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## CLLOUD SERVICES IN THE PRESENT OR IN THE FUTURE OF MICRO-ENTERPRISES

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**Abstract:** This paper presents the results of a study conducted in Slovenia between January and June 2011 in Slovene micro-enterprises. We used a structured questionnaire with some demographic questions about business computerization, the owner's characteristics and some questions about the level of awareness of Cloud computing and what significance have the listed properties of Cloud computing services for owners to hire Cloud solutions. The results show that almost two thirds of micro-enterprises did not know anything about Cloud computing at that time. One of the most important information source on Cloud computing was the Chamber of Commerce and Industry. Micro-enterprises showed the highest interest in the possibility of hiring IaaS – data store capacities and backups. As the most important characteristics they highlight reliability, security and performance of Cloud solutions. The results of this study were compared with the outcome of some other comparable studies, and some recommendations for micro-enterprises are given.

**Keywords:** cloud computing, cloud services, micro-enterprises, Slovenia.

### 1. Introduction

In Slovenia, there were 160,931 enterprises registered in sections of activities C-K of the Standard Classification of Activities (NACE) in 2009; 93.87% of them were micro-enterprises, 4.66% were small enterprises, 1.34% were medium-sized and 0.23% large enterprises [Kapurubandara, Lawson 2007]. The overall share of enterprises organized as private persons was 53.6% and of legal persons 46.4%. Most persons were employed in large enterprises (31.97%), followed by micro-enterprises (26.22%), medium-sized (24.34%) and small enterprises (17.74%). Micro-enterprises generated around one fifth of total turnover (19.77%) in 2009. A similar share of annual turnover was generated by small (20.3%) and middle-size enterprises (25.24%). No generally accepted definition of a small enterprise can be found in the research literature. The most common criterion for a micro-enterprise is the total number of employees, often combined with some financial indicators [Jungwoo 2004].

On 6<sup>th</sup> May 2003, the Commission of the European Communities [The Commission... 2003] adopted Recommendation 2003/361/EC regarding the definition of micro, small and medium-sized enterprises (SME) in Community policies applied within the Community and the European Economic Area. Within the SME category, a micro-enterprise is defined as an enterprise that employs fewer than 10 persons and whose annual turnover and/or annual balance sheet total does not exceed 2 million EUR [Neuberger, R athke 2009]. Slovenia, as a Member State of the EU, accepted this Recommendation which replaced Recommendation 96/280/EC from 1 January 2005 onward.

Due the impact of micro-enterprises on the economy, the recent Slovene statistical data and the present legislation, in 2010 we decided to focus our attention on micro-enterprises.

According to many authors [Rittinghouse, Ransome 2010; Fingar 2009] Cloud computing is still in its infancy. There is a hodgepodge of providers, both large and small, delivering a wide variety of Cloud-based services. But this concept dates back as early as 1961, when Professor John McCarthy suggested that computer time-sharing technology might lead to a future where computing power and even specific applications might be sold through a utility-type business model. In the mid-1970s the idea faded away when it became clear that the IT-related technologies of the day were unable to sustain such a futuristic computing model.

Amazon.com has played a vital role in the development of Cloud computing. In modernizing its data centres after the dot-com bubble burst in 2001, it discovered that the new Cloud architecture it had implemented resulted in some very significant internal efficiency improvements. By providing access to its systems for third-party users on a utility computing basis, via Amazon Web Services, introduced in 2002, a revolution of sorts began. In 2007, Google, IBM and a number of universities began working on large-scale Cloud computing research projects. The first annual Cloud computing conference was scheduled to be hosted online on 20–24 April 2009 [Rittinghouse, Ransome 2010].

## **2. Background**

### **2.1. Micro-enterprises and computerisation**

Micro-enterprises are a major component of all economies and are generally considered to be flexible, adaptive organizations. The influence of micro-enterprises in the entire economy is increasing. Micro-enterprises sometimes act as incubators for future economic giants. More people than ever are employed by micro-enterprises and many more are starting their own businesses. There are almost no articles about micro-enterprises. Mostly they are hidden among SMEs or entrepreneurs. Because of that, we compare small business characteristics that are in many cases similar to micro-enterprises.

