D3.2 External Environment Analysis

Grant Agreement nr.	612053
Project acronym	CloudCatalyst
Project title	Reenergize productivity, efficiency and competitiveness of European economy through Cloud Computing
Funding instrument	Coordination and support actions (CSA)
Due date	31/12/2014
Submission date	15/01/2015
Main editor (s)	UCM
Contributor (s)	Carlos Martin Sanchez, Ignacio M. Llorente, Andreia Jesus

Project Co-funded by the European Commission within the 7th Framework Programme		
DISSEMINATION LEVEL		
PU	Public	X
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
C	Confidential, only for members of the consortium and the Commission Services	

DOCUMENT CHANGE LOG				
Version	**Date**	**Editor**	**Modified pages**	**Summary of modifications**
0.1.	12/05/2014	Carlos Martin Sanchez and Ignacio M. Llorente	All	First version
0.2.	13/05/2014	Carlos Martin Sanchez	All	Cross-review and formatting
0.3.	10/06/2014	Carlos Martin Sanchez and Ignacio M. Llorente	10-14	Improvements in survey questions
0.4.	11/06/2014	Carlos Martin Sanchez and Ignacio M. Llorente	10-14	Improvements in survey questions, review and formatting
0.5.0	15/09/2014	Carlos Martin Sanchez and Ignacio M. Llorente	15-45	Draft of results
0.5.1	22/09/2014	Carlos Martin Sanchez and Ignacio M. Llorente	15-45	Results review and formatting
0.6	02/10/2014	Carlos Martin Sanchez and Ignacio M. Llorente	All	Cross-review and formatting
0.6.1	21/10/2014	Carlos Martin Sanchez and Ignacio M. Llorente	15-47	Formatting, improvements in summaries for each section
0.7	27/11/2014	Carlos Martin Sanchez and Ignacio M. Llorente	All	Cross-review and formatting
0.8	09/12/2014	Carlos Martin Sanchez and Ignacio M. Llorente	All	Improve summarized findings, cross-review and formatting
0.8.1	10/12/2014	Andreia Jesus	All	Review
1.0	17/12/2014	Carlos Martin Sanchez and Ignacio M. Llorente	All	Final review

FINAL VERSION CIRCULATED TO		
Recipient	**Entity**	**Date**
Coordinator	PORTUGAL TELECOM	18/12/2014
European Commission	LARS PEDERSEN (PO)	15/01/2015

Disclaimer

Statement of Originality

This deliverable contains original unpublished work except where clearly indicated otherwise. Acknowledgement of previously published material and of the work of others has been made through appropriate citation, quotation or both.

Table of contents

Executive Summary

Cloud represents a fundamental shift in how technology is acquired and managed. This shift can result in pressure on companies when their structures, culture, policies and internal practices, have not evolved to address the changes inherent in the cloud-computing paradigm.

This report analyzes the external environment factors relevant to the planning, design and evaluation of cloud solutions. The main drivers for cloud computing adoption within specific industries and countries will support the decision process to move to the cloud for start-ups, entrepreneurs and researchers intending to create a cloud computing related business.

Previous studies have been analyzed in order to understand the main motivations and barriers for the adoption of Cloud Computing. With these broad areas as a starting point, a survey was created to gain a more detailed insight into the current barriers and challenges that organizations interested in cloud services are facing. The results of the survey provides valuable guidelines from two different points of view:

- Guide entrepreneurs, researchers, and software developers to create value-added Cloud solutions and services
- Guide any start-up interested in using cloud services to identify potential problems ahead of time, and plan accordingly

WP3 reports of Cloud Catalyst project will provide valuable insights for cloud computing planning. While D.3.1 presents the internal strategic planning, D.3.2 analyses the external environment of cloud industry. These two deliverables will allow the development of Cloud Accelerator Toolbox (D.3.3.) that will act as a guidelines framework for the cloud community, defining how cloud solutions can be successfully implemented and later proven on the market.

1. Purpose and scope of the deliverable

The deliverable is part of WP3 - Cloud accelerator toolbox. WP3 focuses on developing the major tools for enabling and promoting active exchange of knowledge, requirements and common interests in implementing collaboration models for the software community and entrepreneurs. The main output will be a Cloud accelerator toolbox with guidelines and best practices for the developers' community, entrepreneurs, technical transfer units, start-up incubators and other stakeholders that can have an important role in stimulating Cloud Computing uptake.

This work package's main objectives are:

- Distinguish between the perspectives from providers, consumers and developers / researchers, listing their key economic interests and set up a common interest framework.
- Collect requirements and common interests in implementing open collaboration models in software and services technologies.
- Create use cases and guidelines for software development community in terms of cloud computing strategic planning principles.

