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Building technology trust in ICT application at a university

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Abstract

Purpose – The purpose of this paper is to point out the importance of technology trust and relationships between technology trust and trust antecedents. The paper aims to seek answers to the following questions: what determines technology trust (technology trust antecedents) and how to measure it in the case of the University Student Service System (USSS) technology?

Design/methodology/approach – In this study, the survey method was used to collect data. The online survey engaged 413 students representing one Polish technical university. The USSS was the technology of interest. The USSS web is an IT system for managing the course of higher education. The USSS web evolved into a multipurpose platform, which is used by university students for many different purposes.

Findings – Positive verification of three accepted hypotheses *H1*, *H3* and *H5* shows that the ease of use, general trust level of respondents and institutional trust have a statistically significant influence on USSS technology trust. The diversification of regression coefficients indicates that the ease of use determines USSS technology trust more than general trust and institutional trust.

Research limitations/implications – An important limitation of the conducted study was the reduction of the sample group of students representing one university – the Bialystok University of Technology. The relationships between variables, however, have made it possible to explain the reasons for the existing dependencies from the perspective of a single university, which constitutes an important cognitive value in the context of motivating and disseminating information and communication technology solutions. A good adjustment of the developed theoretical model indicates that it can be used to a wider degree.

Practical implications – From the practical point of view, achieved results showed that there are many factors that can be influenced by managers within an organisation to build up technology trust relations. Institutional trust is one example of such factors. Also, considering that building trust is a process, managers should take into account that different factors can affect technology trust in different stages of this process. At the beginning phase, the ease of use of a particular technology seems to be most important for its users, and then the usefulness of the technology becomes the factor which determines the technology trust. Despite the fact that the conducted research did not show statistically significant relations between technology trust and the intention of future system use, results explained main factors affecting such situations. Also, the frequency of system use seemed to be the most important variable that determines the intention of future system use.

Originality/value – The scientific value of the study is an attempt to build a measurement scales relating to trust in technology and constructs determining that trust. According to a very popular technology acceptance model, which explains the behaviour of technology users, the author expanded the acceptance model and finally proposed the model consisting of five input variables (the ease of use, usefulness, institutional trust, general trust, trust in technology and science) and one output variable – the intention to use the system in the future. The novelty of the research results from the fact that it was the first research conducted in Poland on the topic of technology trust topic.

Keywords Perceived usefulness, Institutional trust, Ease of use, General trust, Technology trust

Paper type Research paper

Introduction

The issue of trust is increasingly becoming a subject of interest of the sub-discipline of production and technology management, where a person is a part of a socio-technical system, and trust refers to a relationship between humans and technology or a product that reflects the application of a particular technology. The emergence of a new type of trust, i.e. technology trust/technological trust, requires both refinement and conceptualisation.

The dynamic development of technology and the growing human dependence on technology raise the interest of researchers in technology trust (Krot and Lewicka, 2016). Future technologies such as autonomous cars, robots used in the care of the elderly or the use of the Internet of Things in everyday life will cause a change in the human–technology relationship.



It is expected that the role of technology trust will gain significant relevance both in terms of social relationships and research issues.

The trust underlying social relations (Luhmann, 1979), an element of building social relationships (Larzelere and Huston, 1980), and the formation of social capital (Mayer *et al.*, 1995) are increasingly becoming the focus of most scientific disciplines such as philosophy, sociology, economics, management sciences, psychology, policy science and engineering sciences (technology trust). According to Rotter (1967), the efficiency, adjustment and even survival of any social group depend upon the presence or absence of trust. The lack of an unambiguous definition of trust (Rousseau *et al.*, 1998) results primarily from the multidimensional, complex and multifaceted nature of the concept. Trust is the assured reliance on the character, ability, strength or truthfulness of someone or something. We are speaking of trust when there is uncertainty with regard to the future states of reality (Nazarko and Koniuk, 2013), and the subjects affected by that relation remain dependent on each another (Ryciuk, 2016; Sheppard and Sherman, 1998).

The growing importance of technologies in everyday life, the increasing dependence of people on technologies and the replacement of human–human relationships with human–technology relationships are the focus of researchers searching for answers to such questions as: can technology be trusted? Can technology trust be measured and if yes – how? This issue seems to be particularly relevant in the age of increasing complexity and uncertainty of the surrounding environment associated with the development of technology (Magruk, 2017).

However, in Rousseau *et al.*'s (1998) opinion, assigning consumer technologies with increasingly more characteristics that are particular to human–human relationships, such as ensuring a sense of security, credibility, reliability, loyalty and accuracy, allows using the term “trust” while referring to inanimate objects. Two factors that determine the existence of trust-based relationships are risk and dependency. They point to the growing importance of trust in technology. The use of technologies, especially in the period of their dynamic development and limited access to information (resulting from the lack of knowledge) regarding the technologies (e.g. the effects of their use), is related to the risk taken by technology users (Halicka, 2016; Radziszewski *et al.*, 2016). On the other hand, people are increasingly more dependent on technologies. As McKnight points out, trust in IT technologies is particularly important because people have an unprecedented reliance on them (McKnight, 2005). Muir (1987, 1994) who concentrated on the trust between human users and their machines stated that two situations would need a trust-based relation between a human and a machine, automated control systems and decision-support systems, which are usually designed for complex tasks involving some element of risk.