The role of small and medium-sized enterprises (SMEs) in economic development and economic growth for both developed and developing countries has been increasingly recognized [Yang, Chen 2009]. It is generally accepted that e-commerce contributes to the advancement of SME business in developing countries [Kapurubandara, Lawson 2007].

Small enterprises generally lag behind medium and large companies in adopting and implementing computerisation [Lee et al. 2009; Jungwoo 2004]. This is due to severe constraints on financial resources, lack of in-house expertise, and a short-term management perspective imposed by a volatile competitive environment.

Small-enterprises cannot be treated as downscaled versions of large companies [Rohde 2004], due to differences in organisation, management style, business practice and information systems (IS). However, the available evidence on the size-efficiency relation seems to strongly indicate that there is a positive association between a firm's size and technical efficiency, and that there are also substantial and persistent productivity differences between SMEs and large firms [Yang, Chen 2009].

In contrast, small enterprises demonstrate a high level of ability to adapt to changes in the environment. They use IT for automation of existing processes, rather than for decision support, or to increase the flexibility of the firm and thereby gain a competitive advantage. While large firms are typically capital and equipment intensive, labour-intensive small enterprises may be able to increase productivity and provide value-added services through increased computerisation and digitisation [Lee et al. 2009].

By Fingar [Fingar 2009] the Cloud comprises three aspects:

- Cloud computing,
- Cloud platforms,
- Cloud services.

It seems that Cloud services offer many opportunities for micro-enterprises. Low-cost access and computing devices are expected to play a pivotal role in the adoption of cloud computing among the masses, especially in the developing countries [Dwivedi, Mustafee 2010]. We know that the majority of micro-enterprises outsourced accounting and bookkeeping to an external partner. Also, it is not unusual that small enterprises outsource IT and IS [Rhode 2004]. Cloud computing, with its services, is also some kind of outsourcing of software, hardware and platform. Most authors define Cloud services as:

- SaaS – Software as a Service,
- IaaS – Infrastructure as a Service,
- PaaS – Platform as a Service.

Other authors, such as Rittinghouse, Ransome [2010] and Fingar [2009], would add also the MaaS (Monitoring as a Service) and CaaS (Communication as a Service) and many others.

According to Rittinghouse, Ransome [2010], the key characteristics of Cloud computing are the centralization of infrastructure and lower costs, increased peak-

load capacity, efficiency improvements for systems that are often underutilized, dynamic allocation of CPU, storage, and network bandwidth and consistent performance that is monitored by the provider of the service. Service offerings are most often made available to specific consumers and small businesses that see the benefit of use because their capital expenditure is minimized. This, and similar facts about Cloud computing and services, have encouraged us to focus our research on micro-enterprises and Cloud computing.

### 3. Research approach

Having reviewed the literature on small enterprises and Cloud computing, a structured interview framework was developed to help address the research objectives. We expected that the awareness of the existence of Cloud computing among small-enterprises would be low and would depend upon the characteristics of the business (see [Yang, Chen 2009; Lee et al. 2009; Jungwoo 2004; Rohode 2004]) and the characteristics of the owner (see [Wiklund, Patzelt, Shepherd 2009; Koellinger 2008; Jeon, Han, Lee 2006]).

The main research questions were:

- Are Slovene micro-enterprises aware of the existence of Cloud computing?
- Where do Slovene micro-enterprises get information about innovations in ICT?
- What kinds of Cloud computing services are preferred by Slovene micro-enterprises?
- What kinds of Cloud computing characteristics are important for Slovene micro-enterprises?
- Is the use of Cloud computing in correlation with any other factors found in enterprises?

Data for the study were collected via structured interviews with owners or top managers of micro-enterprises between January and June 2011. In the interview, mostly closed-response questions were asked. Except for demographic data, respondents either rated statements on a scale of 1 to 5, or responded to multiple choice questions. In total, 124 interviews were conducted.

