Usable Security and Cloud

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Lecture at Aalto University Course of Information Security and Usability
29 March 2011

Security & Usability, motivation

Security & Usability, motivation

- Cranor, L.F., Garfinkel, S., 2004, Secure of Usable?, IEEE Security and Privacy, vol. 2, pp. 16-18, 2004:
  - Common sense tells us that security and usability must go together: systems that are secure but not usable will not be used, while systems that are usable but not secure will get hacked, compromised, and otherwise rendered useless.

Security & Usability, motivation

- Norman, D.A., 2009, The Way I See It: When security gets in the way, Interactions 16(6): 60-63 (2009):
  - Without usable systems, the security and privacy simply disappear as people defeat the processes in order to get their work done.
  - When security gets in the way, sensible, well-meaning, dedicated people develop hacks and workarounds to defeat it.
  - Users are continually forced to use arbitrary security procedures, many of which even the professionals ignore. How could the ordinary person know which ones matter and which do not?

Security & Usability, motivation

- Yee, K., 2004, Aligning security and usability, IEEE Security and Privacy, vol. 2, pp. 48-55, 2004:
  - Usability improvements seem to yield more easily compromised software, and adding security measures seems to make software tedious to use or hard to understand.
  - Both security and usability failures can render a product useless.
  - We can view security and usability as aspects of a common goal: fulfilling user expectations

Cloud

- The term ”cloud” stands for a platform that provides all forms of information and communication technology (ICT) and computation equipment, even to the scale of large data centers.
- http://csrc.nist.gov/groups/SNS/cloud-computing/
  - Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.

About CloudSW project

- A large Cloud Software Program on-going in Finland through years 2010-2013
- Participants: 20 companies and 8 research organizations
- http://www.cloudsoftwareprogram.org/
- Research areas:
  - Cloud Technologies
  - Lean SW Enterprise
  - Cloud Business
  - Sustainable Development
  - **Superior User Experience**
  - **Cloud Security**

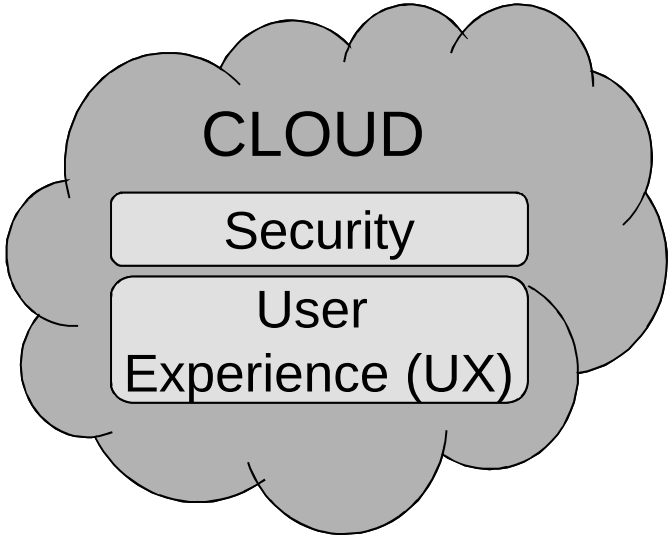
User Perceptions of Security in the Cloud (SecUX) sprint

- Challenge: From user's perspective security can be considered boring, complex, scary and/or geeky= difficult to use
- SecUX sprint will study this challenge in order to create better business

- Goals:
  - Business: find out how to create the best cloud security services
  - Research: find out how users perceive cloud services and cloud security

- Co-operation:
  - Main partners:
    - F-Secure
    - VTT

•Interest group:
- •Digia
- •Nokia
- •TUT

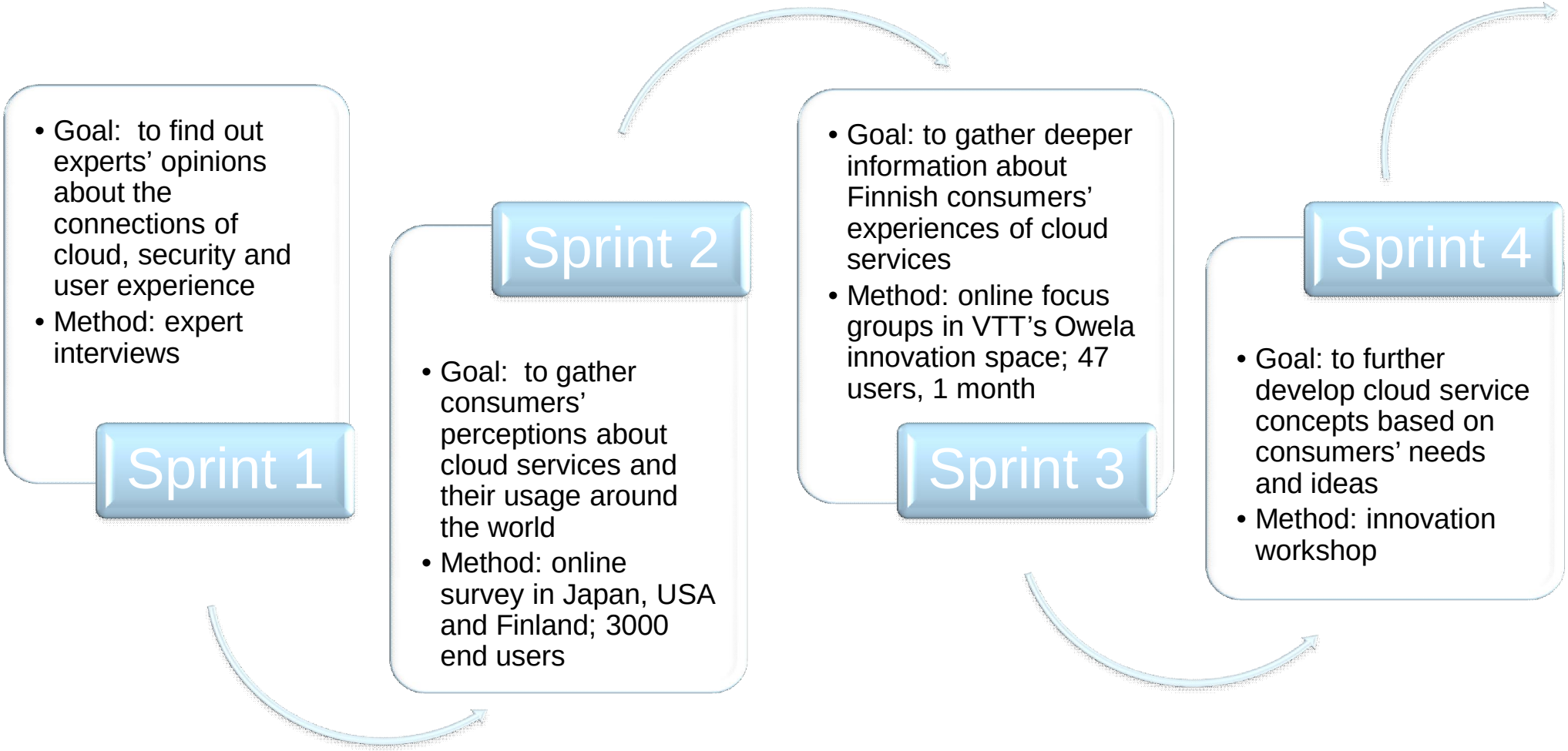


Our Cloud Service Definition

"In cloud services, content (for example, music, email, files), personal information and programs are stored on an Internet server 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."