The risk associated with the introduction and use of new technologies entails a certain level of trust in technology that determines a person's interaction with the technology. The total lack of human confidence in technology would make it impossible to use it in everyday life, and thus would hinder the development of humans and entire civilisations.

The remainder of the article consists of the following sections: Part 2 reviews the literature on the issues relating to technology trust. It also identifies the antecedents of technology trust and the classification of trust antecedents. The conducted literature review served as the basis for the formulation of research hypotheses and research the theoretical model included in Part 3. Part 4 describes the methodology used in this paper. Results are described in Part 5. Final part of the paper summarises the findings and briefly explains limitations of the research and implications for the future research.

Trust, its varieties and antecedents

The multifaceted and complex nature of the concept of trust means that there are many different definitions in the literature that reflect the context of trust adopted by the author. According to Sztompka (2007), “Trust is the expectation of honest conduct of others towards us”.

Fukuyama (1995), in turn, defines trust as a mechanism based on the assumption that other members of a given community are characterised by fair and cooperative behaviour based on shared standards. In turn, the definition formulated by Young-Ybarra and Wiersema (1999) covers three components of trust: reliability (expecting one partner to act in the best interests of another partner), predictability and belief (non-opportunistic partner). Trust is most often viewed as belief, faith, expectation and willingness to surrender or be influenced by others or something. According to Paliszkiwicz (2013), despite such different understanding of the term, trust possess following features: is voluntary, concerns someone or something, has a specific area and level, is dynamic and temporary, develops over time, is related to action and based on experience, is related to expectations for the future, exists in an environment of uncertainty and risk, is the cornerstone of social interaction and generally is a positive concept.

Sztompka (2007) assigned trust an additional feature. In his view, trust is “more than just passive consideration of future possibilities”. According to the author, trust is a conviction-based approach, which means that only the actions taken when faced with uncertainty by the trusting party are the evidence of trust in the other party of the relationship. According to the author, the growing interest in the notion of trust is primarily due to the growing uncertainty surrounding the phenomenon and the need for risk taking, the growing interdependence and the need for cooperation, the growing number of new threats and dangers, and the unrestricted ability to make choices that increase the level of uncertainty. Research on technology trust allowed building up several trust typologies. Considering the type of a trust-based relationship, the object most often stands out as:

- interpersonal trust between at least two people;
- institutional/organisational trust; and
- technology trust (Giffin, 1967; Xu *et al.*, 2014).

Initially, relationships were based on trust and had interpersonal nature, i.e. occurred between two or more people (interpersonal trust). Over time, the concept of trust was applied to institutions/organisations (institutional trust and organisational trust), things, devices and technologies (technology trust). Lippert and Swiercz (2005) claimed that trusting a technology is different from trusting a human being. One of the first definitions of technology trust was developed by Lippert, who pointed out that technology trust expresses the willingness of an individual to be susceptible/influenced by technology, resulting from the expected predictability, credibility and usefulness of technology, and the individual preference for technology (Lippert, 2001). According to Muir and Moray (1996), three attributes of the trust between a human and a machine are important: predictability, dependability and faith.

Sztompka (2007) distinguishes trust in technical systems and introduces the concept of technological trust. However, the trust is not directly placed in the system but in the people who design, operate or supervise its operation. According to the author, technological trust is the expectation of efficiency, reliability and effectiveness of equipment and technical systems from the perspective of persons or creators of a given technology/material objects. According to Lippert and Forman (2006), Giffin (1967) and Xu *et al.* (2014) technology trust is a particular type of trust, where the technology user (a human) lays trusts in “inanimate” technology.

Technology trust as a circle of research interests was analysed mainly in the context of information and communication technologies (ICT). Examples of research include the issue of trust in an electronic tax return system (Chen *et al.*, 2015); trust in government websites (Teo *et al.*, 2008; Belanger and Carter, 2008); trust in cloud computing (Manuel, 2015); trust in software (Lankton *et al.*, 2014); mobile banking applications (Luarn and Juo, 2010); trust in Facebook (Lankton and McKnight, 2011); e-government services (Mpiganjira, 2015); or trust in online communication (Benlian and Hess, 2011).

As a research subject, trust is of interest from two perspectives: the analysis of trust antecedents and the analysis of the impact of trust on other constructs.

Lippert and Swiercz (2005) developed a theoretical model of factors determining trust in IT systems that support human resource management in an organisation (human resource information systems). In the model, the output variable was the successful implementation of the IT solution. The factors determining the trust in technology included in the model were organisational trust, interdependence between employees, organisational community, organisational culture, technology adaptation, technology usefulness, socialisation/socialisation processes, privacy policy and general propensity to trust (Lippert and Swiercz, 2005).

Kim *et al.* (2008) with regard to the technology of online shopping (e-commerce) proposed a theoretical model, in which they specified the determinants of trust by distinguishing factors such as quality of information, perceived privacy protection, perceived security system, third-party authentication system, organisation reputation, overall trustworthiness and user experience. The second element of the model involved two factors influenced by trust: risk and buying intentions (Kim *et al.*, 2008).