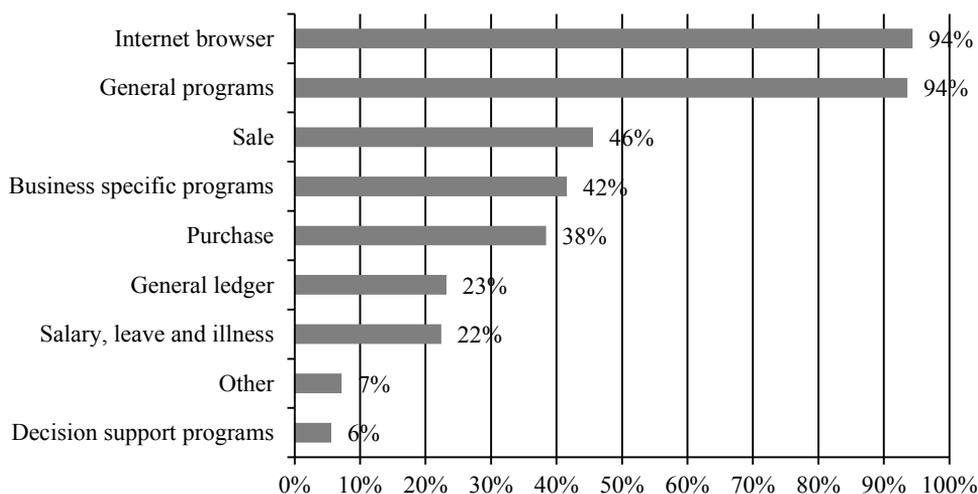
Sample sizes in comparable international studies are similar to our sample. The survey on Cloud computing in Poland, conducted by the Gdańsk Institute for Market Economics (IBnGR), [Kapurubandara, Lawson 2007] had a random sample of 170 businesses. Chuang, Nakatani, Zhou [2009] had a sample of 97 enterprises in a study of the extent of information technology adoption in SMEs. 126 enterprises were used to measure ERP adoption of small and medium enterprises by Shiau, Hsu, Wang [2009]. Gutierrez, Orozco, Serrano [2009] used 104 surveys from enterprises around the world in order to find the factors affecting IT and business alignment.

## 4. Results

### 4.1. Characteristics of the enterprises

Respondents who supplied data came from a wide variety of business backgrounds and sizes. The overall share of individual private entrepreneurs was 60% and of limited liability companies 37%. Enterprises organized in other organisational forms represented only 3% of the sample. The average number of total employees was 2.87, including the owner of the enterprise. In the micro-enterprises analysed three years ago, the average number of total employees was 2.42. We can see that the number of employees is increasing despite the current economic crisis. We conducted a T-test to determine if the difference in the number of employees in 2009 and 2011 is statistically significant (H1). Tests were performed using SPSS Statistics version 17.0. We discovered that there is a statistically significant difference in the number of employers three years ago and today ( $t = 2.944$ ,  $p$ -value is  $0.004 < 0.05$ ); so we can reject the null hypothesis H1 at the 5% significance level. The majority of enterprises (76%) outsourced accounting and bookkeeping to an external partner who specialised in selling accounting services to small companies. Ninety-four per cent of enterprises have Internet access. Figure 1 shows the use of the use of SW in sample micro-enterprises.

The percentage of micro-enterprises using the Internet and general programs such as Word, Excel, PowerPoint etc. was 94%. Only 6% use some decision support programs. On average, micro enterprises invest 1093.04 EUR per year in computer



**Figure 1.** Use of SW programs in Slovene micro-enterprises

Source: own elaboration.

hardware or computer hardware services and 412.4 EUR in software or software licenses. Almost half (49%) of enterprises lost their business data at least once and 33% of them did not manage to retrieve them back. Among them 42% use some kind of software without a license. This is one of the reasons we proposed the use of Cloud services to them when we conducted our interviews.

