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The Importance of Business Model Factors for Cloud Computing Adoption: Role of Previous Experiences

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Background and Purpose: Bringing several opportunities for more effective and efficient IT governance and service exploitation, cloud computing is expected to impact the European and global economies significantly. Market data show that despite many advantages and promised benefits the adoption of cloud computing is not as fast and widespread as foreseen. This situation shows the need for further exploration of the potentials of cloud computing and its implementation on the market. The purpose of this research was to identify individual business model factors with the highest impact on cloud computing adoption. In addition, the aim was to identify the differences in opinion regarding the importance of business model factors on cloud computing adoption according to companies' previous experiences with cloud computing services.
Methodology: Based on literature review, prior research results, and interviews with cloud computing providers and users, a research model was developed. Statistical analysis focused on identification of factors' importance on cloud computing adoption and differences in opinions according to respondents' previous experiences with cloud computing services. The study was done among 80 companies and five major cloud computing providers in Slovenia.
Results: The research results reveal statistically significant differences in opinions on the importance of cloud computing business model factors according to respondents' previous experiences with cloud computing services. The results can provide orientation for redesign or innovation of existing business models towards the creation of a customer-oriented business model for the more successful exploitation of cloud computing services and business opportunities. For potential users, the findings represent guidelines for the successful adoption of cloud computing services.
Conclusions: In our research, the investigated business model factors could be classified into so-called "business model organizational factors", as they primarily need to be considered by cloud service providers when defining or innovating their business models. For future research, the model should also include the impact of environmental factors, such as Competition, Business Partners, Legislation, Economic Situation, in order to investigate their impact on cloud adoption.

Keywords: *Cloud Computing adoption; SaaS; IaaS; Paas; Business model factors*

1 Introduction

More than five decades of research and development activities in virtualization, distributed computing, networks, and software solutions and services enables the implementation of current cloud computing services and facilities. Nowadays, cloud computing is defined as the provisioning of ubiquitous, on-demand available, dynamically scalable, virtualized IT services and facilities to the customer based on the minimum intervention of the provider (Marston, Li,

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Bandyopadhyay and Ghalsasi, 2011). With its characteristics of service orientation, flexibility, resource sharing, elasticity, virtualization, and charging according to service usage, cloud computing offers significant changes in traditional IT implementation and governance and results in optimization and cost reduction (Chebrolu, 2011).

According to IDC InfoBrief report (2015), approximately four of ten organizations have already adopted public or private cloud services, with the primary goals of increased efficiency and decreased costs. In 2017, cloud adoption impact is also expected to result in the strategic allocation of IT budgets at the higher level and increased revenue. According to the same study (IDC InfoBrief, 2015), over 50 per cent of organizations' IT spending is expected to be for third platform technologies, solutions, and services, built on the technology pillars of mobile computing, cloud services, big data and analytics, and social networking, rising to over 60 per cent by 2020. According to IDC Research (IDC Research, 2015), IaaS spending, in particular, is expected to grow at a compound annual growth rate (CAGR) of 15.1% and is expected to reach $53.1 billion by 2019. The total global cloud computing market is expected to grow from $40.7 billion in 2011 to $241 billion in 2020. According to Gartner (Gartner Inc, 2016), by 2020, a corporate "no cloud" policy will be as rare as a "no internet" policy is today.

Cloud computing is, therefore, expected to impact the European and global economies significantly, especially the ICT industry and other industries, in terms of the potential benefits of cloud computing usage through re-energized productivity, efficiency, and competitiveness. According to Eurostat (2016), 19% of EU-28 companies used cloud computing in 2015, mostly for hosting their e-mail systems and storing files in electronic form. Almost half of those companies used advanced cloud services relating to financial and accounting software applications, customer relationship management or to the use of computing power to run business applications. According to the results of the same study, significant differences can be observed across countries. For example: in Finland, Iceland, Italy, Sweden, and Denmark, the cloud computing service adoption rate is over 30%. In contrast, the rate in Hungary, Bulgaria, Greece, Poland, Latvia, and Romania was below 10% (Eurostat, 2016).

The data show that despite many advantages and promised benefits, resulting mainly in more effective and efficient IT governance and service offerings in companies, the adoption of cloud computing is not as fast and widespread as foreseen. This situation demonstrates the need for further exploration of cloud computing potentials and its implementation on the market. While companies adopting cloud computing services aim to achieve maximum business value from the services, providers face the challenge of providing efficient and attractive business models for achieving competitive advantages on the market.

The situation calls for further action. Cloud computing providers need to re-evaluate and redesign their current business models to accelerate cloud computing adoption. They need to position themselves in the market, recognize potential networks, partnerships and understand adoption factors that need to be taken into consideration when addressing current and potential users. It is important to understand what the customers' needs are, what their requirements are, what they prefer, refuse, and what their fears related to cloud computing adoption are. To assure success and long-term development in the cloud computing market, it is also important to consider interactions of the identified factors.

To address the above-presented challenges, we conducted a study focused on the evaluation of business model factors of cloud computing providers. The study was done in Slovenia. The aim of the study was twofold. First, we identified cloud computing business model factors and developed a research model, consisting of 40 factors, classified into eight factor groups. Factors and factor groups were identified from prior research and interviews with cloud computing providers and users. Second, the defined business model factors were estimated to have an impact on cloud computing adoption in companies. In particular, we were interested in the factors' importance and the differences in opinion according to respondents' previous experiences with cloud computing services. It is expected that understanding of cloud computing business model factors and their importance for its adoption will contribute to the development of more efficient cloud computing business models tailored to the customers (users) expectations. In addition, results of the study will contribute to higher levels of awareness of companies considering cloud computing adoption and faster adoption rate. The study was done among 80 companies and five major cloud computing providers in Slovenia.

The paper is organized as follows. After the introduction, a literature review is given, which is followed by introduction of methodology. The next chapter presents the research results. The paper ends with discussion and conclusions.

2 Literature review

The American National Institute of Standards and Technology (Badger et al., 2011) classify cloud computing services according to their key features and implementation model as follows: software solutions as a service, platform as a service, and infrastructure as a service. For value maximization of cloud service delivery to end users, it is necessary to understand the business aspects of cloud computing (Marston et all, 2011). There have been several studies (Tweel, 2012; Chebrolu, 2011; Low, Chen, and Wu, 2011; Benlian, Hess, and Buxmann, 2009; Chen, Shiue, and Shih, 2011, Watson, 2010) conducted related to the

impact of cloud computing adoption factors and research models based on different technology adoption theories, such as: Technology Acceptance Model (TAM), Unified Theory of Acceptance and Use of Technology (UTUAT), Task/Technology Fit Theory (TTF), Technology Organization Environment Model Factors (TOE), and others. Previous research models revealed some individual factors that were included in our study. However, according to our evidence, no comprehensive research model of cloud computing business model factors providing a comprehensive overview of the importance and correlation of these factors to cloud computing adoption exists.