Meng *et al.* (2008) investigated the determinants of technology trust in m-commerce. The theoretical model proposed by the authors included four categories of variables that determine trust in m-commerce: general trustworthiness, trust in mobile technology in general, trust in the seller measured by his ability (competence), credibility and kindness and institutional trust. In the developed model, the output variable was the future intentions in the use of m-commerce (Meng *et al.*, 2008).

Xu *et al.* (2014), in the study of educational software for students, focused on identifying the trust determining factors for two user groups: active (able to control and influence technology) and passive (using technology through active users without the control of technology). The conducted qualitative research has identified the following groups of factors determining trust: technological factors (the ease of use, visibility, control, feedback, errors, the ease of learning, automation, system flexibility, reliability, regularity, effectiveness and appearance), factors reflecting the characteristics of users (confidence in own capabilities, general confidence) and job-oriented factors (clearly defined tasks, performance error) (Xu *et al.*, 2014).

The research conducted by Lee and Wan (2010) dealt with the purchase of electronic airline tickets. The results of the study confirmed the important role of the construct of perceived utility as a moderator of the variable referring to the future intentions of technology use. At the same time, the authors examined the extent to which confidence in electronic tickets depended on the knowledge of a given technology and the ease of its use (Lee and Wan, 2010).

The scientific interests of Chen *et al.* (2015) concerned technological e-government solutions, and, in particular, the electronic filing of tax returns. The authors pointed to and investigated the following factors as determinants of technology trust: general trust in technology, trust in government, trust in government websites and past user experience in using e-government solutions. The output variables of the model, which are influenced by the trust in e-government, were quality of information, quality of the system and quality of services offered by e-government. These three variables were also examined in the context of their continued impact on the perceived usability and user satisfaction, which ultimately should lead to benefits from e-government perceived by the e-government customers (Chen *et al.*, 2015).

The research conducted by Alzahrani *et al.* (2017) focused on the solutions in the field of e-government. The authors developed a theoretical model by defining the following determinants of trust in e-government: technical factors (quality system, quality of service and quality of the information), institutional factors (reputation of the institution and previous experience of users), the factors characterising characteristics particular to users

(general propensity to trust, internet experience and education) and risk factors (risk of expected effects, time risk, and safety and privacy). In the model, the authors have also considered the impact of trust on the intentions regarding the future use of e-government services, which influence the adaptation of solutions and the level of user satisfaction. A valuable component of the proposed model was the inclusion of other factors than just the technological ones determining confidence in e-government. The authors themselves have indicated that the proposed theoretical model requires the operationalisation and definition of measurement metrics of the individual variables in the model (Alzahrani *et al.*, 2017).

On the one hand, Rempel *et al.* (1985) stated that human trust in a machine changes as a result of experience with a system and, on the other hand, Muir and Moray (1996) stated that the competence of the automation is an important aspect of the human-machine trust.

The literature review allowed the author to identify the four main groups of determinants of technology trust: institutional-organisational factors, technological factors, factors representing user characteristics and environmental factors (Table I).

Research concerning the area related to the influence of trust on other constructs has indicated that trust was most often analysed in the context of influencing behaviour intentions (buying intentions and intentions to use the systems in the future), scale and scope of the future use of technology, satisfaction levels, quality of service delivered using the technology, and the perceived usability and expected benefits from users and organisations. For example, trust in technology was the research subject of the team led by

Group name	Description	Trust antecedents
Institutional and organisational	Applicable to organisations that use technology (bank and hospital) or manage technology (Facebook)	Institutional trust Privacy policy Mutual interdependence between employees Organisational community Organisational culture Reputation
Technological	Relating to the technical and technological parameters of the analysed technologies	Ease of use Technology functionality Security level Privacy guarantee System quality Service quality Information quality Risk
User characteristics	Relevant to the characteristics of users: knowledge, skills, experience and demographic characteristics	Interpersonal trust General propensity to trust Trust in similar technologies Level of satisfaction Previous experience with technology Knowledge of technology Technological proficiency Education
Organisational environment	Relating to the environment of the organisation using the technology or the environment ensuring the functioning of technology	Reputation of the institution/organisation in the community Trust the institution/organisation Privacy protection perceived by the environment Security perceived by the environment Social acceptance of technology Legal requirements for security and privacy

Table I.
Groups of factors that determine trust in technology

Source: Created by the author based on the literature review

Mariani *et al.*, who analysed the relationship between trust in online recruitment websites and the attractiveness of companies searching for employees. The results have confirmed the positive link between trust in websites and the attractiveness of businesses according to job seekers (Mariani *et al.*, 2016). Li *et al.* (2008) investigated the formation of the initial trust in the IT technology used in the national identification system. Lippert and Forman (2006), in their trust studies, pointed out that trust in technology could be a source of risk to their users in situations, where the technology fails to meet expectations.