The aim of this deliverable is to present the methodology used to study the external environment factors relevant to the planning, design and evaluation of cloud solutions, and to present the results of the study in order to support the decision process to move to the cloud for start-ups, entrepreneurs and researchers intending to create a cloud computing related business.

We have not finally used the Porter's five forces model, as stated in the DoW, to analyse the external environment. We found that the analysis of previous cloud adoption surveys and the preparation of a new survey was a more suitable methodology for analysing the external factors relevant to the planning, design and evaluation of cloud solutions. The results of the survey analysis provide valuable guidelines that help researchers use efficient go-to-the-market strategies and prepare early market entrance.

In Section 2 we have identified previous cloud adoption surveys targeted to enterprises that have adopted or are looking forward to cloud solutions. Our aim has been to extract relevant information regarding:

- Reasons for using the cloud
- Barriers to cloud adoption
- Adoption of different cloud models (private, public, hybrid)

With these results (presented in Section 2.4) we have defined a survey (Section 3) with questions to know low-level information about the main barriers to adoption.

For example, security as a main barrier to adoption will mean many different things to different people. It can be understood as confidentiality, data integrity, workflow and permission control, workload isolation, etc.

The results of the survey (presented in Section 4) will:

- Guide entrepreneurs, researchers, and software developers to create value-added Cloud solutions and services
- Guide any start-up interested in using cloud services to identify potential problems ahead of time, and plan accordingly

2. Evaluation of Previous Studies in Cloud Adoption and Development

We have identified the following cloud adoption surveys targeted to enterprises that have adopted or are looking forward to cloud solutions.

Surveys/Studies Evaluated

- Breaking Through the Cloud Adoption Barriers, KPMG, February 2013
- Enterprise Cloud Adoption Survey, Everest Group, March 2013
- Future of Cloud Computing Survey, North Bridge, August 2012
- Drivers of Cloud Adoption, Dimensional Research, December 2012
- Cloud Adoption Survey, YS Research, 2012

We have studied them to extract common results about the reasons for using the cloud, barriers to cloud adoption, and other relevant areas for our survey.

2.1. Breaking Through Cloud Adoption Barriers, KPMG, February 2013

Reasons for using the cloud	• Reduce Costs (59%) • Speed Adoption (31%) • Business Process Transformation (30%)
Barriers to cloud adoption	• Loss of Control (48%) • Security (41%) • Integration with Existing Architecture (39%)
Decision making process	• Non-IT
Most important Service Level Agreements	• Data Security (95%) • System Availability (95%)

2.2. Enterprise Cloud Adoption Survey, Everest Group, March 2013

Reasons for using the cloud	• Reduction in Total Cost of Ownership • Flexible Infrastructure • Reduced time for provisioning
Barriers to cloud adoption	• Security • Integration issues
Decision making process	• Compared to other IT fields, high involvement of CxOs
Adoption of the Different Types of Cloud Models	• SaaS is the most widely adopted (56%) • IaaS is the one with fastest growth, specially private (35%) and hybrid (21%)

2.3. Future of Cloud Computing Survey, Everest Group, August 2012

Reasons for using the cloud	• Agility (54%) • Scalability (54%) • Cost Saving (48%)
Barriers to cloud adoption	• Security (46%) • Lock-in (35%) • Regulatory Compliance (30%) • Interoperability (27%)
Future trends	• 76% expect hybrid clouds to be the core of their cloud strategy
Adoption of the Different Types of Cloud Models	• SaaS is most widely adopted (63%) • IaaS is the one with fastest growth (30% yearly)

2.4. Key Findings

From the data collected, we can summarize the key findings in the following table:

Cloud deployment model

- IaaS is the cloud type with fastest growth
- Hybrid cloud will be the main deployment model, increasing interest in combining private and public clouds for performance and security reasons.

Top reasons for using the cloud:

- Agility
- Scalability
- Cost Saving

Main barriers to cloud adoption:

- SLA
- Control
- Security
- Performance
- Interoperability (no lock-in)
- Regulatory compliance
- Integration with existing services within the organization

3. Market Survey Design

For the design of the survey, we have followed the methodology described in D4.1.

3.1. Type of Survey

Although the survey is mostly for organizations building their own cloud service or product, and so technically driven, it also aims to get information from end-users of public cloud offerings.

This is possible because many of the target audience are building hybrid cloud scenarios by combining private and public resources, or have decided to build a private cloud because of some of the existing limitations of public clouds.

3.2. Topic

Cloud adoption drivers and barriers.

3.3. Goal of the Survey

The goal of the survey is to produce an overview of detailed information about the main barriers to adoption in order to help entrepreneurs, researchers, and software developers to create value-added Cloud solutions and services, and start-ups interested in using cloud services to identify potential problems ahead of time, and plan accordingly.