Continuum in SecUX sprints Q1-Q4, 2010

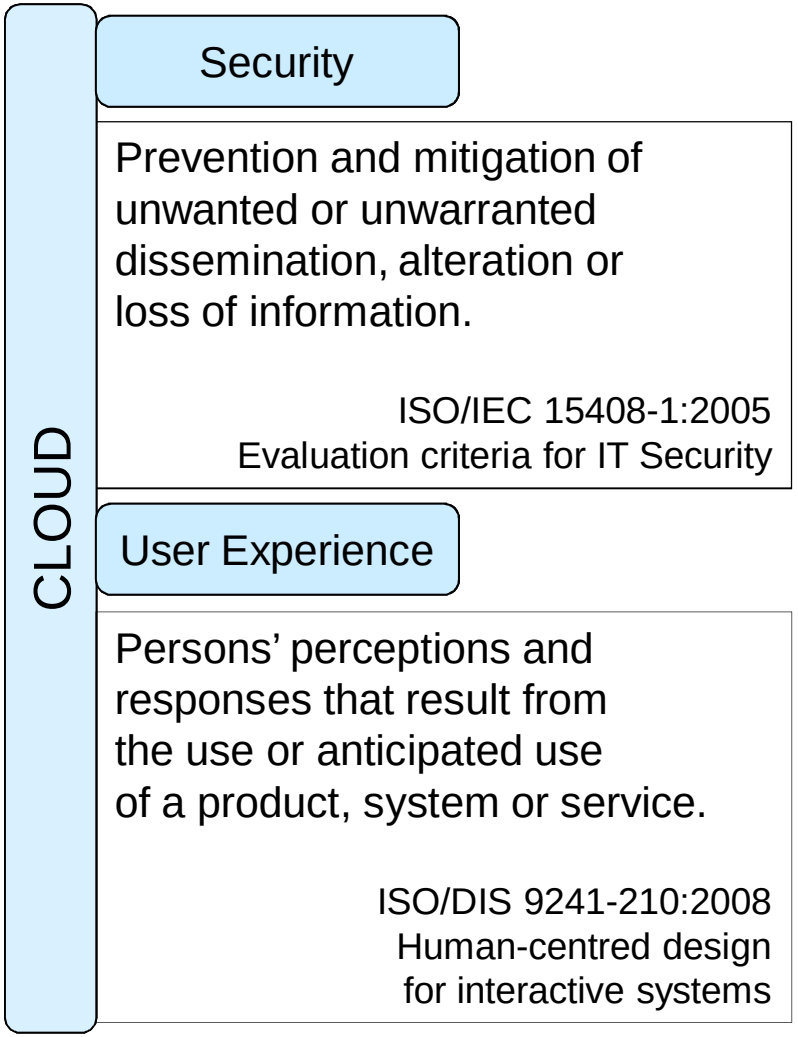


Sprint 1

Expert interviews on user perceptions of cloud services and their security

Research Process & Methods

- Research question Q1
  - What security related user experience issues and challenges do the CloudSW program partners highlight within the cloud environment?
- Methodology
  - The current state of the practice via
    - Literature survey and
    - Semi-structured theme interviews



The study

- An empirical analysis of security and UX issues in the cloud environment from user-centric perspective
  - A highly selective sample - the perceptions of experts who have used and are knowledgeable of cloud services
  - Interviews of eleven experts who are participating in the Finnish Cloud Software Program Consortium and who were registered to the mailing lists of either the Superior UX or Integrated Security themes
- Basic demographics of the interviewees:

Organization		Education		Task		Expertise	
Multinational companies	8	MSc	6	Expert	7	Security	4
University or Research organizations	3	Lic./ PhD	5	Mgmt	1	User Experience	3
				R&D	3	Cloud Computing	4

Results - User experience in the cloud

- Interviewees' definition: The issues that cover an overall experience from the service or a product in the cloud; from aesthetic characteristics such as look and feel to ease of use and how a user can get their whole desired activity done in the most trouble-free way
- Aspects that affect the user experience in the cloud:
  - Trust, and how do users choose between different service providers
  - Liability issues between the user and service provider
  - User comprehension of the cloud
  - Security awareness

UX affectors in the cloud	Mentioned by % of interviewees
Trust	100 %
Liability between cloud user and provider	63 %
Users' comprehension of cloud	45 %
Security awareness	36 %

Results - User experience in the cloud: Trust

- Trust identified as a key to enriched user experience
- How do users lay confidence in the cloud services of their choice?
  - established brand
  - referral by a friend
  - social networking
- The actual functionality of the service will build real user experience and create trust in the long run

Trust creators	Mentioned by % of interviewees
Brand reputation, image and name	91 %
Friends' opinions	45 %
A critical mass of users	36 %
Open source sw, transparency	27 %
Own experiences	27 %
Search engine results	18 %
Understandable EUL agreements	18 %
Price	18 %
Ease of use, good functionality	18 %
Nationality of the company	9 %
Language	9 %
Visual image of the service	9 %

Results – User experience in the cloud: Liability issues

- The division of liabilities = who has what responsibilities in the cloud environment, between a Cloud Service Provider and user
  - *"The responsibilities are shared, definitely. You as a user, if you use a password that is, very easy, like your name or your birth date, or 1234 or something like this. But definitely the service provider is responsible also to a certain extent; that the network is secure, that there is no way that a third person is accessing the network from a back door for instance."*

- One of the main challenges: different jurisdiction within each country
  - *"If you are in USA and click "Yes" on the disclaimer which puts all the responsibility to you, it is legally binding, but if you do the same in Finland, the service provider may still have some responsibility."*

Results – User experience in the cloud: User comprehension of the cloud

- The basic principles of cloud are not thought to be very clear to the users in general
- Marketing focus on the services cloud enables and not on the technological aspect
- Simplicity and automation are needed.
  - *“Theoretically speaking, if the security is well handled, and the programs are robust and secure enough, for the user, the user shouldn't care. If there is a browser and there is a process underneath and there is an operating system, he shouldn't care about that.”*