The multidimensional and contextual nature of trust and the specifics of the technologies studied, reflecting the features and functionality of technology, lead to the lack of a general model of trust in technology. In the process approach, such a model should consider the determinants of trust as input and the factors that are affected by the trust in technology as output.

The specificity of individual technologies and their users, as well as the variety of factors that determine technology trust, indicate the need to develop an individual approach to measuring trust in technology that is of interest to researchers.

Research model and hypotheses

The conducted review of literature pointed to a multitude of factors that determine trust in technology. To develop a theoretical model of trust in technology, the author attempted to locate the term of trust within technology acceptance models (TAMs) that explain the behaviour of individuals in the context of their acceptance of the technology. In the world of limited information availability and the uncertainty of future events, trust in technology plays a key role in the acceptance process.

Assuming that the original model used by the researchers was the TAM developed by Davis (1989) and the subsequent models – the unified theory of acceptance and the use of technology and Model D&M IT Success – constituted its modification, in the constructed model of trust, the author took into account two basic variables from the TAM output model: the perceived ease of use and the perceived usefulness. The perceived usefulness is defined according to Lu *et al.* as a factor that refers to job-related productivity, performance and effectiveness. The perceived ease of use is defined as the degree to which a potential adopter views the use of the target technology to be relatively free of effort (Davis, 1989). The TAM model was designed to evaluate the acceptance of technology from the perspective of prospective/potential users as well as their attitudes and behaviours. Nevertheless, it seems important to use the model to evaluate technology trust in the context of its use and to indicate to what extent the ease of use and usefulness determine this confidence.

The connection between the perceived ease of use and trust has been discussed in the extended TAMs, demonstrating that the ease of use perceived during user interactions with a technology improves their trust level (Hernández-Ortega, 2011). The research conducted by Pavlou and Gefen (2004) analysed the impact of the variable of the ease of use on technology trust and demonstrated that the ease of use of a newly implemented technology has a positive effect on the level of trust in the technology during its use. Similar results were obtained by Klein (2007) dealing with the online system of communication between doctors and patients, showing a positive relationship between the technology, the ease of use and the confidence in the technology. Considering the above, the author formulated the following hypothesis:

- H1.* The ease of use of technology has a strong and positive influence on USSS technology trust.

In the light of the review of literature conducted by the author, the usefulness of technology, on the one hand, is regarded as a determinant of trust in technology, and on the other hand, as a variable dependent on trust. Belanche *et al.* (2012) indicated that in terms of an e-government technology, it is the trust in technology that determines its usability, while the team of Mou *et al.* (2017) pointed to the positive impact of technology on the trust in this

technology. Because trust in a particular technology is based on previous experience with its use and thus the experienced functionality of a given technology, the author undertook the task to verify the hypothesis:

H2. Technology usefulness has a strong and positive influence on USSS technology trust.

The general (social) trust is defined as one's general propensity to trust others. Sztompka (2005) defines the general trust as a willingness to take action, based on an *a priori* expectation that most people and institutions work in a way that is beneficial to us. Belanger and Carter (2008) proved that general trust positively influences trust of the technology such as the internet. In her research, Lippert (2001) also demonstrated that one of the determinants of technology trust is the overall individual's propensity to trust. Thus, this study proposes the following hypothesis:

H3. The general trust has a strong and positive influence on USSS technology trust.

They relate general trust in technology and science in general, allowing the discussion about trust in science and technology. It is not always the case that the fact of a person believing in the development of science and technology (having a general trust in technology) has a direct impact on the trust in a particular technology that is already used or will be used in the future. This was confirmed by the studies conducted by Montague *et al.* (2009) which proved that trust in medical technology is empirically different from trust in technology. Based on the evidence, this study proposes the following hypothesis:

H4. The trust in technology and science has a strong and positive influence on USSS technology trust.

Institutional trust is an important factor determining the trust in an e-government technology. Confidence in public institutions refers to the perception of integrity and the ability of an institution to ensure the proper functioning of a given technology (McKnight and Chervany, 2002). The research conducted by Belanger and Carter (2008) confirmed the existing relationship between the trust in an institution and the trust in the technology offered by this institution. Thus, this study suggests the following research hypothesis:

H5. The institutional trust has a strong and positive influence on USSS technology trust.

In TAMs, based on the theory of reasoned action and the diffusion in innovation theory, the output variable influenced by trust in technology is the intentions of the future use of technology. Many research results confirm the statistically significant relationship between the trust in technology and user intentions in the field of the future use of technology (Vatanasombut *et al.*, 2008; Hsu *et al.*, 2014). Lean *et al.* (2009) proved that higher levels of trust are positively related to higher levels of intention to use e-government services. As a consequence of the above, author test the following hypothesis:

H6. USSS technology trust has a strong and positive influence on the intention of future system use.

The conducted literature review allowed for the construction of a measurement model (Figure 1). The constructs of trust in technology included in the model cover the organisational–institutional factors (institutional trust), technological factors (usefulness, the ease of use), and reflect the individual traits of the users (general trust, trust in technology and science).