3.4. Survey Audience

The survey was open from mid-July to mid-September. We registered over 300 responses from companies interested in future Cloud adoption, as well as Cloud service providers, developers and entrepreneurs that innovate creating new solutions on top of the technology, researchers, and companies of different sizes that use it to create their own private and hybrid cloud environments.

3.5. Questions

Personal Details

Question	Type	Answers
Your Name (optional):	Free Text	

Question	Type	Answers
Your email address:	Free Text	

Question	Type	Answers
Your role in the organization:	Single Choice	• Business • IT

Question	Type	Answers
Your position in the organization:	Single Choice	• Executive • Director/Manager • IT • Other (please specify)

Organization Details

Question	Type	Answers
Your Organization Name (optional):	Free Text	

Question	Type	Answers
Number of employees:	Single Choice	• Less than 10 • 10 to 50 • 50 to 250 • More than 250

Question	Type	Answers
Type of Organization:	Single Choice	• Industry • Research • Academia • Government • Non-Profit • Other (please specify)

Question	Type	Answers
Type of cloud stakeholder:	Multiple Choice	• Provider • Developer • End-User

Question	Type	Answers
Number of years on the market:	Single Choice	• Not yet on the market • Less than 1 year on the market • Less than 3 years on the market • More than 3 years on the market

Question	Type	Answers
Your country:	Single Choice	

Question	Type	Answers
Which industry does your organization operate in?	Multiple Choice	• ICT • Banking • Healthcare • Education • Media • Government • Retail • Other (please specify)

Question	Type	Answers
Rate the top motivators to move to the cloud:	Multiple Choice	• Infrastructure variability / resilience • Application performance • Data security requirements • Capex-Opex trade-offs • Geographic consideration • Customer considerations • Regulatory / compliance requirements • Supply chain considerations

Type of Cloud

Question	Type	Answers
Choose the cloud service model used in your organization:	Multiple Choice	• IaaS • PaaS • SaaS

Question	Type	Answers
Choose the cloud deployment model used in your organization:	Multiple Choice	• Private • Public • Hybrid

Question	Type	Answers
Please indicate if you are aware and if you are using the following private cloud solutions:	Multiple Choice	• VMware vSphere/vCenter • OpenStack • OpenNebula • VMware vCloud Director • Microsoft system center • CloudStack • Eucalyptus • oVirt • Ganeti • OnApp • openQRM

Cloud Drivers and Barriers

Question	Type	Answers
Rate the top motivators to move to the cloud:	Multiple Choice	• Greater scalability • Higher availability • Faster access to infrastructure • Faster time-to-market • Cost savings • Geographical reach • Limited in-house technical resources • Industry-specific reasons

Question	Type	Answers
Rate the top barriers to move to the cloud:	Multiple Choice	• Security concerns • Fear of vendor lock-in • Integration (to private cloud, to internal systems and between platforms) • SLA performance is not acceptable • Lack of budget • Lack of management buy-in • Lack of certified providers • Lack of support from IT • Lack of in-house capability to evaluate cloud solutions • Lack of information about cloud

Cloud Needs

Question	Type	Answers
How important is the possibility of keeping data in your country?	Single Choice	• not at all important • not important • important • very important

Question	Type	Answers
Choose the most adequate characteristics of Service Level Agreement for your organization:	Multiple Choice	• Data ownership • Data portability • Data breaches • Data location (regarding country local legislation) • Legal/government requests for access to data • Data privacy

Question	Type	Answers
Choose the type of security and control that your organization requires:	Multiple Choice	• User authentication control • Backup • Confidentiality • User Rights (authorization) • Integrity • Threat detection • Logs and audit trails • User authentication integration with current organization identity management system • Workload and data isolation

Question	Type	Answers
Choose the interoperability aspects you value the most:	Multiple Choice	• Standard APIs • Contextualization method • Data Portability • Application portability • Appliances portability

Question	Type	Answers
What kind of regulatory compliance requirements does your organization have?	Multiple Choice	• Payment data • Privacy of personal data • Third party audit certification • Accounting data • Other (please specify)

Question	Type	Answers
Which integration support do you value the most?	Multiple Choice	• Accounting • Billing • Internal Processes • Database • Identity management

Question	Type	Answers
What is your organization's stance on Open Source Software?	Single Choice	• not at all important • not important • important • very important

Question	Type	Answers
Which public cloud APIs do you use?	Multiple Choice	• None • AWS • OGF OCCI • DMTF CIMI • VMware vCloud • OpenStack

Question	Type	Answers
Describe your target cloud demand in terms of public and private infrastructure that you are buying:	Single Choice	• 1 - 10 Servers • 10 - 100 Servers • 100 – 500 Servers • More than 500 Servers

4. Market Survey Analysis

This section presents the main findings of the survey. We categorized the participants according to their responses in the following questions:

- Number of employees
- Describe your target cloud demand in terms of public and private infrastructure that you are buying
- Number of years on the market
- Which industry does your organization operate in?
- Type of Organization
- Your role in the organization

For each question, we then cross-referenced the global results with the previously listed groups. The following graphs are those where the resulting data showed relevant or interesting differences.