## 4.2. Characteristics of the respondents

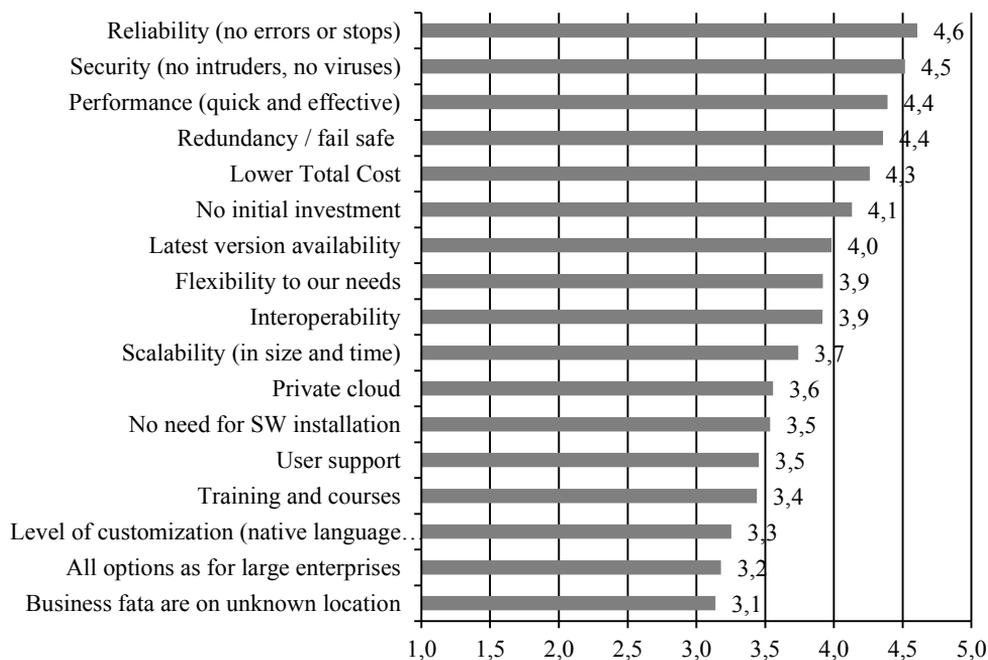
The majority of respondents (58%) were the owners of their businesses, 12% were executive directors, 14% owner-relatives and 15% were some other employees. The age of most of them (39%) was between 31 and 45 years, 22% between 46 and 55.2% were older than 55.21% were between 21 and 25 and 16% between 26 and 30. There were 74% male and 26% female respondents. In most cases, their formal education was secondary school (46%), 10% vocational level, 21% higher, 22% graduate and 2% postgraduate.

## 4.3. Characteristics Cloud computing and micro-enterprises

Thirty-three percent of respondents did hear something about Cloud computing, the rest of them (67%) became acquainted with Cloud computing for the first time. We must point out that the number of micro-businesses that know something about Cloud computing increased in the last phase of data collecting in the summer of 2011.

The Chamber of Commerce and Industry was very active in 2011. They organized several conferences, meetings and presentations on Cloud computing. It seems that they also reached micro-enterprises. We inquired where Slovene micro-enterprises get the information about innovations in ICT. In first place came internet followed by acquaintances and ICT vendors and service. Next are newspapers, relatives, radio and TV. It is unusual that different Chambers of Commerce were last as a source of information on ICT.

Only 15% of micro-enterprises in our sample were not a member of any chamber. To confirm the importance of membership of a Chamber of Commerce and Industry familiar with Cloud computing, we conducted a  $\chi^2$ -test. To provide the minimum number of the required data in the sample (at least 5) we merged data of the Chamber of Commerce with the Business-Chamber of Commerce and other chambers and compared the data with the Chamber of Commerce and Industry, Chamber of Crafts and Small Business and those that are not members of any chamber. The correlation between the membership of Chamber of Commerce and Industry and familiarity with Cloud computing exists ( $\chi^2 = 9.971$ ,  $p = 0.019 < 0.05$ ) and it is significant at the 5% level. Among members of Chamber of Commerce and Industry the share of enterprises familiar with Cloud computing is 51%. Only 31% of enterprises are familiar with Cloud computing among non-members of chambers.