In this chapter, we present a literature review of cloud computing adoption factors and business models. The presented research results have served as a basis for initial research model of business model factor design.

2.1 Cloud computing adoption factors

The literature review of factors impacting cloud computing adoption has revealed the following research models, suggesting some of the factors that could be classified as business model factors (Bogataj and Pucihar, 2012):

Technology Acceptance Model factors impacting cloud computing adoption

Watson (2010) investigated factors impacting the adoption of cloud computing by decision-making managers. The purpose of his research was to evaluate the factors impacting the adoption of cloud computing as a part of their strategic information technology planning. The impact of the following factors to cloud computing adoption was investigated: Cost-effectiveness, the Need for Cloud Computing Services, Perceived Cloud Computing Reliability, and Cloud Computing Service Security and Effectiveness. The study results show a strong positive correlation between each of these four independent variables to cloud computing adoption. These findings are also interesting for our research as the model comprises some factors (Reliability, Security) that can also be classified as business model factors.

Low et al. (2011) investigated important factors affecting SaaS adoption. His explorative model integrates the Technology Acceptance Model (TAM) related theories with additional imperative constructs: Marketing Efforts, Security, Trust, Environmental Factors, Perceived Usefulness, and Attitude Towards Technological Innovations. These findings are also interesting for our research because this model comprises some of the factors that can also be classified as business model factors. The study results show that Marketing Efforts have a positive effect on Social Influence as well as on Perceived Ease of Use, Perceived Usefulness, Security, and Trust.

Factors impacting cloud computing adoption - combination of different adoption theories

Benlian et al. (2009) investigated the factors impacting SaaS adoption. The introduced research model is based on the combination of Transaction Cost Theory, the Resource-Based View, and the Theory of Planned Behaviour. The study results revealed that decision patterns about SaaS adoption differ across application types. Social Influence, Attitude Toward SaaS Adoption, Adoption Uncertainty, and Strategic Value turned out to be the strongest and most consistent drivers across all application types. Furthermore, the study results show that Firm Size does not matter in SaaS adoption, since large companies and small- and medium-sized (SMEs) companies had similar adoption rates.

Low et al. (2011) investigated the impact of technological, organizational and environmental factors to cloud computing adoption in the high-tech industry. Their explorative model investigates the impact of the following factors on cloud computing adoption: Relative Service Advantage, Service Complexity, Service Connectivity, Management Support, Company Size, Technology Readiness, Competitive Pressure, Trading Partner Pressure. The results demonstrate the statistically significant impact of the following factors: Relative Service advantage, Management Support, Company Size, Competitive Pressure, and Trading Partner Pressure. In contrast, the results show no significant impact of Service Complexity and Service Connectivity to cloud computing adoption. Furthermore, Tweel (2012) introduced a research model by utilizing factors from Innovation Diffusion Theory, Institutional Theory, and Technology-Organization-Environment Frameworks in order to examine the relationship of the factors in adopting cloud computing. The study demonstrates the statistically significant positive impact of Relative Advantage, Compatibility, and Top Management Support to cloud computing adoption. The results show statistically significant positive correlation between all investigated factors in the research model, except Company Size.

Borgman et al. (2013) presented a research model conceptualizing the link between the TOE Framework and the Decision of Organizations to Adopt Cloud Computing, as well as the moderating effect of IT Governance Structures and Processes on these relationships. The results show that a high Perceived Relative Advantage of cloud computing, a high level of Top Management Support and High Competition Intensity are positively linked to the decision for cloud computing adoption. Moreover, according to the research results of Lumsden and Gutierrez (2013), Compatibility and Relative Advantage are the most essential components impacting cloud computing adoption. According to the same research (Lumsden and Gutierrez, 2013), in the organizational group of factors, Top Management Support is most critical for the adoption of cloud computing.

Gangwar et al. (2015) presented a research model integrating TAM factors and TOE Model factors. The study identified that Relative Advantage, Compatibility, Complexity, Organizational Readiness, Top Management Commitment, and Training and Education as relevant variables for affecting cloud computing adoption, using Perceived Ease of Use and Perceived Usefulness as mediating variables. Furthermore, Competitive Pressure and Trading Partner Support were found to directly affect cloud computing adoption intentions. The findings of this research are also interesting for our research as the model comprises some of the factors (Complexity, Compatibility) that can also be classified under the umbrella of business model factors.

Task-Technology Fit and Information Systems Effectiveness model factors impacting SaaS adoption

Chen et al. (2011) investigated SaaS adoption through TTF. Their explorative model investigates the impact of Technology Characteristics, Task Characteristics, Individual Abilities to Adoption Intention, Relation Consideration, and Benefit Consideration. The results show that Technology Characteristics. Task Characteristics and Individual Abilities can influence the degree of TTF positively. The higher the degree of TTF is, the higher the intention to adopt SaaS is.

Chebrolu (2011) was assessing the correlation of Strategic Alignment, Information Technology Effectiveness and Cloud Computing Adoption in IT companies. The study findings show a very strong statistically significant correlation between Cloud Computing Adoption and Information Technology Effectiveness. In contrast, the correlation between Cloud Computing Adoption and Strategic Alignment was not recognized as statistically significant.

Table 1 and Table 2 present summaries of previous research findings of related research studies, investigating the impact of strategic, economic, social factors, UTAUT, TTF, and TAM factors on cloud computing adoption.

2.2 Business models and business model factors

Many authors (Timmers, 1998; Afuah and Tucci, 2001; Petrovic, Kittl, and Teksten, 2001; Hedman and Kalling, 2003; Rappa, 2010; Osterwalder and Pigneur, 2005, 2009, 2010; Amit and Zott, 2001; Gordijn, Akkermans, and van Vliet, 2000) provide definitions of the business models, business model frameworks and ontologies. For example, Timmers (1998) defines "business model" as an architecture and presentation of a) information and service/product flows, including a description of business actors and their roles, b) potential advantages for individual business actors, c) sources of revenue. Gordijn et al. (2000) define "business models" as descriptions of what the business is about and explanations of "who provides services or products of value to whom, and what he expects in return".