For entrepreneurs and startups planning to develop a cloud product, this study aims to help them to understand what companies value about the existing cloud offerings, the barriers they find to adopt them, and the regulations that they will be required to comply with. The insight this survey provides should be useful to tailor their product to the needs of their specific target market.

Small and recently created companies will benefit from the answers of bigger and more consolidated companies, as they will help them to plan ahead before they have to deal with the commonly reported problems and concerns.

4.1. Type of cloud

As can be seen in Fig. 1, **SaaS** is the most used cloud service model globally. This can be explained with the wide variety of SaaS products that meet the needs of many different use cases.

The data of Fig. 2 and Fig. 3 shows that as the company size and infrastructure demand increases, so does the usage of **IaaS** services.

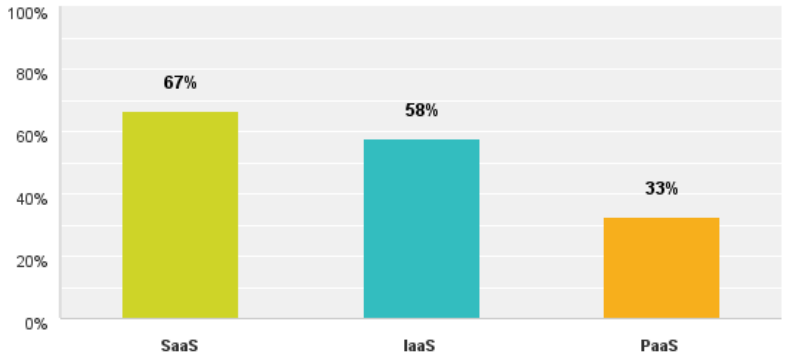

Fig. 1 cloud service model used, global results

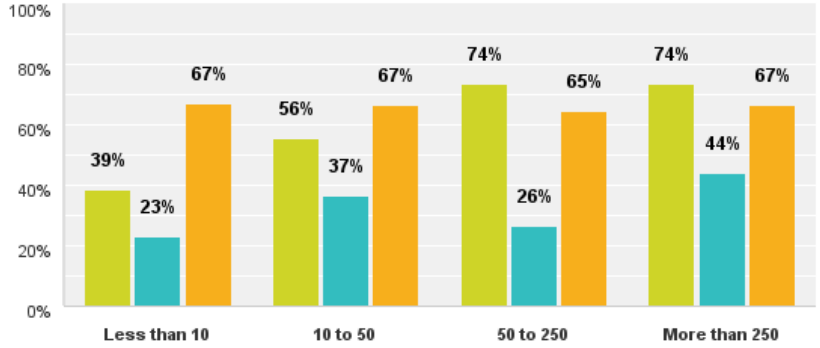

Fig. 2 cloud service model used, by number of empoyees

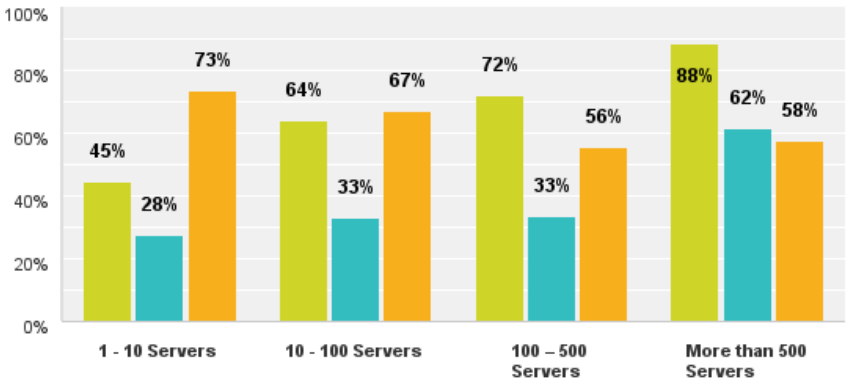

Fig. 3 cloud service model used, by cloud demand

From Fig. 4 we can conclude that **Private** and **public** cloud deployments have a similar adoption.