Results – User experience in the cloud: Security awareness

- Average users would need to be more aware of security issues in general, and within the cloud
- At the moment there are great differences on the security awareness level of users, probably mostly based on the age and education of the user
  - *“Age range could be forty; people under forty are interested but over forty don’t care?”*

Results - Security in the cloud

- Interviewees' definition:
  - Having a safe, authentic and reliable access to the data
  - Ensuring the continuity of the service
  - Sharing of the security threats transparently

Cloud security promoters	Mentioned by % of interviewees
Reliable data storage	63 %
Ubiquitous data access points	45 %
Professional security management	36 %
Threat analysis possibilities	9 %

Cloud security threats	Mentioned by % of interviewees
Profiling, identity thefts	45 %
Privacy threats	45 %
Availability breaches	36 %
Liability, data ownership and copyright	27 %
Data sanitation problems	18 %
Access rights	9 %
Backward compatibility	9 %

Results - Security in the cloud: Positive effects

- Users not need to worry about losing the data if their personal computer is damaged or stolen; automatic backups
- Opportunity to access the data from several locations and with several devices
  - *“Everything is centralized, you can access your information from any terminal, doesn't matter where you are, it doesn't matter the type of terminal.”*
- Information security handled by professional experts within the cloud
  - *“Good thing is that you can have really professional companies managing your security in the cloud. When you're handling your data locally, you can have a lot of potential threats in your machine, because you are not an expert. However, someone who is really expert in that, well, I really believe that they can handle the risks much better than you do.”*

Results - Security in the cloud: Threats 1/2

- Identity theft by a third party easier with the massive amount of personal data in the cloud
  - *"If I have access to your social networking account, it's not only the data I have from your account, but also lots of your personal information can be extracted from those you are connected with."*
- Profiling and possible exploitation of user information by cloud service provider
  - *"Cloud will raise profiling possibilities to a new level, when you can interconnect where the person moves, where and what he buys, whom he sends which kind of messages, what he updates to Facebook etc. Pretty much anyone can be profiled that way."*
- Privacy questions: cloud expands the risks and the effects of the incidents
  - *"It's not only the threat of your person, your information, but also your friends' information, and the people who is in your network."*

Results - Security in the cloud: Threats 2/2

- Loss of availability to the data stored in the cloud environment: connection, capacity and bandwidth problems possible
- Liability and data ownership issues: who owns the data - liability, privacy legislation and copyright issues
- Access rights and data sanitation: how can the user be sure that his data is available for only to the group of people it should, or that the data is really removed when the user asks it to be removed
- Backward compatibility problem: all the data is handled within the cloud, with the updated software existing in the cloud, what happens when the user wants to handle his old data that was stored in an old format which the newest software does not support anymore?

Results - Presentation of the security effectiveness level

- Secured connection and good security level of a service should be presented clearly
- There should be a way to give each different user group a safe and secure feeling of the cloud
  - *“Security should be invisible, unnoticeable, flavorless and odorless; so that it just would be there and work but would not disturb everyday life too much.”*

Results - security and user experience

- Good UX can forgive security risks, even for a security expert:
  - *"When Gmail came, I remember thinking that I am never going to use it because Google will read all my mails. Well, when I tried it once with a test id, I was like, wow, everything works really well here, and this is by far the best made webmail ever. Then I started to use it, and thought that ok, Google can not be so interested in me as an individual person, and did not care about that any more. It just works; it is so much better than anything similar I have ever tried."*
- Combining security and UX seems mostly be about providing the highest security to cloud service users in a non-intrusive manner

Summary Q1

- Cloud effect on security and user experience
  - There is hardly any research results available of this area
  - Both user experience and security issues are generally thought to be the key factors in the success of a cloud service
  - Providing non-intrusive security with reliable access to the data is crucial for users
  - From the user point of view, security should be invisible, automated, reliable, always updated and available...
  - Trust is seen as one of the main things in the cloud context –

    How to build trust towards a service provider within the cloud?

Sprint 2

Survey on user perceptions of cloud services and their security

RQ and method

- Research question Q2
  - What creates good user experience of security in the cloud environment?
- Goal:
  - to gather consumers' perceptions about cloud services and their usage around the world
- Methodology
  - Online survey

Online survey 06/10

Over 3000 survey respondents from USA, FINLAND and JAPAN

Online survey 06/10

Over 3000 survey respondents from USA, FINLAND and JAPAN

Gender

Male 49,5%
Female 50,5%

Age

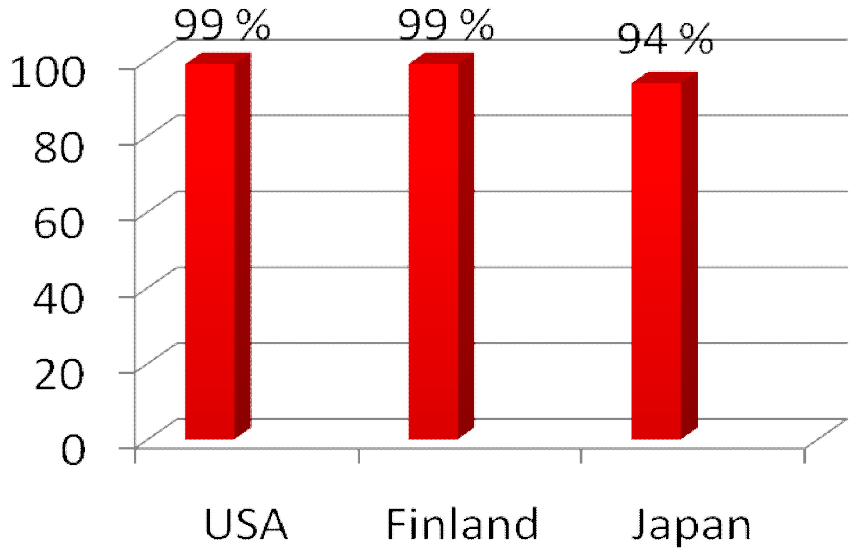
15-24 12,8%
25-34 17,9%
35-44 19,0%
45-54 18,8%
55-64 18,9%
Over 65 12,6%

People are already in the cloud

97% of people use cloud services.