Lambert and Davison (2012) provide an overview of research on business models for the period of 1996-2010. Their findings contribute to the definition of business model elements and concepts. The following findings are relevant for our study: Rappa (2010) defines the business model as the method of doing business by which a company can generate revenue. Amit in Zott (2001) define "business models" as descriptions of value creation steps, aiming at finalizing different transactions. In general, the business model can be defined as the logic of an organization that reflects its business strategy (Johansson, Malmstrom, Chroneer, Styven, Engstrom, and Kåreborn, 2012). In business model definition, it is also important to include the company's ecosystem (Pucihar, Lenart, Kljajić, Marolt, and Maletič, 2016).

Osterwalder and Pigneur (2009, 2010) define "business model" as follows: "a business model describes the rationale of how an organization creates, delivers and captures value". They introduce the business model canvas, which is nowadays a popular strategic tool that enables practitioners to design business models in a creative way. The canvas tool is a comprehensive conceptual model with various design variables in different domains. In this context, a business model is defined as a presentation of a) Values offered by the organization to one or more customer segments, b) Organizational business framework and partner network aiming at producing, marketing, delivering created values and profit generation. The concept also considers the following elements: a) Customer Relationship Management, b) Partner Network, c) Revenue Generation, d) Price Mechanisms (Osterwalder and Pigneur, 2009).

The STOF Business Model Framework (Bouwman, De Vos, and Haakre, 2008) elaborates ways of dealing with design issues and success factors for business models. The method describes the interdependencies between the four core domains: Service, Technology, Organization, and Finance. It provides a detailed description of each domain and the interdependencies of critical design issues of each domain and between domains (Bouwman, De Reuver, Solaimani, and Daas, 2012).

A comprehensive overview of business model definitions also results from the 5th Framework Programme research project E-Factors: A Thematic Network and E-Business Models. According to their definition, a business model concept is structured of following groups of elements: a) Technical and Technology, b) Organizational, c) Industrial d) Individual, e) Social (E-Factors consortium, 2003).

The previous overview of research on business model definitions is not exhaustive. Nevertheless, it offers a comprehensive outline of business model elements and business model design methods. Business models should evolve through time and vary regarding product or service life cycle and its level of adoption in the market (De Reuver, 2007).

Table 1: Summary of previous research results – impact of strategic, economic and social factors to cloud computing adoption

Author	Factor / Factor group	Findings
Gangwar et al.	• Technological (Relative Advantage, Compatibility, Complexity) • Organizational (Readiness, Top management commitment, Training and Education) • Environment (Competitive Pressure, Trading Partner Support) • Others (Perceived Ease of Use, Perceived Usefulness)	• Statistically significant, positive impact of the following variables: Perceived Ease of Use and Perceived Usefulness as mediating variables to cloud computing adoption: Relative Advantage, Compatibility, Complexity, Organizational Readiness, Top management Commitment, and Training and Education • Competitive Pressure and Trading Partner Support were found to directly affect cloud computing adoption intentions.
Borgman et al.	• Technological (Relative Advantage, Complexity Compatibility) • Organizational (Top Management Support, Firm Size, IT expertise of Business Users) • Environmental context (competitive and regulatory environment) • IT Governance Structures • IT Governance Process	• Positive impact of a high perceived Relative Advantage of cloud computing, a high level of Top Management Support and a high Competition Intensity are positively linked to the decision for cloud computing adoption.
Lumsden and Gutierrez	• Technology (Relative Advantage, Complexity, Compatibility) • Organization (Top Management Support, Firm size, Technology Readiness) • Environment (Competitive Pressure, Trading Partners Pressure)	• Statistically significant positive impact of the following variables to cloud computing adoption: Compatibility and Relative Advantage, Top Management Support.
Tweel	• Relative Advantage • Compatibility • Company Size • Company Organizational Readiness • Top Management Support • Skimming • Environmental Factors (Legislation, social Norms, Expectations, Skimming).	• Statistically significant, positive correlation of all investigated factors of introduced model, except with Company Size. • The most important factors impacting cloud computing adoption: Compatibility, Top Management Support, Relative Advantage.
Chebrolu	• Company Strategic Alignment • Modularity, Connectivity, Compatibility of Services • Information Technology Effectiveness.	• Statistically significant, positive correlation of Information Technology Effectiveness and cloud computing.
Low et al.	• Relative Service advantage • Service Complexity • Service Connectivity • Management Support • Company Size • Technology Readiness • Competitive Pressure • Trading Partner Pressure.	• Statistically significant, positive correlation of all investigated factors • Statistically significant, positive impact of almost all factors to cloud computing adoption, except Service complexity and Service Connectivity.
Benlian et al.	• Business and Technological Uncertainty of Service Adoption • Unique Service Value • Strategic Service Value • Ability for Service Replacement • Individual attitude And Behaviour	• Statistically significant, positive correlation of Individual Attitude and Adoption Rate • Statistically significant, negative correlation of Strategic Service Value and Adoption Rate and Unique Service Value and Adoption rate.

Table 2: Summary of previous research results – impact of TAM, UTAU, and TTF factors on cloud computing adoption

Author	Factor / Factor group	Findings
Chen et al.	• Technology Characteristics • Task Characteristics • Individual Abilities to Adoption Intention • Relation Consideration • Benefit Consideration	• Statistically significant, positive impact on Relation Consideration and Technology Characteristics to cloud computing adoption.
Wu	• Marketing Effort • Environmental Factors • Perceived Usefulness • Attitude Towards Technological Innovations • Security and Trust • TAM theory factors	• Statistically significant, positive correlation of the following factor groups: • Marketing Effort and Security and Trust • Attitude towards Technological Innovations and TAM theory factors • Perceived Usefulness and Attitude Towards Technological innovations.
Watson	• Perceived cost effectiveness • Perceived need for service adoption • Perceived service security • Perceived service reliability	• Statistically significant, positive correlation of all investigated factors and cloud computing adoption.

Rapid development and ever-changing and competitive environments demand continuous evaluations, adjustments, and development of business models in order to remain competitive over time and sustain future growth (Amit and Zott, 2012; Teece, 2010; Zott, 2009). Furthermore, business model innovation is becoming an essential and continuous activity for the companies to survive and thrive in today's global competitive markets (Hanelt, Hildebrandt and Polier, 2015).

3 Methodology

In this chapter, we present the research model, research questions and hypotheses, and data collection method.

3.1 Research model

The research framework used in our research was derived from prior research results and is based on two holistic frameworks: Osterwalder's (2004) business model framework and the framework designed in the research project E-Factors: A Thematic Network and E-Business Models (E-Factors consortium, 2003). The preliminary research model consists of the following business model pillars: Provider's Capability for Cloud Computing, Value Proposition, Customer Relationship Management, Revenues, and Costs. Each of the four pillars in the research model consists of several groups, for which several business model factors have been identified. For the purpose of initial research model evaluation, we conducted interviews with five major cloud computing providers and five cloud computing users in Slovenia. The detailed research model is presented in Figure 1. Further in this chapter, we describe the model in detail (Bogataj and Pucihar, 2012; Bogataj and Pucihar, 2013; Bogataj Habjan and Pucihar, 2017).

