USAGE OF CLOUD SERVICES
A Survey for Consumers in USA, Japan and Finland

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Abstract: The purpose of this study is to examine how commonly cloud services are used by consumers around the world and to discover possible differences in cloud service usage within various countries. An online survey was conducted in three countries (Finland, USA and Japan) with more than 3000 respondents. The results show that almost all respondents have used at least some cloud services but the Japanese use them substantially less than the Americans or the Finns. From the five cloud service categories examined in the survey, webmail services are the most commonly used by 91 percent of the respondents. Out of all cloud service examples in our survey Youtube is the most popular one.

1 INTRODUCTION

Cloud is one of the main global trends washing through the ICT industry (Dikaiakos et al., 2009, Hayes, 2008, Kim et al., 2009). In addition to wide-spread use of cloud services within industrial sectors, they are also today's reality in consumers' life; typical web users use cloud services daily whether they know it or not. However, majority of current research on cloud services takes the industry or business to business (B2B) perspective. This paper contributes to the less studied, but equally important, area of cloud service research – consumer behaviour.

The usage of cloud services is a very global phenomenon; hence, for capturing a comprehensive picture of the current situation, an international sample of end users is a necessity. We conducted a large web-based survey in three countries (Finland, USA and Japan) in order to understand how cloud services in general as well as individual cloud services have penetrated different markets and what kind of critical differences these markets have which the service providers should be aware of.

The paper is structured as follows: Section 2 gives background to cloud services, while Section 3 briefly describes the research design behind the study. Section 4 provides the results and analysis of the study. Finally, Section 5 summarizes the study results as well as discusses about the further work.

2 CLOUD SERVICES

Several definitions for cloud computing and cloud services exist. Weiss (2007) states that with cloud computing software functionality, hardware computing power, and other computing resources are delivered in the form of service so that they become available widely to consumers.

According to (Kim et al., 2009, Naone, 2007, Hoover and Martin, 2008), cloud computing includes the Internet access to computing resources that are administered remotely and are dynamically allocated and deallocated according to the needs of the users and being paid by the actual use of these resources. Kim et al. (2009) continues that services such as free email services, Internet portal services, web hosting services, computing infrastructure services, etc. are all cloud services that predate the coining of the term cloud computing.

NIST (2009) defines cloud services from the consumers' perspective as follows: "The capability provided to the consumer to use the provider's applications running on a cloud infrastructure. The applications are accessible from various client devices through a thin client interface such as a web browser (e.g., web-based email). The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, storage, or even individual application

capabilities, with the possible exception of limited user-specific application configuration settings."

Most of the definitions presented in the literature are quite technical in nature and challenging for an average end user to understand easily. In order to make sure that the survey respondents understood the basics of the cloud phenomenon and were able to identify some concrete examples of cloud based services we constructed the following, simple, cloud service definition which was presented at the survey:

"In cloud services, content (for example, music, email, files), personal information and programs are stored on Internet servers instead of the user's own computer. The cloud services and the content in them are accessible from various devices anytime and anywhere through the Internet.

For example Gmail (emails are stored on an Internet server instead of user's own computer), Spotify (almost unlimited music libraries can be accessed through the Internet), and Facebook (personal information, photos, games, etc. are shared with other Facebook users in the Internet) can be defined as cloud services."

3 RESEARCH DESIGN

As the target of the study was to examine how people in different countries use cloud services, a broad and representative sample of end users in several countries was needed. Hence, a quantitative research approach was used. A web-based survey was chosen as the data collection method due to its several advantages e.g. flexibility to create more complicated surveys, the fast speed of recruitment and no travel cost needed (Kumar et al. 2002). The survey was conducted in three countries; Finland, Japan and USA. These three countries were chosen as they all can be identified as past or current pacesetters in many ICT fields and as they represent very different cultural backgrounds and geographical areas of the world.

We received a total of 3187 responses, between the time period of 10 June and 21 June 2010. There were 1005 respondents from Finland, 1089 from USA and 1093 from Japan. The analysis was made using SPSS Statistics 17.0 computer software.

4 USAGE OF CLOUD SERVICES

The results of the survey show that as much as 97 percent of the respondents use cloud services. When

comparing the three countries, the cross-tabulation reveals ($\chi2 = 74,591$, $p = 0,000$) that the usage of cloud services is significantly lower in Japan (93,8 %) than in the two other countries (USA 99,3 % and Finland 98,8 %).