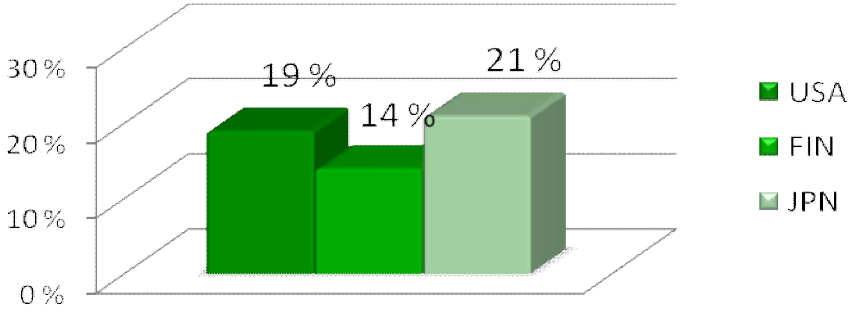
"In cloud services, content (for example, music, email, files), personal information and programs are stored on an Internet server instead of the user's own computer.

The cloud services and the content in them are accessible from various devices anytime and anywhere through the Internet."

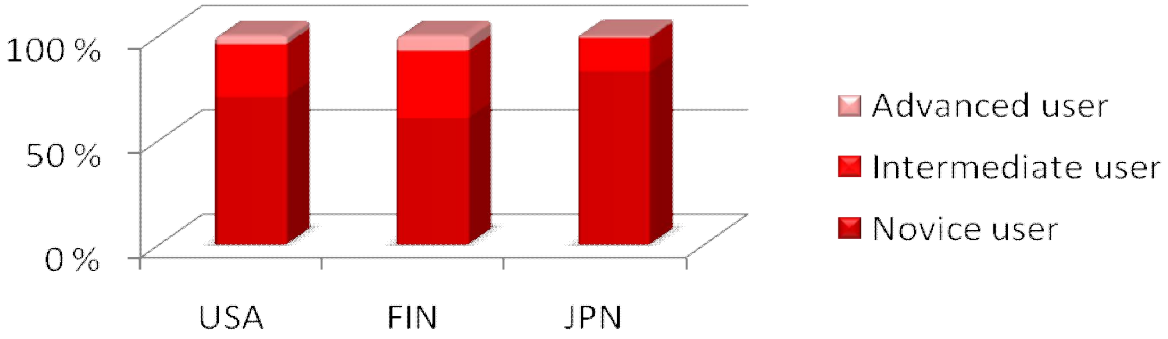


Cultural similarities and differences II

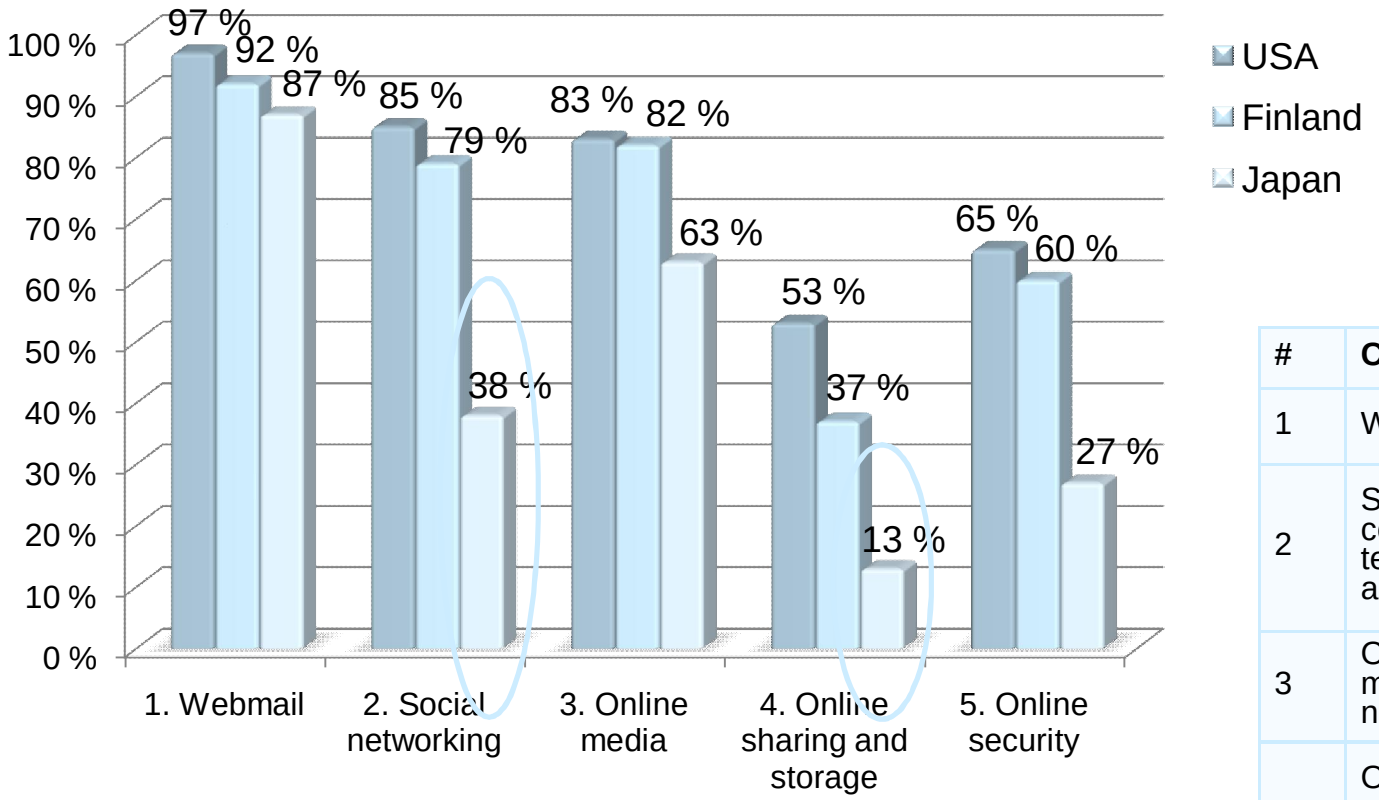
The term cloud service is more familiar in Japan and USA than in Finland.



Finns consider themselves more experienced cloud services users than Americans and Japanese.