Provider's Capability for Cloud Computing

The Provider's Capability for Cloud Computing pillar consists of two groups of factors: Collaboration with Partners and Provider's Tangible Assets. Both groups consist of several factors related to provider's capability for service and value delivery:

Collaboration with Partners

- Co-branding or linked branding is considered to be a strategy of the joint presentation of two or more independent brands within one service (Erevelles, Stevenson, and Srinivasan, 2008).
- Collaboration among Partners is considered to be the level of arrangement to cooperate among partners in their network.
- Dispute Resolution Mechanisms with partners are considered to be the definition of potential problem-solving means among partners in the cloud provider's partner network.
- Partner Network Size is considered to be the number of cloud providers included in a partner network.

Provider's Tangible Assets

- The Financial Resources of the provider are considered to the availability of the provider's financial resources, proving the capability for execution of business and development investments in order to ensure service quality.

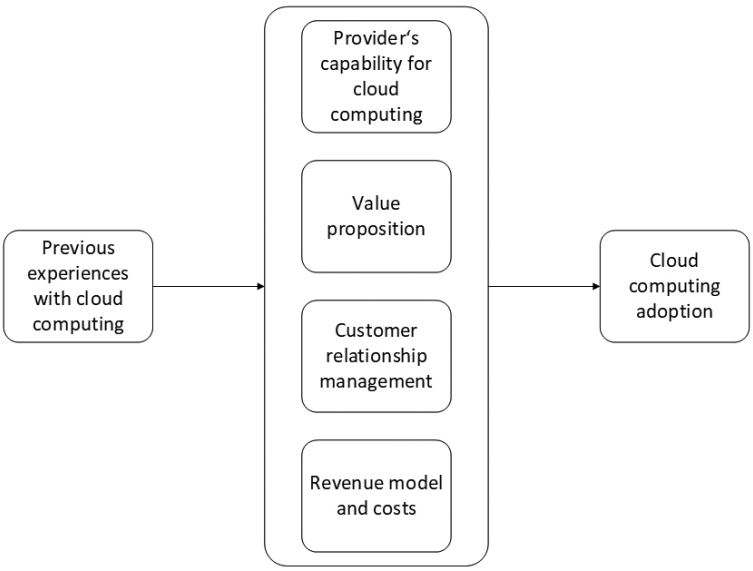

Figure 1: Introduced research model – Provider's business model pillars (Adapted from Osterwalder, E-Factors Consortium and interview results) (Bogataj and Pucihar, 2013)

- Provider's Technology and equipment are considered to be ICT availability (Hardware, Software Solutions, Telecommunication Equipment, and Services) for offering cloud computing services.

Provider's Intangible Assets

- The Provider's Reputation is considered to be its corporative reputation.
- References and Recommendations are considered to be the range of recommendations of satisfied customers, expressing positive collaborative experiences with the cloud computing provider. They support potential new users in selecting a specific service provider or selecting a specific cloud computing service.
- Knowledge and Experiences are considered to be a set of data and provider's behaviour, acquired through education and work.

Value Proposition

The Value Proposition pillar covers all aspects related to the product/services of the company: in our case, cloud computing services. This pillar is also related to the manner in which providers differentiates their service offering from their competitors. For the purpose of our research, value proposition pillar consists of two factor groups: service value for customers, and orientation of services to target customers.

Service Value for Customers

- Economic Value of the Service/cost savings is considered to be a recognized service value that can be expressed monetarily or from the aspect of cost reduction (i.e. investment, maintenance, better efficiency in source exploitation, etc.).
- Usability is defined as the level of service conformity to the needs, desires, and demands of customers.
- Flexibility is defined as the level of service conformity in regard to customer's needs.
- Trademark is defined as the label or combination of labels, established for representing a cloud computing provider or its service.
- Added Value is defined as a standard upgrade of cloud computing service.
- Connectivity/Interoperability is defined as the ability to use the same service through different service providers of cloud computing services.
- Customer Support is defined as the level of customer assistance for using cloud computing services.

Orientation of Services to Target Customers

The focus of cloud computing service by individual segments of target customers in the research is defined according to the activity area and size of the target customer, as well as according to the complexity of their processes and their geographic activity.

Customer Relationship Management

The Customer Relationship Management pillar is related to providers' activities towards their customers. In our re-

search, this pillar consists of two groups of factors: marketing and trust-building mechanisms:

Marketing
A group of factors, defined as the usage of different marketing channels to offer cloud computing services: Internet and Social Media, Events (conferences, workshops, etc.), Direct Marketing, Use of Partners' Marketing Channels, Publications.

Trust-Building Mechanisms
- User Authentication or Access Control is a basic starting element for secure service provisioning.
- System Security is considered to be the ability of cloud service providers to prevent access to network and data to unauthorized users, with suitable tools and technologies (i.e. firewall, virtual private networks, use of safer protocols, advanced encryption techniques, etc.).
- Service Quality is not exclusively limited to performance, but it can also be defined with other characteristics, such as security, availability, upgrade possibility, etc.
- Service and System Availability are defined in close relation to their reliability.
- Service Recovery Procedures are considered to be the definition of recovery/restoration process after service malfunction (due to hacking, loss of power, or an accident).

Revenue Model and Costs

In our research, the business model pillar of Revenue Model and Costs defines the revenue model and costs structure for value creation. The logic of revenue generation is an indicator of business results and organizational success (Sainio and Marjakoski, 2009). For the purpose of our research, we define the following factors in these groups:

Revenue Model
- Service Billing Pay Per Use is defined as a means of charging that is based on the number of transactions, used disk space, recorded use of other resources, etc.
- Service Billing Pay Per Service is defined as the means of charging in regard to service use.
- Service Billing Based on Market Price is defined as the means of charging for the service based on supply and demand.
- Service Billing Based on Target Customers is defined in the research as means of charging for the service according to customer type, their characteristics, abilities, and willingness to pay for the service.

Costs
- Provider's Hardware Costs are defined as the costs of hardware equipment necessary to provide cloud computing services: servers, computers, processors, hard disks, etc.
- Provider's Software Costs are defined as service provider costs of application servers, operating systems, software solutions for virtualization and other software solutions providing cloud computing infrastructure, platforms, and services (Li, Liu, Qui, and Wang, 2009).
- Human Resources Costs of the Provider are defined as costs which occur due to service provisioning and maintenance, technical assistance, ensuring system security, etc. (Li, Liu, Qui, and Wang, 2009). The above-stated costs originate mostly from the salaries of employees.
- Outsourcing Costs of the provider, defined in the research as costs that occur because of the need to involve external services, equipment, and infrastructure when providing cloud computing service. This includes costs for providing security, service restoration, additional technical expertise, etc.
- Collaboration Costs With Other Cloud Computing Providers are defined as costs that occur in business cooperation among service providers.
- Network Costs are defined as the costs of network devices and network equipment, as well as the direct costs of energy for network activity.