Research methodology

Data

The author has attempted to measure trust in the technology of the University Student Service System (USSS). The conducted surveys of confidence measurement are a pioneering

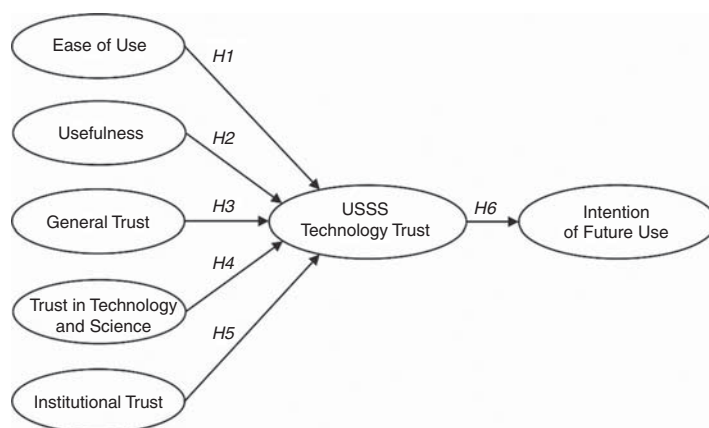


Figure 1.
Research model
and hypotheses

research in Poland and hence should be considered a contribution to further scientific discussion. The technology being the focus of trust issues was the USSS system, meaning an IT system for managing the course of higher education. This system is used by more than 60 universities in Poland. The system includes, among others, the following applications:

- USSS web – allows a remote management of the issues related to the course of study.
- Umail – enables communication between university staff and students.
- University Lectures – an online service allowing to register for subjects available to students.
- Graduate Diploma Archives – a website serving as a repository of diploma theses.
- ECTS Guide – an internet site containing information about the credit transfer and accumulation system.
- Interviewer – an internet service used to carry out all kinds of electronic surveys.
- Classroom Reservation System – an online service for staff to reserve rooms across the whole university.
- Planner – a desktop application for creating lesson plans.
- Online Recruitment of Candidates – service for candidates to studies.

The conducted research focused on the USSS web applications.

The electronic questionnaire survey was addressed to all students of the Bialystok University of Technology, both full time and part time. In total, the survey was sent to over 8.4 thousand students. A fully completed questionnaire was obtained from 413 students, which provided the total return rate of 5.1 per cent.

This result should be considered satisfactory, corresponding to the return rate of surveys in social research, which oscillates between 3 and 5 per cent. Of the 413 respondents, 202 (48.9 per cent) were women, and 211 (51.9 per cent) were men. The respondents represented seven faculties of the Bialystok University of Technology: Architecture, Building and Environmental Engineering, Electrical, Computer Science, Mechanical, Faculty of Forestry and Faculty of Management.

The proportion of respondents aged 18–24 was 85.5 per cent (353 persons), followed by 11.1 per cent (46 persons) aged 25–34 and 3.4 per cent (14 persons) of persons over 35.

Measures

In this study, a survey method was used to collect data. Since constructs of technology trust, the ease of use and usefulness institutional trust cannot be directly observed, a series of measures were used for each. Based on the literature study, six items have been identified to measure usefulness, three – the ease of use, six – technology trust, five – trust in technology and science and seven – institutional trust. General trust and intention of future use were measured using one direct question (Table II).

The questionnaire conducted based on confidentiality was distributed in March 2017. All constructs were measured using a seven-point Likert scale to assess the degree to which the respondent agreed or disagreed with each of the items (1 = totally disagree to 7 = totally agree). Cronbach's α coefficients of the constructs were employed (ranging from 0.697 to 0.903). The author used the average score of measures of each construct for further analysis.

Findings and hypothesis verification

Table III shows the descriptive statistics and correlation matrix for variables. Significant correlations are found between all constructs, but the strength of dependence is poor or moderate.

Table IV displays the list of items, their sources and their respective standardised factor loadings. The positive and significant loadings confirm the convergent validity of the measures. When analysing the suitability of the system for respondents, the key features are the ones indicating that the USSS improves comfort and quality of studying, facilitates studying and saves time for its users. Considering the hidden ease of use as a variable, it should be noted that respondents found the easy and intuitive use of the system to be the most important thing. Respondents believed that confidence in the researched technology meant guaranteed security and anonymity. The construct of trust in technology (USSS technology trust) is reflected by ensuring the security of our students' personal data (the USSS web system ensures the security of my personal data). Trust in technology and science is dependent to the highest degree on the fact that science and technology are making respondents' lives better, easier and more comfortable. Confidence in the institution, which is the university, is reflected in the fact that the university takes care of its students, applies the principles of ethics and social responsibility in its activities and provides opportunities for student personal development. The fact that the university is recognised internationally has the least significance for the trust in the university.

Having satisfied the requirement arising from measurement issues, the structural model in Figure 1 was subsequently tested. The generalised least squares (GLS) model with AMOS was set to test the hypothesised relationships shown in Figure 2. GLS is a technique for estimating unknown parameters in a linear regression model. In the structural equation modelling, a measurement model allows setting the relationships between observed variables (i.e. indicators) and their respective unobserved (latent) variables by defining a particular structural model (Ejdys, 2016).