Use of cloud services by categories

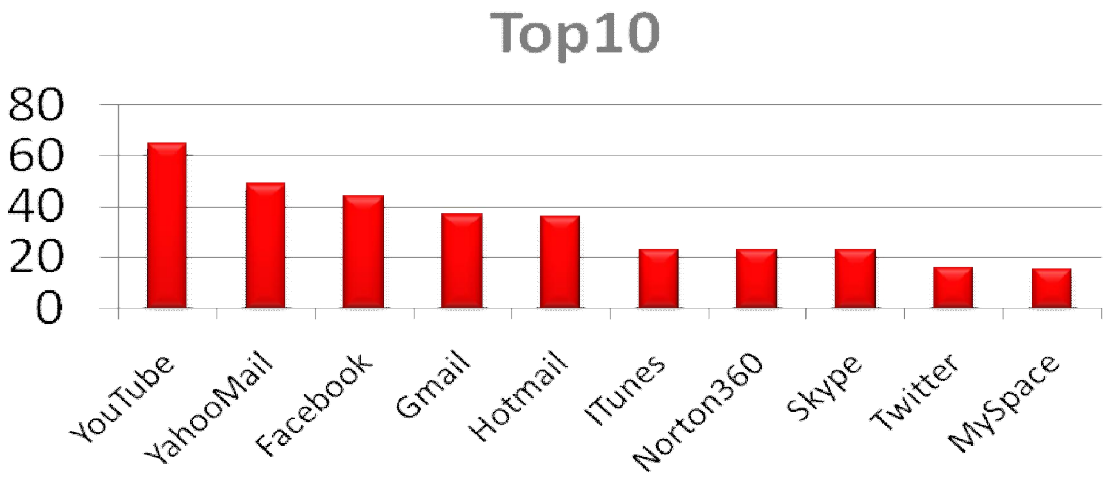


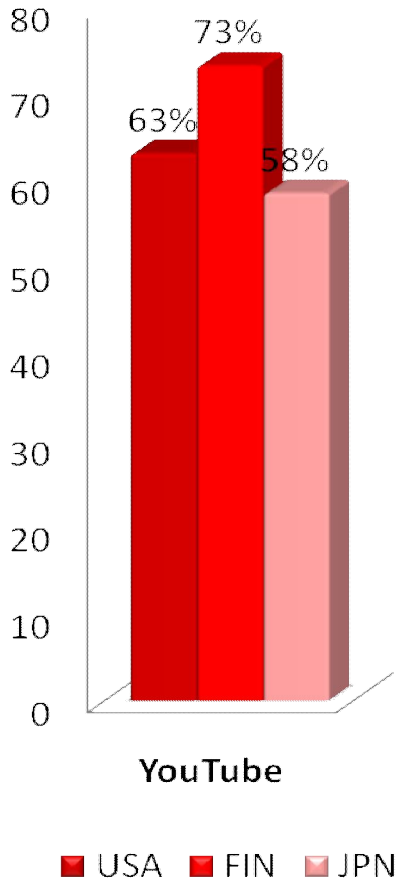
#	Categories
1	Webmail
2	Social networking: online communities, blogging, online telecommunication, online games, and virtual worlds
3	Online media: online TV, video and music, e-books, and online newspapers
4	Online sharing and storage: content sharing, online file storage, and editing photos, documents, and files through the Internet
5	Online security: online back-up, antivirus, and malware scanning

Most popular service: YouTube

Need to attract peoples' attention globally?