Figure 2 presents the initial research model in detail.

3.2 Research questions and hypothesis

Based on the introduced research model, the aim of the research was to address the following research question:

Q1: What are the differences in opinion about the importance of business model factors on cloud computing adoption according to previous cloud computing experiences?

Based on the research question, we developed the following hypothesis:

H01 There are no significant differences in opinion about the importance of business model factors on cloud computing adoption according to previous cloud computing experiences.

3.3 Data collection

The importance of the factors and their impact on cloud computing adoption was investigated by a survey conducted among 80 companies in Slovenia, which was conducted using the questionnaire, which was designed based on

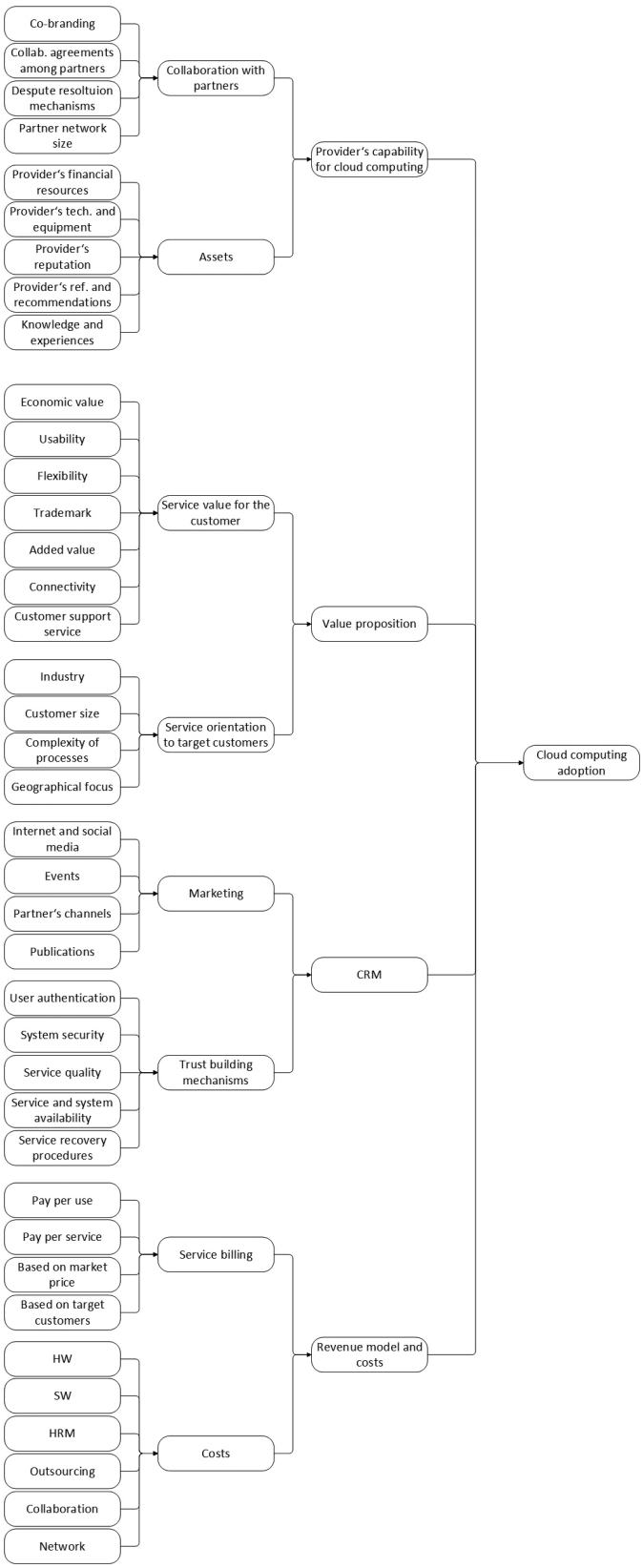

Figure 2: Initial research model for investigation of business model factors for cloud computing adoption

initial research model. The questionnaire was tested with 10 participants (six representatives of cloud computing providers and four representatives of cloud computing end users).

The questionnaire was structured in the following question groups:

- Data on respondents (field of work, experiences) and companies (role, size, main activity area, number of employees in ICT, previous investments in ICT, etc.)
- Opinion on cloud computing business model factors' importance for cloud computing adoption (introduced 40 factors) for each service type (SaaS, PaaS, IaaS). A five-point Likert scale was used from "1" meaning not important at all to "5" meaning very important.
- Experiences with cloud computing adoption (SaaS, PaaS, IaaS).

Managers and IT managers of 900 companies (300 randomly selected large companies, 300 medium-sized companies, 300 small companies) were invited to participate in the survey. In total, 80 responses were valid for further statistical analysis.

4 Research results

Most of the surveyed companies, 42% (n = 34) can be categorized as medium-sized companies; 35% (n = 28) of the sample were smaller (micro and small) companies. Large companies represent 23% (n = 18) of the sample.

A total of 32.89% of companies have already had previous experiences with cloud computing services. Table 3 (below) presents the proportion of responses according to previous cloud computing experiences.

Model Reliability and Validity

The reliability and validity of the structural model were tested with Cronbach alpha and the average variance (AVE). The model consists of nine combined variables. Table 6 (below) presents the AVE and Cronbach alpha values. Confirmation of the reliability and validity of the structural model allowed the continuation of the analysis.

Impact of business model factors on cloud computing adoption

Based on the statistical analysis results, it can be con-

Table 3: Respondents according to previous cloud computing experiences by service type

Experiences with cloud computing services	Frequency	%
Experiences with SaaS	25	32.89%
Experiences with PaaS	25	32.89%
Experiences with IaaS	16	21.05%

Table 4: AVE and Cronbach alpha values

Business model pillar	Business model factor group	AVE	Cronbach alpha
	Y – Cloud Computing Adoption	0.726	0.811
Value Proposition	D1.1 – Service Value for Customers	0.729	0.982
	D1.2 – Service Orientation Towards Target Customers	0.896	0.989
Providers Capability for Cloud Computing	D2.1 – Collaboration with Partners	0.755	0.971
	D2.2 – Assets	0.758	0.978
Customer Relationship Management	D3.1 – Marketing	0.690	0.960
	D3.2 – Trust-Building Mechanisms	0.750	0.980
Revenue Model and Costs	D4.1 – Revenue Model	0.754	0.971
	D4.2 – Costs	0.590	0.925

cluded that there is no statistically significant impact of the analysed business model factors on cloud computing adoption.