The appropriateness of the measurement model was evaluated by using the χ^2 statistics. As Table V shows, the χ^2 value was statistically significant ($\chi^2 = 701.86$, $p < 0.005$) indicating good model fit to the data. As this measure is excessively conservative and is biased against large samples (Bollen, 1989), several disparate indices must be taken into consideration jointly to evaluate an accurate reflection of the overall model fit. The indices included the root mean square error of approximation (RMSEA), the goodness-of-fit index, the adjusted goodness-of-fit index and comparative fit index. The results of the SEM test are provided in Table V. The approximate fits are also good, specifically, the normed χ^2 (i.e. χ^2/df) value = 1.9444, which is well within the acceptable range for this heuristic (Bentler and Chou, 1987; Bollen, 1989), RMSEA = 0.048, which is a good value

Constructs	Items	Mean	Cronbach's α
Usefulness (Davis <i>et al.</i> , 1989)	U1 The USSS web system makes it easy for me to study	4.81	0.903
	U2 The USSS web system provides me with access to current information related to studies	4.19	
	U3 Most of the system functionality is useful to me	3.92	
	U4 The USSS web system improves the comfort and quality of studying	4.48	
	U5 The USSS web system saves my time	5.04	
	U6 The USSS web provides an efficient system of communication with employees of the university	3.85	
Ease of use (Davis <i>et al.</i> , 1989; Hernández-Ortega, 2011)	EU1 Getting started with the USSS web was easy	5.15	0.679
	EU2 Using the USSS web system is easy and intuitive	4.96	
	EU3 I need additional training to master the ability to use all the modules of the USSS web system (reversed question)	2.17	
The USSS technology trust	TT1 The USSS web system guarantees the anonymity of users	4.10	0.786
	TT2 In the Survey Module, I can express my opinion about studies, subjects and teachers without any fear	4.35	
	TT3 The USSS web system ensures the security of my personal data	4.27	
	TT4 The USSS web system is efficient and always works reliably	2.93	
	TT5 The USSS web system is predictable and unchanging	4.81	
	TT6 I can rely on the USSS web System	4.11	
General trust	GT Most people can be trusted	3.82	–
	T1 Due to the ICT technology, our lives are easier and more comfortable	5.85	
	T2 Due to the ICT technology, our lives are safer	4.17	
	T3 Science and technology are making our lives better	5.03	
	T4 Science and technology are making our lives easier	5.66	
Trust in technology and science	T5 I believe that new technologies are created for the good of a human being	4.89	0.830
	IT1 My university takes care of its students	4.59	
	IT2 Graduates of my university have no problem finding a job in their profession	4.12	
	IT3 My university is well recognised by employers in the labour market	4.75	
	IT4 My university applies the principles of ethics and social responsibility in its activities	4.84	
Institutional trust	IT5 My university provides opportunities for student personal development	4.94	0.890
	IT6 My university is recognised internationally	4.48	
	IT7 My university uses new technology to improve my studies and gain knowledge and skills	4.63	
Intention of future use	IFU I intend to use the USSS web system to a greater extent	3.16	–

Table II.
Constructs and items

(Konarski, 2010; Bollen, 1989, Ejdy, 2016). This means that the model is likely to be interpreted as a real model of the relationship between the variables.

Figure 2 presents the individual structural path estimates. Table V reports the results for the structural model depicted in Figure 2.

Table III.
Descriptive statistics
and correlation matrix
(Spearman's coefficient)

	Usefulness	Ease of use	General trust	Trust in technology and science	Institutional trust	Technology trust	Intention of future use
Usefulness	1	0.347**	0.317**	0.276**	0.470**	0.619**	0.447**
Ease of use	0.347**	1	0.163**	0.218**	0.276**	0.420**	0.052
General trust	0.317**	0.163**	1	0.390**	0.389**	0.388**	0.262**
Trust in technology and science	0.276**	0.218**	0.390**	1	0.478**	0.336*	0.141**
Institutional trust	0.470**	0.276**	0.389**	0.478**	1	0.548**	0.276**
Technology trust	0.619**	0.420**	0.388**	0.336*	0.548**	1	0.389**
Intention of future use	0.447**	0.052	0.262**	0.141**	0.276**	0.389**	1

Note: **Significant at the 0.01 level (two-tailed)
Source: Author's own elaboration

The hypotheses can be confirmed through the interpretation of the structural path coefficients. Moreover, the factor loadings for path usefulness, i.e. technology trust and the ease of use, as well as technology trust measurement items are significant.

The path coefficient from the ease of use to technology trust is 0.617 ($p < 0.001$). Thus, this positive relationship confirmed that $H1$ was supported. Also, in case of general trust and institutional trust and relations with USSS technology trust, $H3$ and $H5$ were supported. The path coefficient from usefulness and trust in technology and science to USSS technology trust is very low, and $H2$ and $H4$ were rejected. The path coefficient from USSS technology trust to intention of future use is 0.151 ($p = 0.276$), which rejects $H6$ (Table V).