According to the survey the most popular cloud service is Youtube, used by 65 % of the respondents. Youtube is followed by YahooMail (49 %) and the third place goes to Facebook (44 %). More than every third of the respondents have also used Gmail and Hotmail services. For more information see Figure 1.
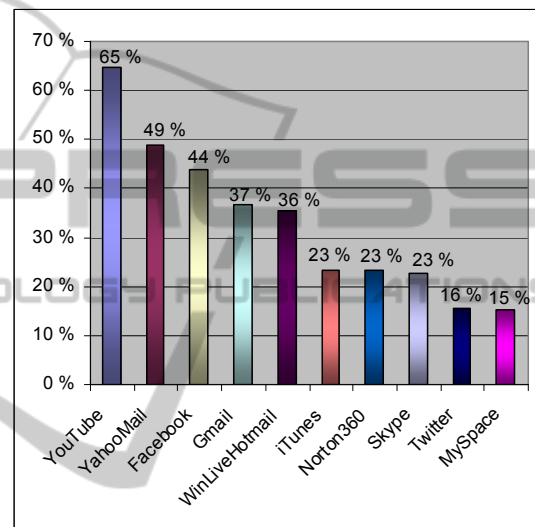

Figure 1: Ten most commonly used cloud services.

4.1 Usage Divided by Cloud Service Categories

In the survey individual cloud services were divided in five different categories: 1. Webmail, 2. Social networking services, 3. Online media, 4. Online sharing and storage and 5. Online security. From these five cloud service categories, webmail services are the most commonly used, by 91 percent of the respondents. Webmail services are followed by online media services, which have been used by 74 percent the respondents. Almost two thirds (64 %) of the respondents have used various social networking services and every other (48 %) respondent have used online security services. Online sharing and storage services are used by 30 percent of the respondents.

When comparing the three countries, it is again notable that USA has the highest usage percentage in four out of five categories, closely followed by Finland (for more information see Figure 2). Apart from webmail services, there is a considerable

difference when comparing usage percentages of Japanese respondents to the other two countries; it seems that cloud services have not yet broken through in Japan as broadly as in USA and Finland ($p = 0,000$).
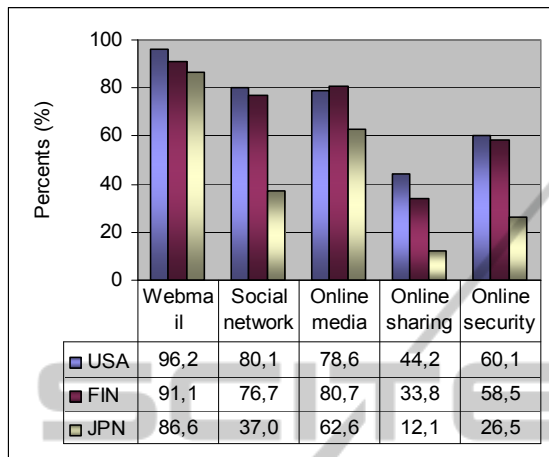

Figure 2: Usage of cloud services divided by categories and countries.

	Webmail	Social network	Online media	Online sharing	Online security
USA	96,2	80,1	78,6	44,2	60,1
FIN	91,1	76,7	80,7	33,8	58,5
JPN	86,6	37,0	62,6	12,1	26,5

4.2 Respondents' Prior Knowledge about Cloud Services

Out of all the respondents less than 20 percent had actually heard the term cloud service prior to the survey. Over 70 percent of the respondents had not heard the term and 12 percent were not sure whether they had heard it or not. Hence, even though most of the respondents use cloud services quite regularly the term itself is quite unknown among the users. Out of those people who reported to having heard the term before, slightly more than 60 percent indicated knowing the meaning of the term, 13 % did not know it and 25 % were not sure.

When comparing the answers from different countries with cross-tabulations and chi-square tests, significant differences were found. From Table 1 we can see that only less than 14 percent of the Finnish respondents had heard the term, while the corresponding numbers in USA and Japan are close or slightly over 20 percent ($\chi2 = 261,635$, $p = 0,000$). One conclusion that could be drawn from this is that the term "cloud service" has been longer in use in USA and Japan and already gotten a buzz words status, whereas in Finland the term is only just starting to get a firmer ground.