Nevertheless, slope coefficient values and t-statistics also reveal some business model factors with moderate or strong impact on cloud computing adoption, by service type. Based on slope coefficient values and t-statistics, in the Value Proposition business model factor group, Service Added Value and Service Usability can be recognized as having the highest (although not statistically significant at p=0.05) impact on all cloud computing service types. Furthermore, in the business model factor group of Collaboration with Business Partners, Collaboration Agreement Among Partners can also be identified as having the highest (although not statistically significant at p=0.05) impact on all cloud computing service types. In the business model factor group of Revenue Model, the factor Service Billing Based on Target Customers can be recognized as having the highest (although not statistically significant at p=0.05) impact on all cloud computing service types.

Table 5 (below) presents business model factors with positive slope coefficients and their statistical importance to cloud adoption by service type (SaaS, PaaS, IaaS).

Differences in opinion on importance of business model factors impacting cloud computing adoption according to previous experiences with cloud computing

Table 6 (below), titled "Differences in opinion on importance of business model factors impacting cloud computing adoption according to previous experiences with SaaS", presents statistically significant differences in opinion on the importance of business model factors among companies with previous SaaS experiences (e.g. implemented ERP, CRM as a Service, Document Management System as a Service, etc.) and companies without previous SaaS experiences.

We can claim that companies with previous SaaS experiences estimate the following factors as more important in comparison to companies without previous experiences with SaaS: Service Usability, Customer Support Services, Co-Branding User Authentication, and Service Recovery Procedures in case of detected problems. In contrast, we can claim that companies without previous experiences with SaaS (specifically experiences with customer relationship management services) view the following factors as more important in comparison to companies with such experience: User Authenticity and Service Quality as more important compared to companies with such experience.

Table 7 "Differences in opinion on the importance of business model factors impacting cloud computing adoption according to previous experiences with PaaS" (below) presents statistically significant differences in opinion about business model factors' importance on cloud computing adoption. The differences are presented among companies with previous experiences with PaaS and the companies without previous such experiences. We can claim that companies without previous experiences with PaaS recognize in Table 7 (below) "presented business model factors to be more important for cloud computing adoption in comparison to companies with previous such experiences.

Table 8 "Differences in opinion on the importance of factors according to experience with the service type, Infrastructure as a service" presents statistically significant differences in opinion about business model factors' importance on cloud computing adoption. The differences are presented among companies with previous experiences with IaaS and those without such experiences. We can claim that companies without previous experiences with IaaS recognize almost all factors (except Service Billing Based on Service Usage) in Table 9 (below) as more important for cloud computing adoption in comparison to companies with previous experiences with IaaS.

Based on the results, hypothesis H01, stating there are no significant differences in opinion about the importance of business model factors to cloud computing adoption among the companies with previous cloud experiences and the companies without previous cloud computing experiences, has been rejected.

5 Discussion and conclusions

5.1 Discussion of research results

Our study was aimed at identifying business model factors with the highest impact on cloud computing adoption. In particular, we were interested in identifying the differences in opinion regarding factors' importance according to respondents' previous experiences with cloud computing services (SaaS, PaaS, IaaS). For those purposes, we developed a research model consisting of 40 cloud computing business model factors, placed into eight factor groups. The research model was built upon prior research and adapted from Osterwalder's business model framework (Osterwalder, 2004) and the E-Factors research project (E-Factors consortium, 2003). The initial research model was evaluated and adapted based on interviews with five major cloud providers and five cloud computing users. Furthermore, a survey was conducted among 80 companies in Slovenia, which represented an 8.89 per cent response rate. The initial sample size was 900 randomly selected companies.

Business model factors' importance

First, based on the statistical analysis results, it can be concluded that there is no statistically significant impact of the analysed business model factors on cloud computing adoption. Nevertheless, slope coefficient values and t-statistics reveal some business model factors with moderate or strong impact on cloud computing adoption, by service

Table 5: Business model factors with positive slope coefficients and their statistical importance to cloud adoption – by service type

Business model pillar	Business model factor group	Business model factor	Slope coefficient	t-statistics
Value Proposition	D1.1 Value Proposition	Customer Support Service → SaaS	5.5764	0.737
		Customer Support Service → PaaS	4.5745	0.5218
		Service Added Value → SaaS	2.0215	0.2754
		Service Added Value → PaaS	0.6933	0.1058
		Service Added Value → IaaS	3.4923	0.4442
		Service Usability → SaaS	1.8263	0.2158
		Service Usability → PaaS	1.4948	0.2041
		Service Usability → IaaS	1.3551	0.1152
		Service Connectivity → SaaS	0.1723	0.0193
		Service Connectivity → IaaS	1.5868	0.1097
		Service Economic Value → IaaS	3.3911	0.4897
	D1.2 Service Orientation Towards Target Customers	Based on Industry → SaaS	1.688	0.2466
		Based on Customer Size → SaaS	0.554	0.0434
		Based on Customer Size → PaaS	6.3405	0.4501
		Based on Customer Size → IaaS	16.6395	1.1293
		Based on Geographical Focus → PaaS	2.5631	0.3609
		Based on Geographical Focus → IaaS	4.7213	0.701
Provider's Capability for Cloud Computing	D2.1 Collaboration with Business Partners	Collaboration Agreement Among Partners → SaaS	6.8348	1.1638
		Collaboration Agreement Among Partners → PaaS	0.0801	0.0245
		Collaboration Agreement Among Partners → IaaS	0.4	0.1051
		Co-Branding → SaaS	2.3194	0.4075
		Co-Branding → PaaS	4.8125	0.7936
		Dispute Resolution Mechanisms → PaaS	0.3704	0.0553
		Size of the Partners' Network	6.5178	0.7411
	D2.2 Assets	Provider's Technology & Equipment → SaaS	6.0943	0.9282
		Provider's Reputation → SaaS	2.4508	0.3933
		Provider's Reputation → PaaS	3.1992	0.4155
		Provider's Financial Resources → SaaS	1.4277	0.2541
		Provider's Financial Resources → IaaS	1.4128	0.1187
		Provider's References and Recommendations → PaaS	1.4149	0.2757
		Provider's References and Recommendations → IaaS	0.5752	0.0567

Table 5: Business model factors with positive slope coefficients and their statistical importance to cloud adoption – by service type (continued)