**Figure 2.** Cloud computing characteristics sorted by importance for Slovene micro-enterprises

Source: own elaboration.

The majority of Slovene micro-enterprises (47%) is interested in IaaS (Infrastructure as a service – Cloud data store resources and backup) followed by (41%) SaaS (Software as a service-business software, general programs, etc.) and 31% in the whole package (HW, SW, programs). Next, we were interested in what kinds of Cloud computing characteristics are important for Slovene micro-enterprises (see Figure 1). As the most important characteristics of Cloud solutions were Reliability (4.6), Security (4.5) and Performance (4.4). As stated by Miller [2009], one of the disadvantages of Cloud computing can be the fact that it can be slow. We can confirm that micro-enterprise owners agree with that. On the contrary, the owners do not care much about the location of business data (3.1), options – as for large enterprises (3.2), and solutions – in the Slovene language (3.3).

#### 4.4. Comparison of our study results with others

Since only a few studies deal with micro-businesses, during the review of literature we did not find any similar study. Because of that we used the results of studies that dealt with Cloud computing on different samples like SMEs.

We found most comparable the study on Cloud computing in Poland conducted by the Gdańsk Institute for Market Economics in 2011 [Łapiński, Wyżnikiewicz

2011]. They used a random sample of 170 SMEs. Similar to us, the survey indicates the need for cloud service providers to introduce information and education campaigns on the benefits and threats related to Cloud computing. The current level of knowledge on Cloud computing by Polish entrepreneurs is far from sufficient. In Slovenia only one third of participants did know something about Cloud computing in 2011. The percentage of Polish businesses with at least nine employees using the Internet for contacts with the public administration in 2009 was 89%. In our case with micro-businesses that employs fewer than 10 persons Internet access was available in 94% of cases. Polish businesses value IT security and put it before purely financial and economic benefits. That confirms our results shown in Figure 1. Similar results were found also by the IDC Enterprise Panel on September 2009 [Gens et al. 2012] where 263 CIOs were involved. They were asked to rate the challenges/issues of the cloud/on-demand model. Security was in the first place (87.5%), second was availability (83.3%) and in third place was performance (82.9%). We can agree that security and reliability play an important role when the micro-business

**Table 1.** Examples of Cloud outages in 2011

Service	Company	Date outage began	Length of outage	Users impacted
Jive Software	Jive	14.01.2011	No data	500
Microsoft Windows Live Hotmail	Microsoft	30.12.2010	3 days	17,000
Twitter Service	Twitter	25.02.2011	1–4 hours	Hundreds of thousands
Gmail and Google Apps	Google	27.02.2011	2 days	120,000
Twitter Service	Twitter	16.03.2011	1–4 hours	Hundreds of thousands
Netflix Streaming Service	Netflix	22.03.2011	8 hours	20 Million
Twitter Service	Twitter	25.03.2011	1–4 hours	Hundreds of thousands
Twitter Service	Twitter	27.03.2011	1–4 hours	Hundreds of thousands
Intuit Service and Quickbooks	Intuit	28.03.2011	2 days – 5 days	Thousands
Epsilon Data	Epsilon	1.04.2011	Intrusion	50
Amazon Web Services	Amazon.com	21.04.2011	4 days	Millions
Playstation Network	Sony	21.04.2011	25 days	75 million
VMware Cloud Foundry	VMware	25.04.2011	29 hours	No data
Yahoo Mail	Yahoo	28.04.2011	2 days	1 million
Microsoft BPOS	Microsoft	10.05. 2011	3 days	1.5 million
Microsoft BPOS	Microsoft	19.05. 2011	4 hours	1% users
Microsoft BPOS	Microsoft	22.06. 2011	4 hours	No data