While only 64 and 56 percent of the US and Japanese respondents who had heard the term also reported knowing its meaning ($\chi2 = 22,289$, p = 0,000), interestingly over 70 % of the respondents in

Finland claimed to be familiar with also the meaning of the term. Significant differences are also apparent when genders regardless of the citizenship are compared; 27 percent of the male respondents had heard the term cloud service before opposed to only 9 percent of the women ($\chi2 = 203,543$, $p = 0,000$). From the respondents who had heard the term, two out of three males knew what it means, while only slightly over half of the women reported knowing the meaning ($\chi2 = 8,446$, $p = 0,015$).

When examining the differences between various age groups it can be noted that middle-aged users (age group 35-44 years) had come across (22 %) with the term most, while less than one of every sixth respondent in the youngest and the oldest age groups (15-24, 55-64 and over 65 years) had heard the term before. Out of the respondents who had heard the term cloud service before, the age group of 45-55 years had the most confident knowledge (69 %) about the meaning of the term. Again, the people in the oldest age group (over 65 years) were the most uncertain about the term's meaning, with only 42 percent of the respondents answering that they actually know what the term cloud service means.

Table 1: Percentages of the respondents having heard the term "cloud service" divided by countries.

Have you heard the term "cloud service" before?			
	USA	FIN	JPN
Yes	18,5 %	13,7 %	20,9 %
No	76,4 %	80,1 %	55,8 %
Not sure	5,1 %	6,2 %	23,3 %

4.3 Respondents' Expertise in Cloud Services

The respondents were also asked to evaluate their knowledge and usage of cloud services. Out of all of the respondents even as much as slightly over 70 percent report being novice users, while only 24 percent consider themselves to be intermediate users and only four percent to be advanced users.

Again, when comparing the answers of the respondents from different countries with cross-tabulations and chi-square tests, significant differences are found ($\chi2 = 140,614$, $p = 0,015$). Clearly, the highest amount of people considering themselves to be advanced users of cloud services are found in Finland (7 %), compared with USA (4 %) and Japan (1 %). As many as every third Finn felt that they are intermediate users, when only every fourth American and every sixth Japanese considered themselves to be as experienced. Notable

is that in Japan over 80 % of the respondents considered themselves to be novice users.

Results also show that males consider significantly more often themselves to be advanced users and females respectively feel more insecure about their knowledge ($\chi2 = 67,327$, $p = 0,000$). When looking more closely at the differences between the age groups, surprising is that the youngest age group (15-24) is the highest one to think themselves to be advanced users ($\chi2 = 147,941$, $p = 0,000$), even when they do not report their knowledge of the term itself and its meaning to be very high. This may reflect that even though many young people had not heard the cloud service term before, after reading the definition of the term they realized that they actually had used those services a lot without knowing the term before.

5 CONCLUSIONS

The purpose of this study was to examine how commonly cloud services are used by consumers in USA, Japan and Finland, and to discover possible differences within these countries. The results of our study show that the usage of cloud services is very common. However, apart from webmail services, there is a considerable difference when comparing the cloud service usage percentages between the three countries; cloud services have not yet broken through in Japan as broadly as in USA and Finland.

The survey also revealed that only four percent of the users evaluate themselves as advanced users. Every fourth person consider themselves to be intermediate users, while novice users dominate the market with more than 70 percent's share.

All in all the results indicate that cloud services have already penetrated into consumer markets, despite the fact that the term "cloud service" itself is still relatively unknown. This indicates that consumers are not very interested in how a service is provided to them as long as it provides sufficient value. For consumers, the challenges related to adoption of cloud services found in industrial studies, such as security and service reliability, do not seem to be important enough to prevent the adoption and use of the services.

The study results, showing that consumer cloud service markets appear to have reached the wide spread adoption phase, present good opportunities for companies in cloud service business. In USA and Finland, webmail, social networking and online media services are already in high demand. In Japan, there still are some challenges related to the adoption of social networking services as well as online sharing and storage services.

The results of demographic analyses indicate that perhaps the best way to further fuel the existing cloud service markets is to increase the female consumers' and older age segments' awareness of cloud services. The most efficient ways to increase awareness in different consumer segments is an important issue which calls for further investigation. It would also be interesting to conduct this type of extensive consumer studies on cloud service use in other countries to get a wider understanding of global consumer markets for cloud services.

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