Discussion and conclusions

Positive verification of three accepted hypotheses ($H1$, $H3$ and $H5$) shows that the ease of use, general trust level of respondents and institutional trust have a statistically significant influence on USSS technology trust. The diversification of regression coefficients indicates that the ease of use determines USSS technology trust more than general trust and institutional trust. In a case of rejected hypotheses ($H2$, $H4$ and $H6$) positive statistically significant relationships between tested variables were not proved.

The obtained results showed neither significant statistical relationship between the construct of usefulness and USSS technology trust nor have they confirmed the significance of the construct of usefulness compared to the ease of use construct in building trust in the analysed technology. In the light of the results obtained for the students being studied, it is the ease of use of a given software and its intuitiveness that shape the trust in the technology, and not the usefulness of technology as shown by the results of other studies. Keil *et al.* (1995), analysing the effects of two variables, namely usefulness and the ease of use, have also proven that usefulness is a more important factor than the ease of use in determining the use of a system. Also, Davis (1993) proved that in determining the use, the perceived usefulness was 50 per cent more influential than the ease of use. Subramanian (1994) noticed that perceived usefulness rather than the ease of use is a determinant of the predicted future use. As the obtained results differed from those observed by other researchers, it was also examined to what degree the frequency (which reflects experiences of users) of use by the respondents of the USSS system affects the other variables in the model. The frequency of the USSS system use was examined using a scale where 0 meant I do not use the system at all, 1 – I use it only occasionally during Winter and Summer examination periods, 2 – I use it sporadically during the semester, and many times during

Abbreviation	Items descriptions	Loadings
<i>Usefulness</i>		
U1	The USSS web system makes it easy for me to study	0.778
U2	The USSS web system provides me with access to current information related to studies	0.466
U3	Most of the system functionality is useful to me	0.338
U4	The USSS web system improves the comfort and quality of studying	0.845
U5	The USSS web system saves my time	0.648
U6	The USSS web provides an efficient system of communication with employees of the university	0.061
<i>Ease of use</i>		
EU1	Getting started with the USSS web was easy	0.783
EU2	Using the USSS web system is easy and intuitive	0.855
EU3	I need additional training to master the ability to use all the modules of the USSS web system (reversed question)	0.310
<i>USSS technology trust</i>		
TT1	The USSS web system guarantees the anonymity of users	0.467
TT2	In the Survey Module, I can express my opinion about studies, subjects and teachers without any fear	0.260
TT3	The USSS web system ensures the security of my personal data	0.748
TT4	The USSS web system is efficient and always works reliably	0.559
TT5	The USSS web system is predictable and unchanging	0.274
TT6	I can rely on the USSS web System	0.476
<i>General trust</i>		
GT	Most people can be trusted	0.196
<i>Trust in technology and science</i>		
T1	Due to the ICT technology, our lives are easier and more comfortable	0.670
T2	Due to the ICT technology, our lives are safer	0.535
T3	Science and technology are making our lives better	0.734
T4	Science and technology are making our lives easier	0.672
T5	I believe that new technologies are created for the good of human being	0.619
<i>Institutional trust</i>		
IT1	My university takes care of its students	0.760
IT2	Graduates of my university have no problem finding a job in their profession	0.466
IT3	My university is well recognised by employers in the labour market	0.453
IT4	My university applies the principles of ethics and social responsibility in its activities	0.781
IT5	My university provides opportunities for student personal development	0.611
IT6	My university is recognised internationally	0.281
IT7	My university uses new technology to improve my studies and gain knowledge and skills	0.405
<i>Intention of future use</i>		
IFU	I intend to use the USSS web system to a greater extent	0.082
Source: Author's own elaboration		

Table IV.
Constructs,
measurement items and
validity (standardised
regression weights)

Winter and Summer examination periods, 3 – I use it many times but only during the Winter examination period and Summer examination period to check results of examinations and 4 – I use it many times throughout the academic year.

The analysis of correlation coefficients indicated that at the significance level of $p < 0.001$, there was a statistically significant correlation between the frequency of the USSS system use and the two variables: usefulness (Spearman's correlation: 0.273) and USSS

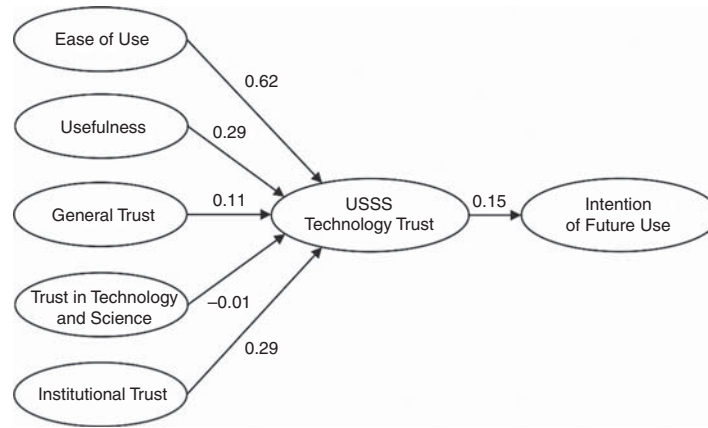


Figure 2.
Path coefficients
(unstandardised
regression weights)