USE YOUTUBE



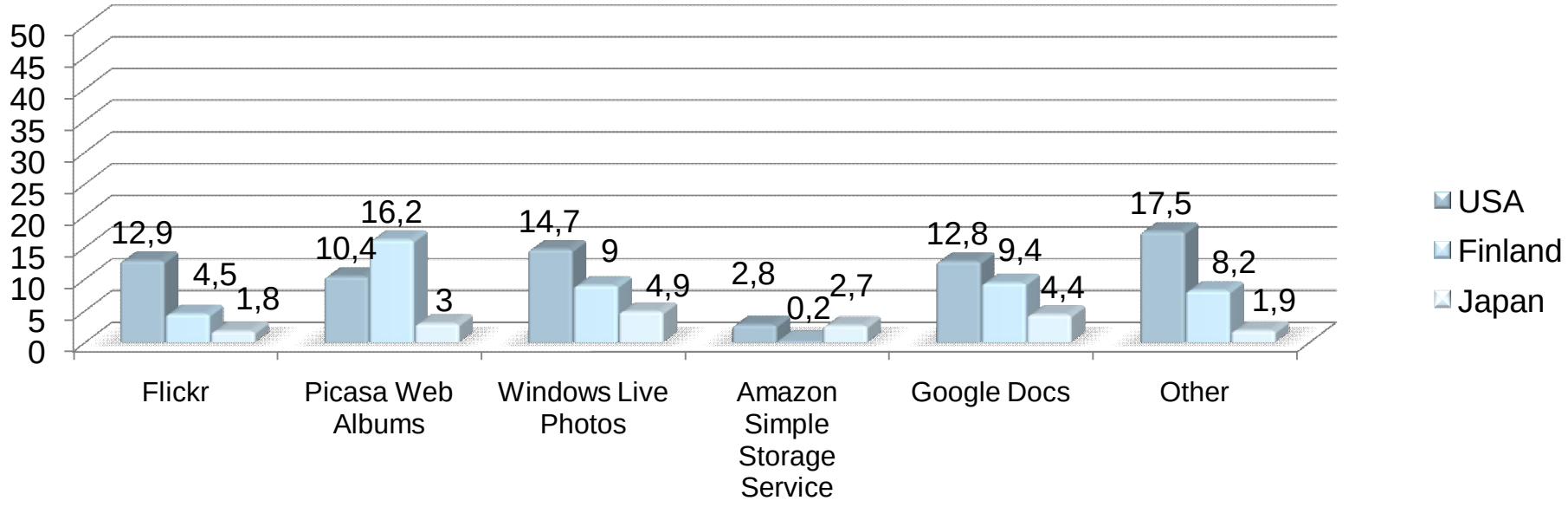


Online sharing and storage

Market leader position is

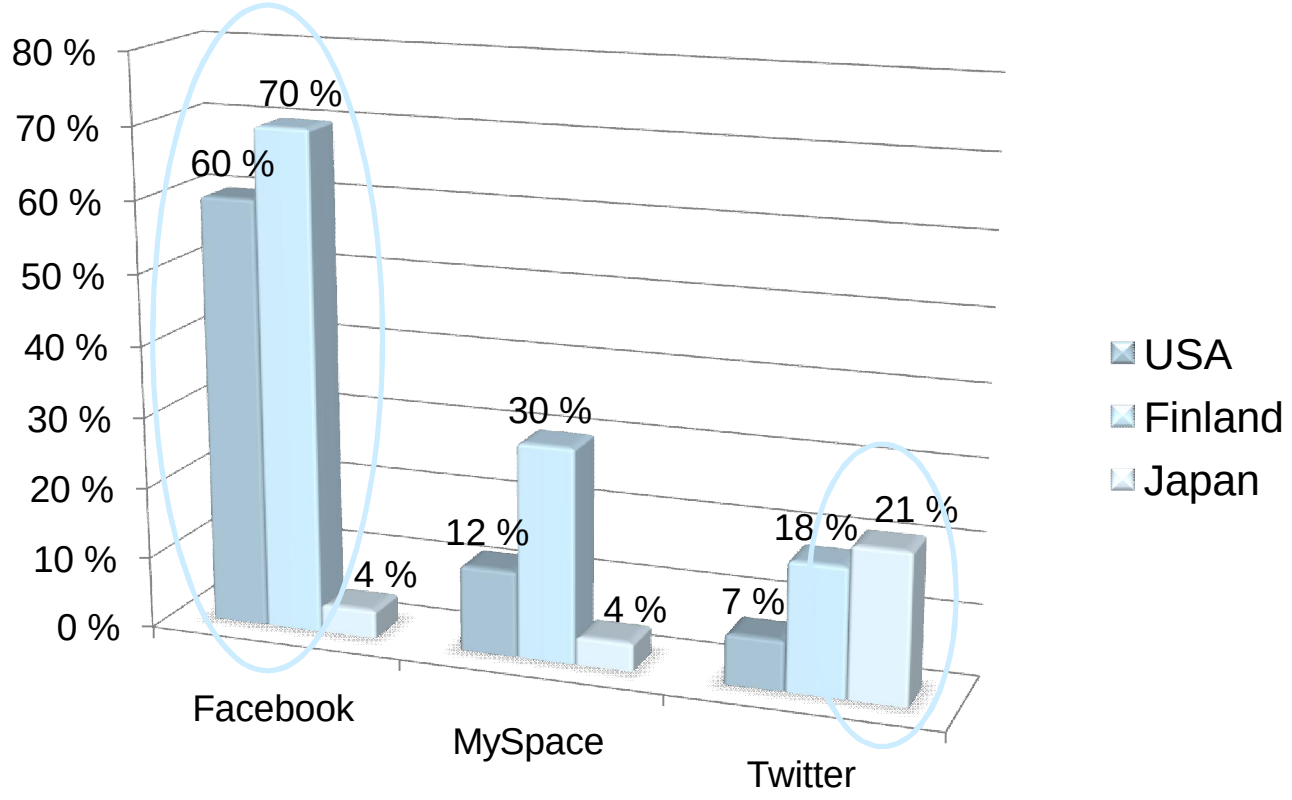
OPEN

There are no clear leaders, yet.



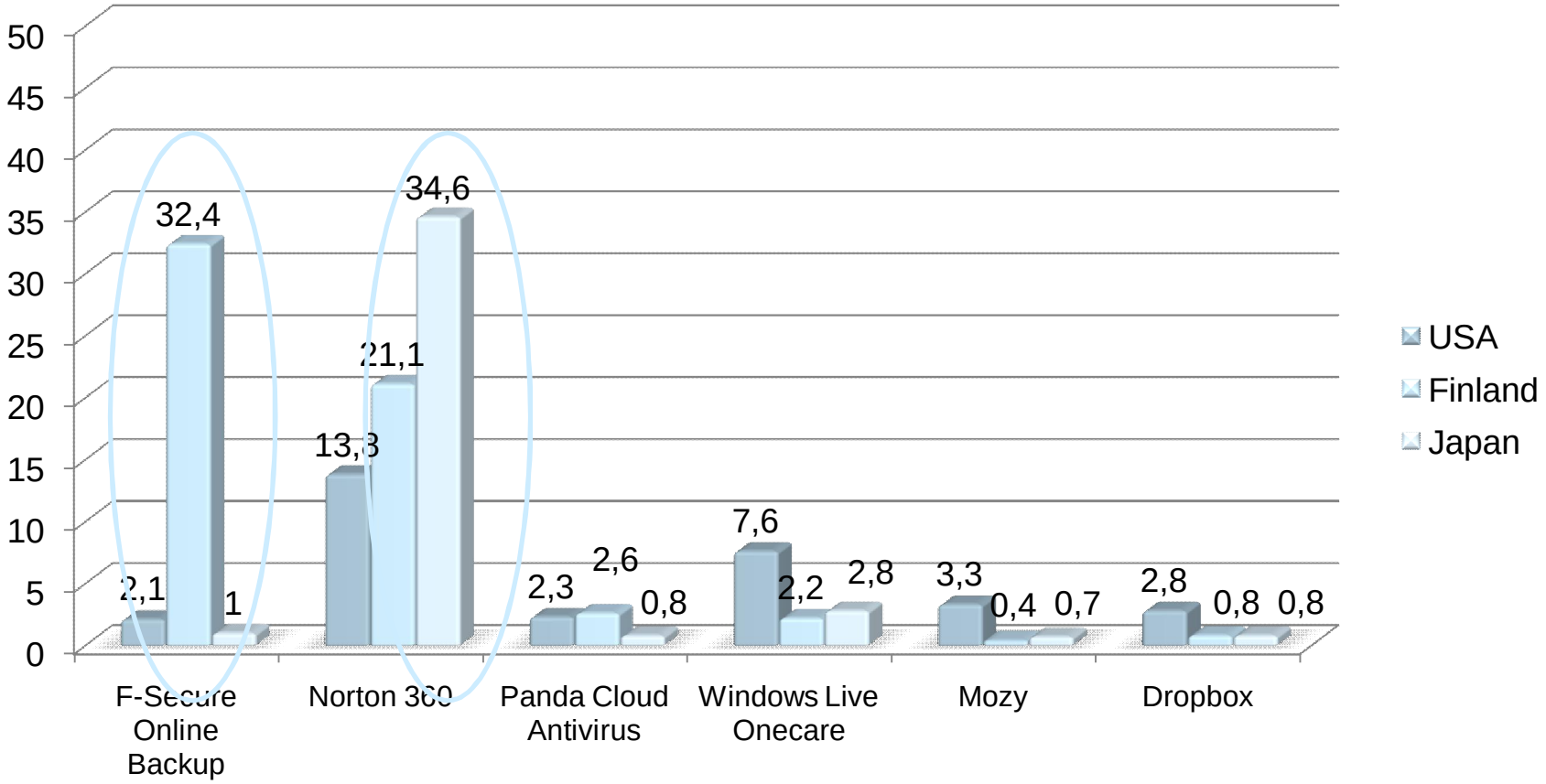
Social networking

Finns and Americans socialize in Facebook. Japanese tweet.



Online security

F-Secure big in Finland, Norton in Japan.



Users' perceptions of security in the cloud

Statistics	
Statements	Mean
Before I start using a cloud service I try to find out if it is secure.	5,53
I would like to be informed how my documents or data are secured in the Internet.	5,53
I often think about the security of the cloud services I use.	4,47
I would like to be warned if I am about to do something that would risk my security in the Internet.	5,91
I would like to have the opportunity to check how my documents or data are secured in the Internet.	5,57
*Scale: 7 stage Likert scale; 1 = Strongly disagree, 7 = Strongly agree	

Security vs. Usability

If a cloud service works well and is easy to use, I do not care if it is secure or not.

