

The above results are reflected in the clusters analysis of respondents. For the study, three customer clusters (for each composite indicators) were specified, using the *k*-mean method: (1) with a low level of indicators, (2) with an average level of indicators, and (3) with a high level of indicators). As it can be seen (Tab. 4), cluster No. 2 (moderate level) is the most numerous for each indicator. In the case of the CUICI indicator, the cluster No. 3 is also numerous (it includes customers with a high level of the complexity of using ICTs in purchasing processes). Clusters No. 1 are the least numerous for each of the three composite indicators.

Table 3. Descriptive statistics for DRCI, DRII, and CUICI (N = 320)

Descriptive statistics	DRCI	DRII	CUICI
Mean	2.8343	3.2752	3.5864
Median	2.8035	3.2540	3.6779
Dominant	2.00	3.00	3.00
Standard deviation	0.54451	0.58248	0.69179
Variance	0.296	0.339	0.479
Coefficient of variation	19%	18%	19%
Skew	0.277	-0.156	-1.058
Minimum value	1.00	1.16	1.01
Maximum value	5.00	5.00	5.00

Source: Own elaboration

Table 4. Three clusters of customers according to the value of DRCI, DRII, and CUICI (N = 320)

	Clusters		
	No. 1: Low level	No. 2: Moderate level	No. 3: High level
	INDEX: DRCI		
Number of customers	54	197	69
Stand(DRCI)	-1.41685	-0.08461	1.35040
	INDEX: DRII		
Number of customers	60	188	72
Stand(DRCII)	-1.41905	-0.04534	1.30092
	INDEX: CUICI		
Number of customers	34	150	136
Stand(CUICI)	-2.13203	-0.27052	0.83137

Source: Own elaboration

On the basis of the above analysis, hypothesis, which states that the digital risk complexity, the digital risk importance, as well as the consumers' use of ICTs complexity are at a high level, can be negatively verified (i.e. falsified).

Discussion and conclusions

The empirical research showed that the digital risk complexity is at a moderate level, the digital risk importance is at a moderate level too, as well as the consumers' use of ICTs complexity is at a relatively high level throughout the research sample. Samson et al. (2014) pointed out that the complexity and importance of the digital risk management in purchasing processes is rather high. The same is true in a context of the complexity of using ICTs – the research by Birch-Jensen et al. (2020) indicated, that this complexity is at a high level. The results of the survey conducted on Polish consumers indicate a much lower importance of the digital risk, as well as a much lower perceived complexity of this socio-technological and economic phenomenon. This may indicate either a lack of interest of Polish consumers in the phenomenon of digital risk, or their low awareness of the conditions of its formation and impact on purchasing processes (and consumers too). This is not a good situation, as it suggests specific shortcomings in the consciousness of Polish consumers – especially in terms of a development, as well as the role and importance of the phenomenon of the digital risk.

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