Relation between constructs	Estimate	SE	CR	<i>p</i>	Hypothesis testing
<i>H1</i> : Ease of use vs USSS technology trust	0.617	0.183	3.380	***	Support
<i>H2</i> : Usefulness vs USSS technology trust	0.290	0.163	1.779	0.075	Reject
<i>H3</i> : General trust vs USSS technology trust	0.106	0.038	2.813	***	Support
<i>H4</i> : Trust in technology and science vs USSS technology trust	-0.006	0.050	-0.121	0.903	Reject
<i>H5</i> : Institutional trust vs USSS technology trust	0.285	0.072	3.942	***	Support
<i>H6</i> : USSS technology trust vs Intention of future use	0.151	0.138	1.090	0.276	Reject

Notes: $\chi^2 = 701.86$; $df = 361$; $\chi^2/df = 1.944$; $p < 0.005$; RMSEA = 0.048; GFI = 0.893. Adopted level of the statistical significance was 0.05. *** $p < 0.001$

Table V.
Results of the
test hypotheses

technology trust (Spearman’s correlation: 0.156). Considering the fact that the average value for the variable of frequency amounted to 0.45 in the study, which indicates that respondents rarely use the software, has little experience with it and do not appreciate its usefulness. In the first period of implementation of technological innovation, users always focus more on the ease of use and intuition rather than realise the real benefits and the usefulness of the system.

An important result of the study is the observed relationship between the institutional trust and USSS technology trust. Respondents, by building trust in the technology used at the university, focus on the factors shaping trust to the university. In practical terms, motivating students to make more use of the USSS can be achieved by building trust in the university itself and building its international image, image as an entity recognisable in the local job market and a university guaranteeing good work for its graduates. The obtained results coincide with the results of other authors dealing with e-government technology trust, where one of the antecedents of ICT technology trust was institutional trust (Weerakkody *et al.*, 2013; Reddick and Roy, 2013).

Previous studies (Lippert and Swiercz, 2005), as well as author’s results, confirm that general trust (social trust) indicates trust to particular technology. According to relationships between trust in technology and science and USSS technology trust, previous studies also confirm that trust to particular technology (e.g. medical technology) can be perceived differently than general trust to technology (Montague *et al.*, 2009).

The author's findings suggest that there is no significant statistical relationship between USSS technology trust and intention of future use. At the same time, other studies confirm that trust affects continuance intentions of technology using by its users (Hernández-Ortega, 2011; Lee *et al.*, 2007). The explanation of the reasons for the lack of a statistically significant relationship between USSS technology trust and the intention of future use of the USSS application can also be found in the frequency of use of the USSS system. The results also confirmed a statistically significant relationship between the frequency of system use and the intention of future use of the system ($p < 0.001$, Spearman Coefficient: 0.285).

From the practical point of view, achieved results showed that there are many factors that can be influenced by managers within an organisation to build up technology trust relations. Institutional trust is one example of such factors. Also, considering that building trust is a process, managers should take into account that different factors can affect technology trust in different stages of this process. At the beginning phase, the ease of use of a particular technology seems to be most important for its users, and then the usefulness of the technology becomes the factor which determines the technology trust. Despite the fact that the conducted research did not show statistically significant relations between technology trust and the intention of future system use, results explained main factors affecting such situations. Also, the frequency of system use seemed to be the most important variable that determines the intention of future system use.

The conducted literature studies confirmed the significant interest among researchers in technology trust. In this study, a framework was made for measuring technology trust and technology trust antecedents. The main goal of the research was to find the answer to the question what determines technology trust (technology trust antecedents) and how to measure it in case of the USSS technology. Examination of the relationship between constructs may be particularly important in the process of improvement and development of the USSS web application.

Taking into account the fact that the use of the technology under the research takes place within a public institution, the conducted research confirmed that institutional trust itself plays an important role in the process of implementation, adaptation and using new technologies. This issue seems to be particularly important in relation to the public sector. In the context of the future dynamic development of e-government services, the issue of technology as well as institutional trust becomes particularly important.

An important limitation of the conducted study was the reduction of the sample group of students representing one university – the Białystok University of Technology. The relationships between variables, however, have made it possible to explain the reasons for the existing dependencies from the perspective of a single university, which constitutes an important cognitive value in the context of motivating and disseminating ICT solutions. A good adjustment of the developed theoretical model indicates that it can be used to a wider degree.

Directions for future research

The literature review confirmed that researchers use different observable variables to build their own measurement scales, which is justified by the specificity of the analysed technology. Future research should focus on the analysis whether the type of technology, its characteristics, the level of risk, the dependence of users on the technology determine the characteristics that allow the measurement of technology trust. However, it should be assumed that the individual characteristics of technology and their nature may require the development of different constructs and scales for measurement of technology trust.

It would be useful to research comparing the measurement scales used by the authors for the purpose of testing technology trust that are differentiated due to technology specificity and usability.

Also, research which allowed comparing level of trust and its antecedents in reference to different ICT technology having the same functionality would be desirable.

Technology trust can be particularly important with respect to new emerging technologies in the context of research concentrated on the acceptance of these technologies by society (e.g. android, gynoid and flying cars).

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