Source: [Perdue 2011; Widjava 2011; Hickey 2011].

owners decide to adopt Cloud computing services. Moreover, as shown by our Polish colleagues [Łapiński, Wyżnikiewicz 2011], the Cloud computing service is a relatively new service, and its on-going development may be accompanied not only by new benefits but also by new threats. Why their concern is so high can be explained by the collected data [Hickey 2011; Widjava 2011; Perdue 2011] of Cloud services failures in 2011 (see Table 1). We can see that the failures are not only of small Cloud service providers. We must also stress that in 2012 we witnessed Cloud service failures. What is more, the mobile network O2 was facing a massive consumer backlash on 11 June 2012, after hundreds of thousands of customers were left without any service for almost 24 hours [Frith, Bonnici 2012]. They had technical problems with their network so users could not make phone calls or use the Internet connection. One O2 user, Graham Brown, from Sevenoaks, Kent, said: “I use my iPhone for my building business but I couldn’t get any calls or emails yesterday”.

## 5. Conclusion

Cloud computing is not well known among Slovene micro-enterprises. Regarding the characteristics and opportunities of Cloud computing, we can agree with Rittinghouse and Ransome [2010] that Cloud services are a useful solution for micro-enterprises, especially at the beginning if they cannot invest in HW and SW. Obviously, Cloud computing requires Internet connection so enterprises that work offline or businesses where Internet is not available are not ideal for Cloud computing [Miller 2009]. Because Cloud computing is used over the Internet (except in the case of private clouds), a natural barrier possibly limiting the adoption of this kind of service is insufficient access to good-quality Internet connections.

A company with poor-quality Internet connectivity will not be able to make full use of all the possibilities offered by the migration of its IT to the cloud [Łapiński, Wyżnikiewicz 2011]. We witnessed crashes in Cloud services of small and also large companies so reasonable doubt exists. Now, depending on providers, foreign and Slovene, they will create interest also in Slovene micro-enterprises. When we were talking with colleges about the current prices we were surprised because Cloud solutions are more expensive per year than the classic purchase of SW they hire. Of course, we must also take into account the benefits that we get with cloud services, but will that also be important for micro-business owners? The Chamber of Commerce and Industry was very active in Cloud computing promotion. It seems that they also reached micro-enterprises. There are many factors in micro-enterprises in correlation with Cloud computing (gender, type of business, owner age, etc.) which we have not discussed and which will be presented in future publications.

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## PRZETWARZANIE W CHMURZE A TERAŹNIEJSZOŚĆ I PRZYSZŁOŚĆ MIKROPRZEDSIĘBIORSTW

**Streszczenie:** W artykule zaprezentowano wyniki badań wykonanych między styczniem a czerwcem 2011 roku w słoweńskich mikroprzedsiębiorstwach. Użyto specjalnego kwestionariusza oraz pytań demograficznych o komputerowy interfejs, charakterystykę właścicieli i o poziom znajomości programu *Cloud*, ale przede wszystkim zapytano, jakie są jego główne aspekty użycia dla właścicieli programu. Wyniki pokazują, że prawie dwie trzecie mikroprzedsiębiorców nie wiedziało nic o *Cloud*. Jednym z najważniejszych źródeł informacji o *cloud computing* była Izba Przemysłowo-Handlowa. Mikroprzedsiębiorstwa wyraziły największe zainteresowanie co do możliwości wynajęcia IaaS, związanej z wielkością pamięci i plików zapasowych. Za największe charakterystyczne zalety *Cloud* można uznać: solidność, bezpieczeństwo i bardzo dobrą wydajność na *Cloud Solutions*. Rezultaty te były porównywalne z innymi podobnymi badaniami, co pozwoliło podać zalecenia dla mikroprzedsiębiorców.

**Słowa kluczowe:** przetwarzanie w chmurze, usługi w chmurze, mikroprzedsiębiorcy, Słowenia.