Entrepreneurs will find interesting the clear market opportunity for the **Hybrid** model. Fig. 4 suggests it is likely to experiment a significant growth in the future.

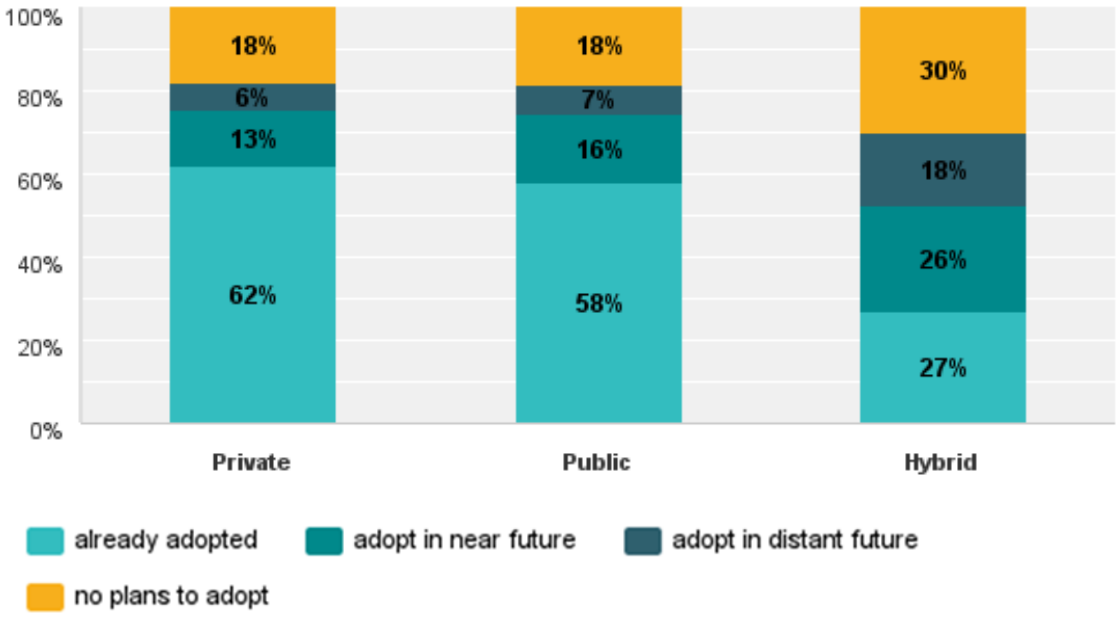

Fig. 4 Cloud deployment model, global results

Fig. 5 shows clearly that bigger companies (in terms of number of employees and cloud demand) have a higher adoption rate of private cloud.

Regardless of company size, most of them plan to adopt hybrid clouds in the near or distant future. It is interesting to note that bigger companies, especially those with really high computing demands, are ahead of the trend and have a higher adoption rate already.