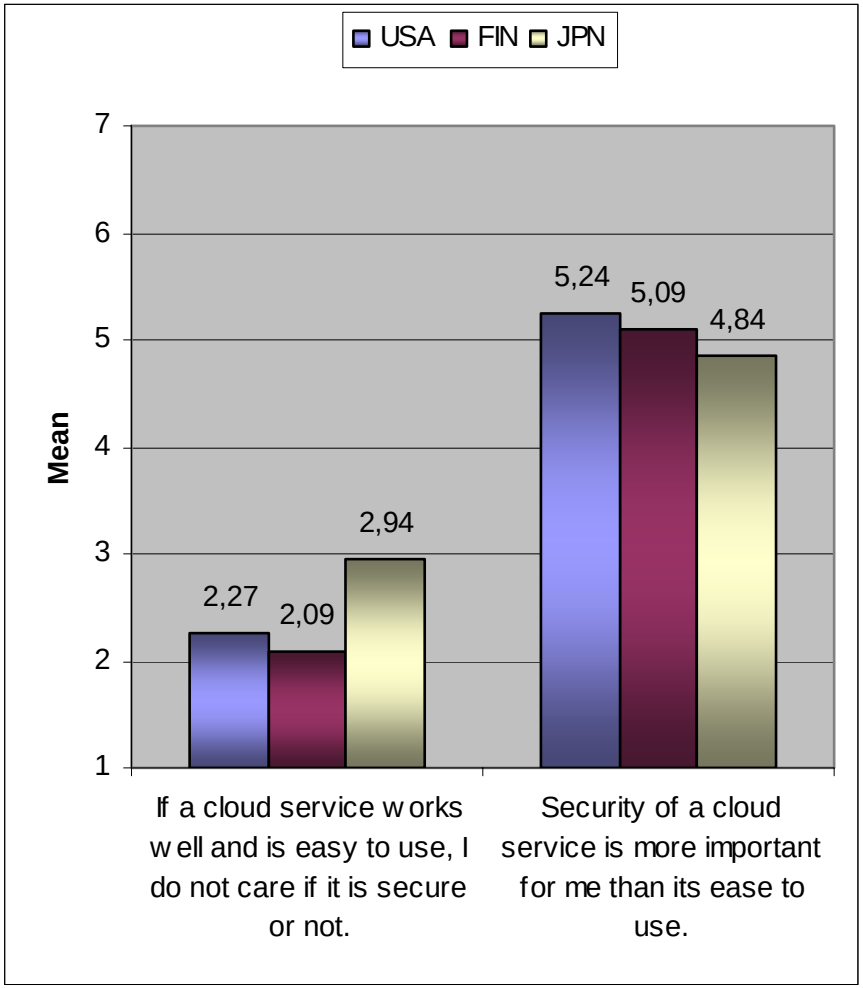
Agreed only by

14,2% of Americans,
8,1% of Finns and
15,6% of Japanese.

Security of a cloud service is more important for me than its easiness to use.

Agreed by

68,2% of Americans,
64,4% of Finns and
54,6% of Japanese.



Security vs. Usability

Security tools (for example, antivirus) slow down my computer annoyingly.

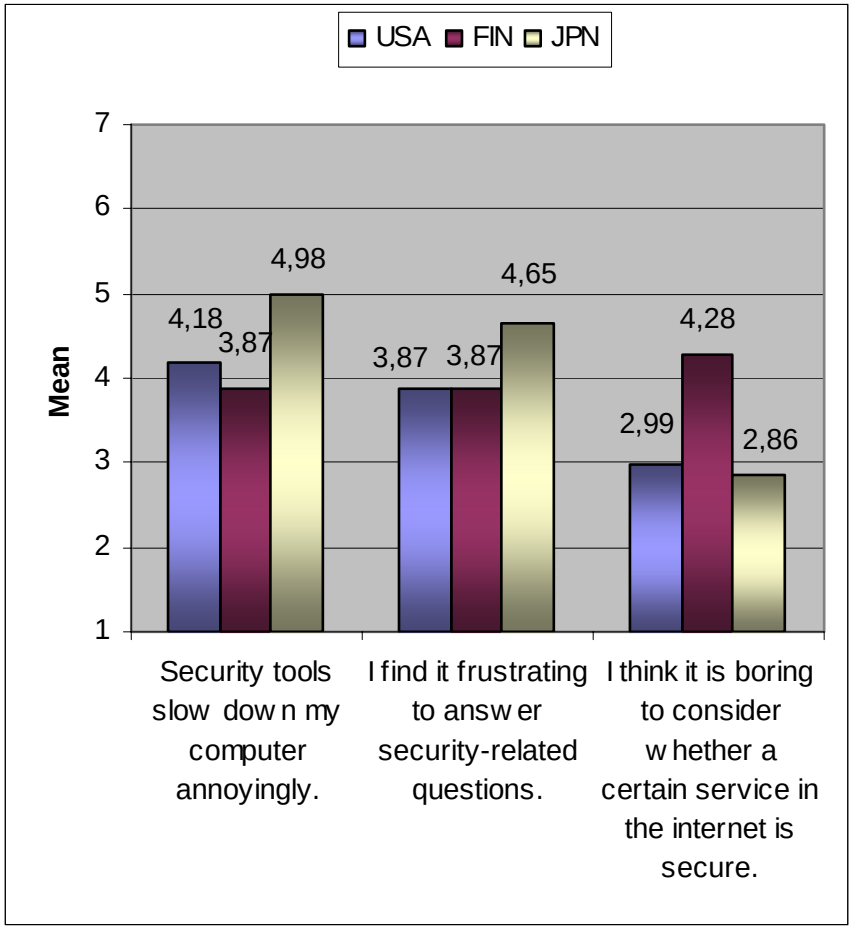
Agreed by

48,3% of Americans,
41,4% of Finns and
65,5% of Japanese.