Customer Relationship Management	D3.1 Marketing	Partner's Channels → SaaS	3.3262	0.478
		Internet and Social Networks → IaaS	2.6258	0.4777
		Publications → PaaS	15.6806	1.193
	D3.2 Trust-Building Mechanisms	System Security → SaaS	2.8447	0.3455
		User Authentication → SaaS	4.2828	0.7241
		Service Quality → PaaS	4.544	0.3811
		Service Quality → IaaS	1.6883	0.1477
		Service and System Availability → SaaS	1.6711	0.2187
		Service and System Availability → IaaS	1.0593	0.1046
		Changing the Provider Trust-Building Mechanism → SaaS	0.8035	0.1419
		Changing the Provider Trust-Building Mechanism → PaaS	3.6428	0.526
		Service Recovery Procedures → IaaS	1.4396	0.075
Revenue model & Costs	D4.1 Revenue model	Service Billing Pay Per Use → SaaS	5.0161	0.6061
		Service Billing Pay Per Use → PaaS	3.1423	0.4053
		Service Billing Pay Per Use → IaaS	4.2671	0.475
		Service Billing Based on Target Customers → SaaS	1.1348	0.1308
		Service Billing Based on Target Customers → PaaS	2.5428	0.1746
		Service Billing Based on Target Customers → IaaS	4.5038	0.3307
		Service Billing Based on Market Value → PaaS	0.6273	0.0904
	D4.3 Costs	HW Costs → SaaS	1.552	0.3636
		HW Costs → IaaS	0.6253	0.1803
		Human Resources' Costs → IaaS	0.4338	0.1324
		Outsourcing Costs → SaaS	0.7145	0.1919
		Outsourcing Costs → PaaS	2.4583	0.4665
		Outsourcing Costs → IaaS	2.2053	0.803
		Collaboration Costs → SaaS	0.385	0.056
		Network Costs → SaaS	0.1903	0.0273
		Network Costs → PaaS	0.2483	0.0141
		Network Costs → IaaS	1.3417	0.2266
R^2 = 0,412 – SaaS, R^2 = 0,4474 – PaaS, R^2 = 0,439 - IaaS				

Table 6: Difference in opinion on importance of business model factors impacting cloud computing adoption according to previous experiences with SaaS

Business model factor group	Business model factor	Independent variable	t	p	M1	M2
Service Value for Customers	Service Usability	Document management	-2.15	0.045	4.27	4.89
Service Value for Customers	Customer Support Services	ERP	-2.58	0.018	4.20	4.89
Collaboration with Partners	Co-Branding	ERP	-2.09	0.049	2.87	3.78
Assets	Knowledge and Experiences	Customer relationship management	2.886	0.011	4.82	3.92
Marketing	Internet and Social Media	Group work	2.243	0.035	4.45	3.23
Trust-Building Mechanisms	User Authentication	Customer relationship management	3.000	0.007	4.75	4.00
Trust-Building Mechanisms	User Authentication	Document management	-2.35	0.028	4.13	4.78
Trust-Building Mechanisms	Service Quality	Customer relationship management	2.165	0.049	4.92	4.33
Trust-Building Mechanisms	Service Recovery Procedures	Document management	-2.22	0.038	4.40	4.89
Legend: M1 – average on factor importance / companies without previous SaaS experiences, M2 – average on factor importance / companies with previous SaaS experiences, t- value, p – statistical significance						

Table 7: Differences in opinion on importance of business model factors according to previous experiences with PaaS

Business model factor group	Business model factor	Independent variable	t	p	M1	M2
Service Value for Customers	Service Added Value	Software Development	2.515	0.029	4.00	2.25
Service Value for Customers	Customer Support Services	Data Warehousing	2.206	0.052	5.00	4.45
Service Orientation to Target Customers	Based on Customer Process Complexity	Software Development	3.245	0.008	4.11	2.00
Collaboration with Partners	Defined Collaboration with Partners	Data Warehousing	4.977	0.000	5.00	3.69
Collaboration with Partners	Dispute Resolution Mechanisms	Data Warehousing	4.168	0.002	5.00	3.92
Assets	Provider's References & Recommendations	Memory Capacity	3.237	0.008	4.83	3.14
Assets	Provider's Knowledge and Experiences	Software Development	2.892	0.014	4.78	3.40
		Migration of Software Solutions	2.854	0.015	4.70	3.25
Marketing	Partners' Marketing Channels	Software Development	2.286	0.052	3.89	3.00
Revenue Model	Service Billing Based on Service Usage	Data Warehousing	2.93	0.014	5.00	4.08
Legend: M1 – average on factor importance / companies without previous PaaS experiences, M2 – average on factor importance / companies with previous PaaS experiences, t- value, p – statistical significance companies with previous SaaS experiences, t- value, p – statistical significance						

Table 8: Differences in opinion on importance of business model factors according to experience with service type, IaaS

Business model factor group	Business model factor	Independent variable	t	p	M1	M2
Service Value for Customers	Service Flexibility	IaaS - Server Capacity	2.689	0.03	5.00	4.30
		IaaS - Network Equipment	2.505	0.03	4.75	3.75
Service Value for Customers	Customer Support Services	IaaS - Memory Capacity	2.535	0.030	4.67	3.67
Service Orientation to Target Customers	Based on customers' company size	IaaS - Network Equipment	2.449	0.03	4.13	2.25
Service Orientation to Target Customers	Based on customer process complexity	IaaS - Network Equipment	2.736	0.02	4.25	2.25
Service Orientation to Target Customers	Based on customers' geographical location	IaaS - Network Equipment	2.736	0.02	4.25	2.25
Collaboration with Partners	Collaboration with partners	IaaS - Network Equipment	2.616	0.02	4.11	2.80
Assets	Provider's Technology & Equipment	IaaS - Server Capacity	2.283	0.05	5.00	4.36
Assets	Provider's References & Recommendations	IaaS - Server Capacity	2.39	0.04	5.00	4.27
Revenue Model	Service billing based on service usage	IaaS – Network Equipment	-2.26	0.05	4.00	4.83
Legend: M1 – average on factor importance / companies without previous IaaS experiences, M2 – average on factor importance / companies with previous IaaS experiences, t- value, p – statistical significance						

type. Based on slope coefficient values and t-statistics, in the Value Proposition business model factor group, Service Added Value and Service Usability can be recognized as having the highest (although not statistically significant at p=0.05) impact on all cloud computing service types. Furthermore, in the business model factor group of Collaboration with Business Partners, Collaboration Agreement Among Partners can also be identified as having the highest (although not statistically significant at p=0.05) impact on all cloud computing service types. In the business model factor group of Revenue Model, the factor Service Billing Based on Target Customers can be recognized as having the highest (although not statistically significant at p=0.05) impact on all cloud computing service types.