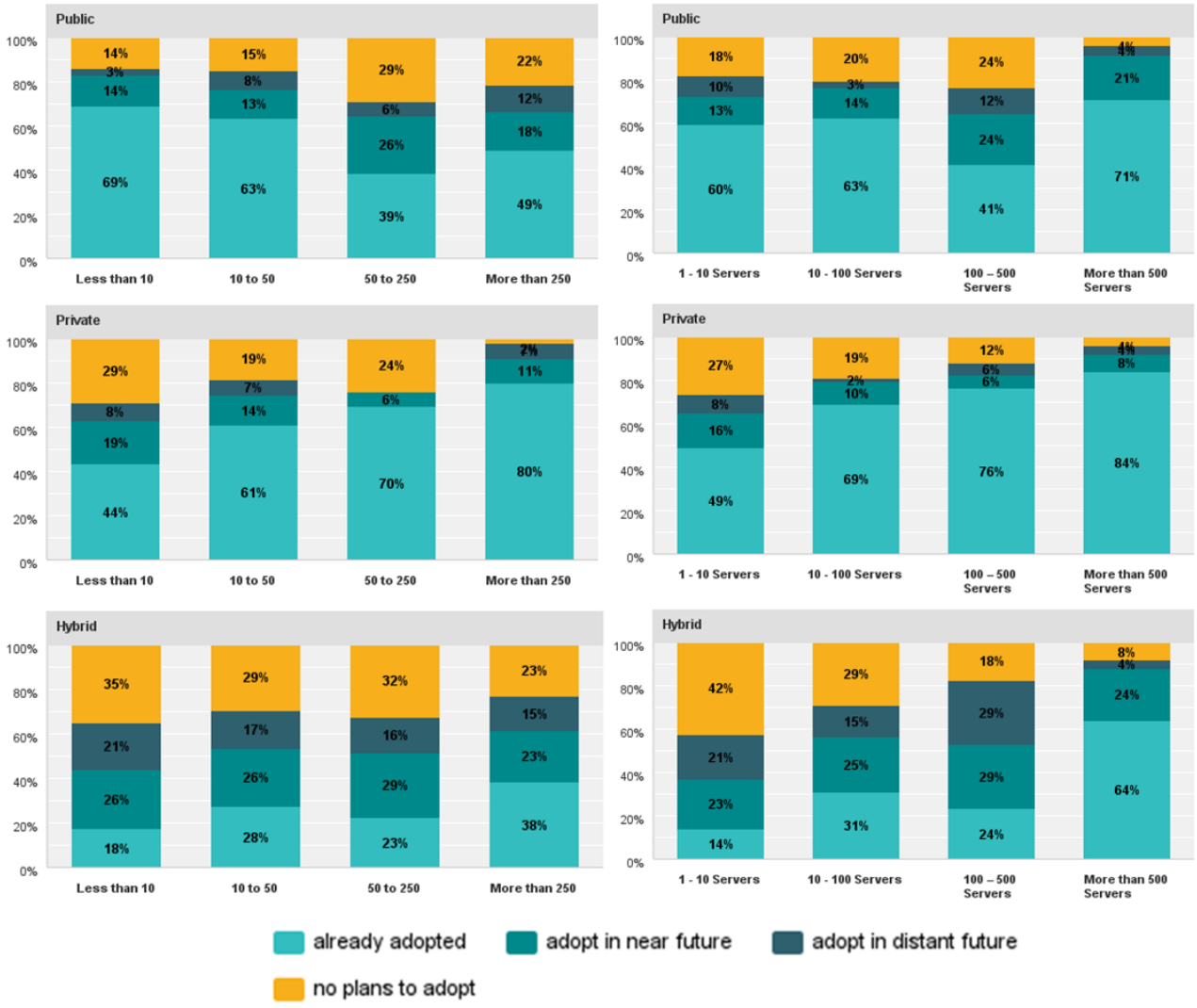

Fig. 5 Cloud deployment model, by number of employees (left) and cloud demand (right)

Cloud Model Adoption

- SaaS is the most widely used model at 67%, followed by IaaS (58%) and PaaS (37%)
- Big companies with high computing demands show a bigger adoption of the IaaS and Private cloud models
- Private and public cloud deployments have a similar adoption rate
- There is a clear market opportunity for the Hybrid model. It is likely to experiment a significant growth in the future

4.2. Motivators and Barriers

The top 3 reasons for cloud adoption are related to the infrastructure management benefits that the cloud paradigm brings: More flexible and quick scalability, redundancy and high availability, and faster deployments of new projects.

Our recommendation is that these top motivators should be advertised as benefits of new cloud products.