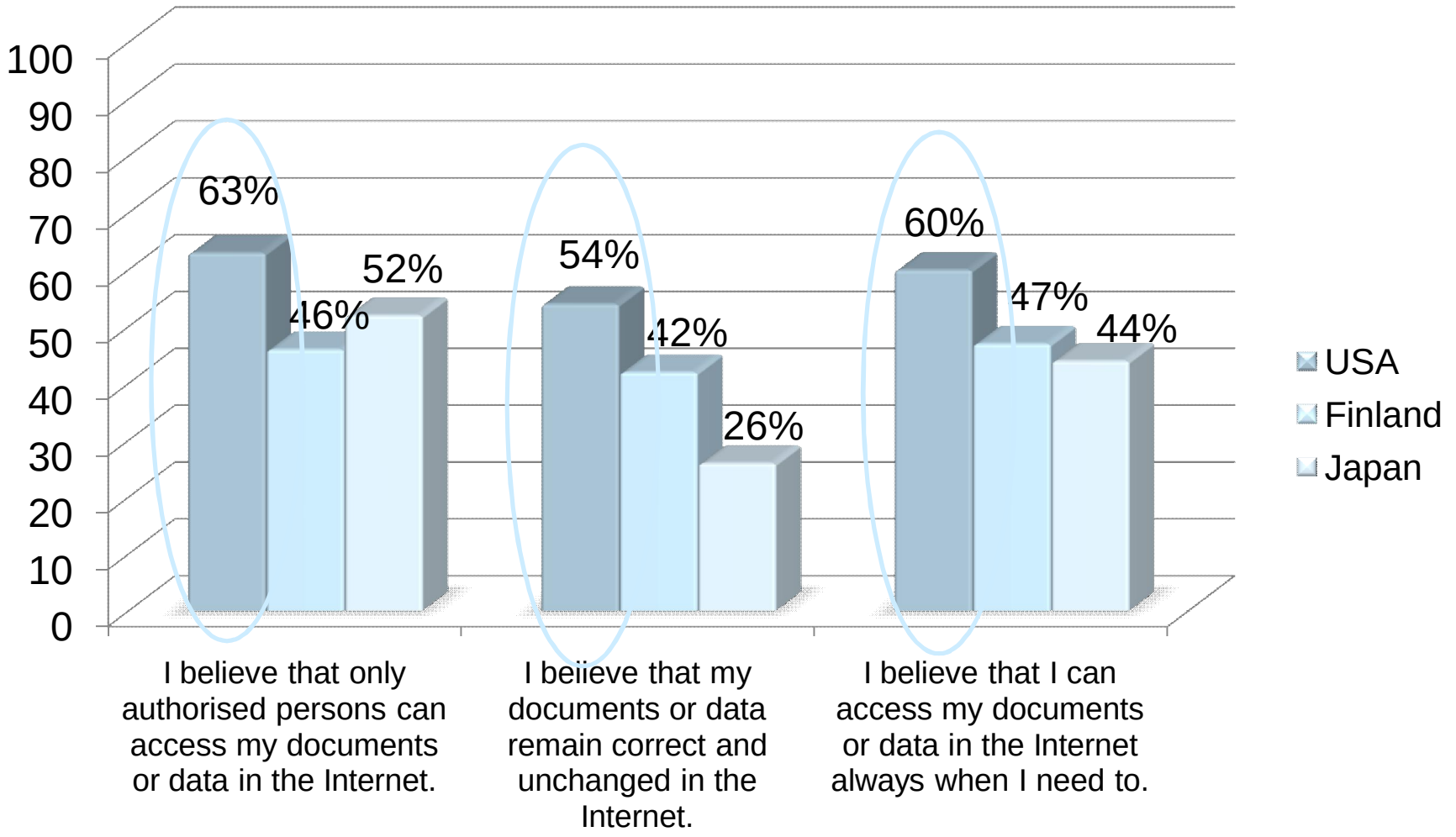
I find it frustrating to answer security-related questions asked by computers, browsers, security software, etc.

Agreed by

39,1% of Americans,
38,7% of Finns and
54,1% of Japanese.



Perceptions on Trust and Access rights



Top three providers of trust in cloud services

1. Ease of use
2. Availability in own language
3. Low price

Americans trust on companies located in their own home country.

Finns value their own and friends' experiences.

Japanese have the most faith in search engine results.

Summary Q2

- Cloud services have already penetrated into consumer markets, despite the fact that the term “cloud service” is still relatively unknown
  - Consumers are not very interested in how a service is provided to them, as long as it provides sufficient value
  - Even the challenges related to adoption of cloud services, such as security and service reliability, do not prevent the adoption and use of these services

Summary Q2

- Ease of use does not overrun security.
- Ease of use creates trust.

- Even though people understand the importance of security features, some improvements on the functionality of security tools would be appreciated by the users.

- Japanese value ease of use over security more than the Americans and the Finns.
- Japanese respondents also have the most critical attitude towards both the security tools and the security-related questions.
- Americans have the most trust towards security in cloud services.

Sprint 3

Owela research – User perceptions of cloud services for today and tomorrow

RQ and method

- Research question Q3
  - What the user perception of cloud services and their security is, and how it is formed?
- Goal:
  - to gather deeper information about Finnish consumers' experiences of cloud services and their security
- Methodology
  - Online focus groups in VTT's Owela innovation space

Owela innovation space - http://owela.vtt.fi

- Owela (Open Web Lab) is an online space for **open innovation with users** and customers.
- It provides tools for
  - Understanding user's needs and experiences
  - Designing new products and services together
- Through online collaboration users can be involved in innovation activities **regardless of time and place.**

SecUX Owela study in numbers

2 identical work spaces
- Innocloud
- Ideacloud

4 weeks
- 24.9.-22.10.2010

47 participants

+ 4 company representatives

+ 2 researchers

4 themes
- Week 1: ”Content” – content storage and sharing in the cloud
- Week 2: ”Identity” – identity in the cloud
- Week 3: ”Trust” – trust towards cloud services
- Week 4: ”Future cloud services” – clarification of users’ expectations and ideas

5 tasks
- Discussions (320 postings)
- Blogs (60 comments)
- Ideations (14 ideas, 80 comments)
- Daily mini polls (28 polls, 432 answers)
- Chat sessions (5 x 2 hour sessions separately for both work spaces)

Selected Owela findings

Cloud services are seen beneficial

– independency of time and place is important for the users.

Selected Owela findings

File sharing and storage via Internet is very common

– but not with the services created especially for this purpose.

Webmail and Facebook are used instead.

However, cloud services are not trusted as the only content storage location.

Selected Owela findings

Not many negative experiences in using cloud services – YET.

Even the services that are perceived less trustworthy are used if the benefits are seen to be greater than the possible loss.

Selected Owela findings

Participants had thought a lot about their online identity and its protection.

Password and user account management was seen especially challenging.

Sprint 4

Innovation workshop – User needs for cloud services in the future

RQ and method

- Goal:
  - to further develop cloud service concepts based on consumers' needs and ideas
- Methodology
  - Innovation workshop

Innovation workshop

- In collaboration with F-Secure, Digia and VTT
- Survey and Owela study results used as stimulation material and basis of idea generation
- Participants represented different areas of expertise: business, technical, user experience, innovation
- New ideas developed further
- Results are already integrated into F-Secure's processes for getting action plans around these findings

Summary Q4

- As an end result of the study the voice of the cloud service users was turned into several new business ideas that will be further explored within F-Secure

Thank you!