Differences in opinions

The research results reveal statistically significant differences in opinions. We can assert that companies with previous SaaS experiences estimate the following factors as more important compared to companies without previous experiences with SaaS: Service Usability, Customer Support Services, Co-branding, User Authentication, and Service Recovery Procedures in the case of detected problems. In contrast, we can assert that companies without previous experiences with SaaS (specifically experiences with Customer Relationship Management Services) consider the following factors to be more important in comparison to companies with such experience: User Authenticity and Service Quality.

Furthermore, companies without previous PaaS experiences declare the following factors to be more important to cloud computing adoption in comparison to companies with previous PaaS experiences: Service Added Value, Customer Support Services. Service Orientation to Target Customers Based on Customers' Process Complexity, Dispute Resolution Mechanisms, References & Recommendations, Knowledge & Experiences, Partners' Marketing Channels, and Service Billing Based on Service Usage.

Companies without previous experiences with IaaS recognize the following business model factors as more important for cloud computing adoption in comparison to the companies with previous experiences with IaaS: Ser-

vice Flexibility, Customer Support Services, Service Orientation to Target Customers Based On Customers' Size, Service Orientation To Target Customers Based on Customers' Process Complexity, Service Orientation To Target Customers Based on Customers' Geographical Location, Collaboration With Partners, Technology & Equipment, and References & Recommendations.

5.2 Implications for practice

The results of our research also have implications for practitioners. They can provide orientation for the innovation of existing business models towards the creation of a customer-oriented business model for the more successful exploitation of cloud computing services and business opportunities. For potential users, the findings may represent guidelines for the successful introduction and adoption of cloud computing services.

The research model presents a comprehensive consideration of the impact of business model factors on cloud computing adoption. Besides identifying business model factor groups and individual factors having the highest impact on cloud computing adoption, it also addresses the differences in opinion resulting from previous experiences with cloud computing services. Furthermore, end users should consider these factors with special consideration when defining service level agreements with providers and deciding about cloud computing service adoption.

It is understandable that cloud computing business models will be changing and evolving over time, adapting to market requirements, technological development, environment/social needs, and legislation. However, the results of this study show which factors of business models are considered to be more sensitive and important when companies consider cloud computing adoption. This can help providers to rethink, redesign, or re-market their current business models and tailor them according to the needs of different customer segments.

5.3 Limitations and future research recommendations

Findings of this study should also be interpreted considering its limitations.

The analysis shows a low proportion of explained variance in the model (it can be argued that cloud computing adoption is impacted by many other factors. not included in our structural model). Due to this result, future research should further investigate individual business model factors or their grouping into new factor groups. The research should thus focus on the definition of research models with a higher proportion of explained variance.

The response rate in our study was 8.88%. For further research, an increase in the rate of participating companies is recommended. As the study has been done in Slovenia, research should be expanded to other geographical areas.

Further investigation is also recommended to address public institutions, as well as investigating potential models of cloud computing adoption (public cloud, private cloud, hybrid cloud, etc.).

With the aim of in-depth understanding of the impacts of business model factors, deepening the investigation of each group of respondents (users/providers) is suggested. In this direction, it would be interesting to investigate and compare the characteristics of users and providers. Potential differences could also be investigated from the perspective of organizational structure, strategic alignment, the role of ICT, etc.

In our research investigated business model factors could be classified into so-called "business model organizational factors", as they primarily need to be considered by cloud service providers when defining or innovating business models. For future research, the model should also include the impact of environmental factors, such as Competition, Business partners, Legislation, Economic Situation, in order to investigate their impact on cloud adoption.

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Pomen dejavnikov poslovnega modela za uvedbo računalništva v oblaku: vloga predhodnih izkušenj

Izhodišča: Računalništvo v oblaku prinaša številne priložnosti za učinkovitejše upravljanje IT in izrabo IT storitev, zato v prihodnjih letih pričakujemo njegov pomemben vpliv na tržišču. Podatki o trenutni uporabi računalništva v oblaku na tržišču kažejo, da kljub prednostim in priložnostim računalništvo v oblaku še ni razširjeno kot je bilo pričakovano. Omenjena situacija nakazuje potrebo po nadaljnjem raziskovanju potenciala za uvedbo računalništva v oblaku. Namen raziskave je bilo identificirati posamezne dejavnike poslovnega modela računalništva v oblaku, ki imajo največji vpliv na njegovo uvedbo v organizacijah. Poleg tega, smo v raziskavi želeli identificirati razlike v mnenjih o pomembnosti posameznih dejavnikov poslovnega modela računalništva v oblaku glede na predhodne izkušnje organizacij.
Metodologija: Na podlagi pregleda literature, predhodnih raziskav in intervjujev s ponudniki in uporabniki računalništva v oblaku smo oblikovali raziskovalni model. Statistične analize so bile usmerjene na identificiranje pomembnosti dejavnikov za uvedbo računalništva v oblaku in razlike v mnenjih glede na predhodne izkušnje uporabnikov. V raziskavi je sodelovalo 80 organizacij in 5 največjih ponudnikov računalništva v oblaku v Sloveniji.
Rezultati: Rezultati raziskave so pokazali statistično pomembne razlike v mnenjih o pomembnostih dejavnikov poslovnega modela računalništva v oblaku glede na predhodne izkušnje organizacij. Rezultati raziskave predstavljajo usmeritve za preoblikovanje ali inoviranje obstoječih poslovnih modelov ponudnikov računalništva v oblaku. Na podlagi tega lahko ponudniki oblikujejo poslovne modele računalništva v oblaku, ki bodo prilagojeni potrebam strank ter s tem omogočili učinkovitejšo izrabo storitev računalništva v oblaku in odpiranje novih poslovnih priložnosti. Za potencialne uporabnike, rezultati raziskave predstavljajo usmeritve za učinkovitejšo uvedbo storitev računalništva v oblaku.
Zaključek: Dejavniki poslovnega modela, obravnavani v tej raziskavi, spadajo v tako imenovano skupino organizacijskih dejavnikov. Ponudniki računalništva v oblaku jih upoštevajo pri preoblikovanju ali inoviranju poslovnih modelov. V prihodnjih raziskavah bi bilo smiselno vključiti tudi dejavnike, ki se nanašajo na poslovno okolje ponudnikov kot na primer konkurenca, poslovni partnerji, pravni vidiki in tržne razmere ter proučiti tudi njihov vpliv na uvedbo računalništva v oblaku.

Ključne besede: *računalništvo v oblaku; uvedba; SaaS; IaaS; Paas; poslovni model; dejavniki*