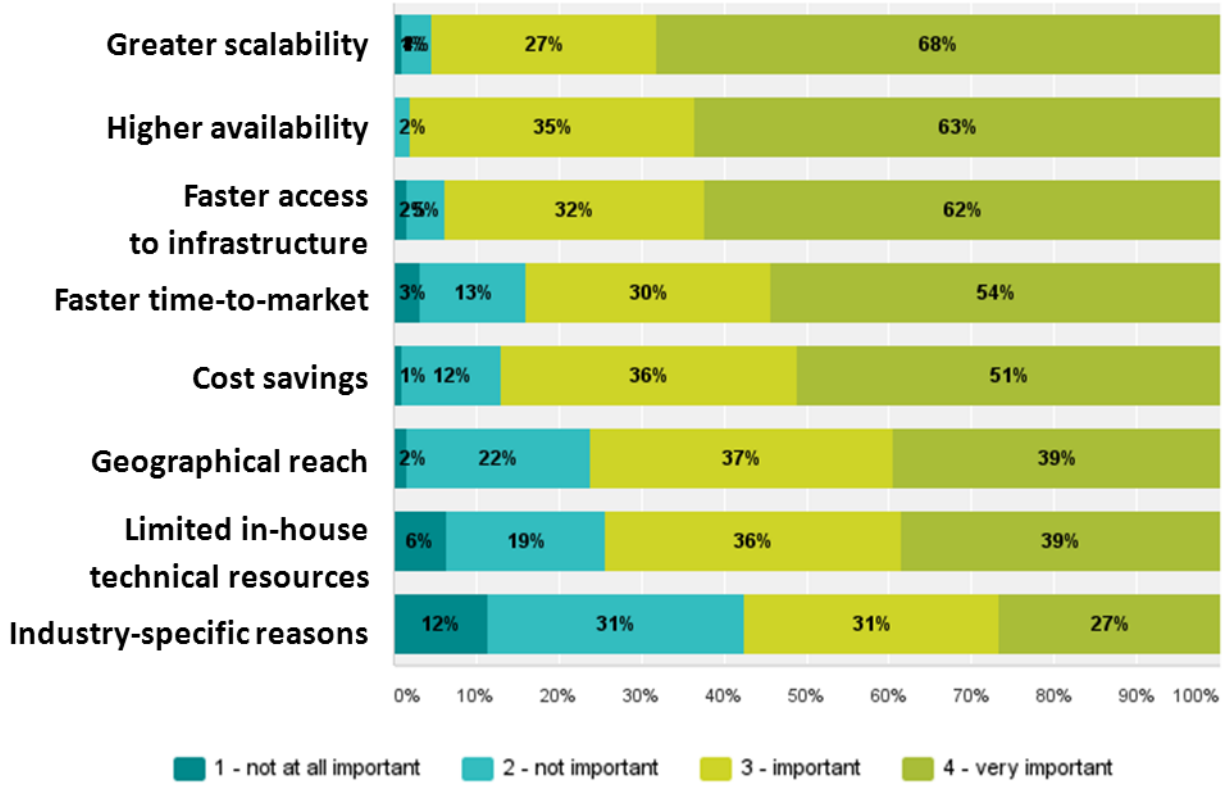

Fig. 6 Motivators to move to the cloud, global results

In Fig. 7 we cross-referenced the motivators to move to the cloud with the number of employees. We can see that having limited in-house technical resources is a more recurring answer for smaller companies.

New offerings targeting small companies can take advantage of this information, by making their product differentiator **simplicity** to use and to operate, even by a small team.

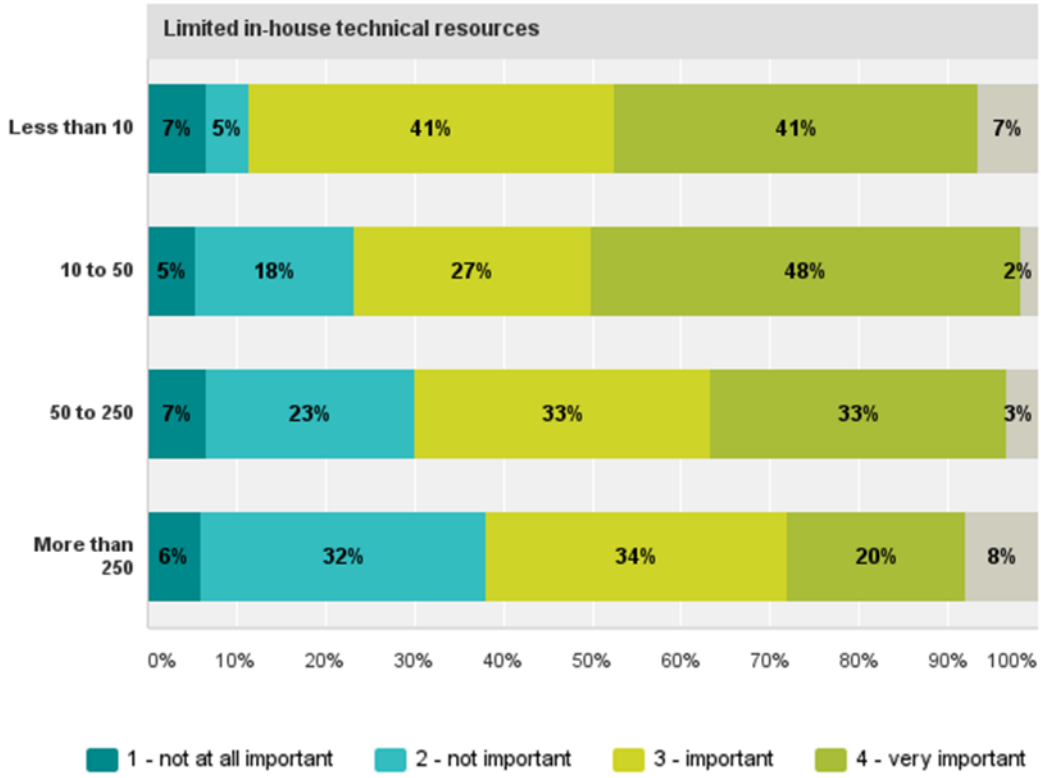

Fig. 7 Motivators to move to the cloud. Limited in-house technical resources answer, by number of employees

The main barriers to move to the cloud, as can be seen in Fig. 8, are:

1. Security concerns
2. Fear of vendor lock-in
3. Integration (to private cloud, to internal systems and between platforms)
4. SLA performance is not acceptable
5. Lack of budget
6. Lack of management buy-in
7. Lack of certified providers
8. Lack of support from IT
9. Lack of in-house capability to evaluate cloud solutions
10. Lack of information about cloud

It is noteworthy that the 3 more important barriers that organizations encounter when they try to move to the cloud are **technical**: security concerns, fear of vendor lock-in, and integration to their existing infrastructure.

The lack of information and people to evaluate and implement cloud solutions are also issues, although not so important.

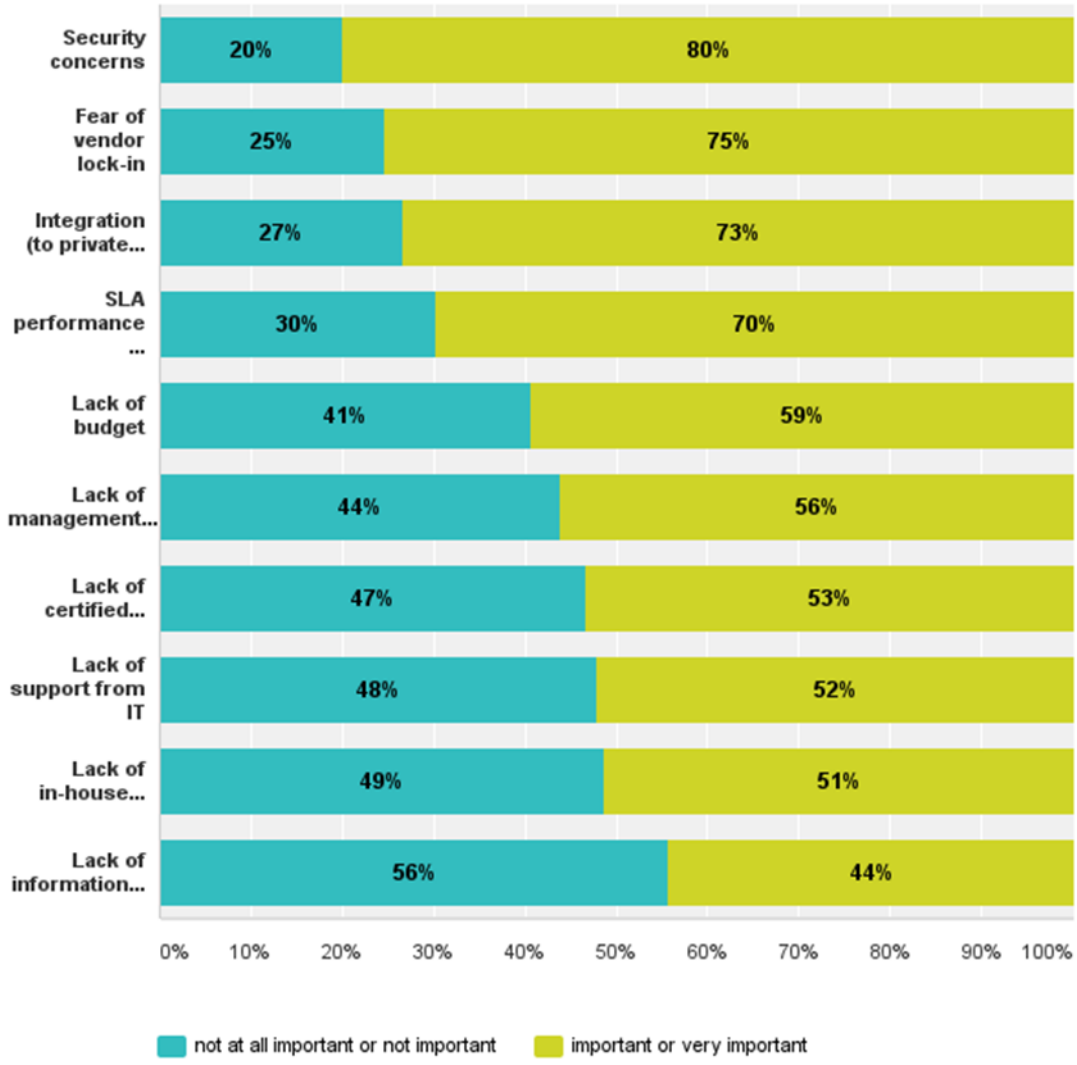

Fig. 8 Barriers to move to the cloud, global results

The integration of cloud solutions with existing internal systems is an issue that companies with more years on the market see as more important (see Fig. 9).

The companies with a bigger demand for cloud servers (Fig. 10) also consider the integration to private clouds and systems a more important barrier to cloud adoption.

Young companies, or those with a small cloud demand, should be aware that this may be an issue for them in the future. To plan for it, they should study the compatibility of public cloud offerings with internal systems they may have in place.

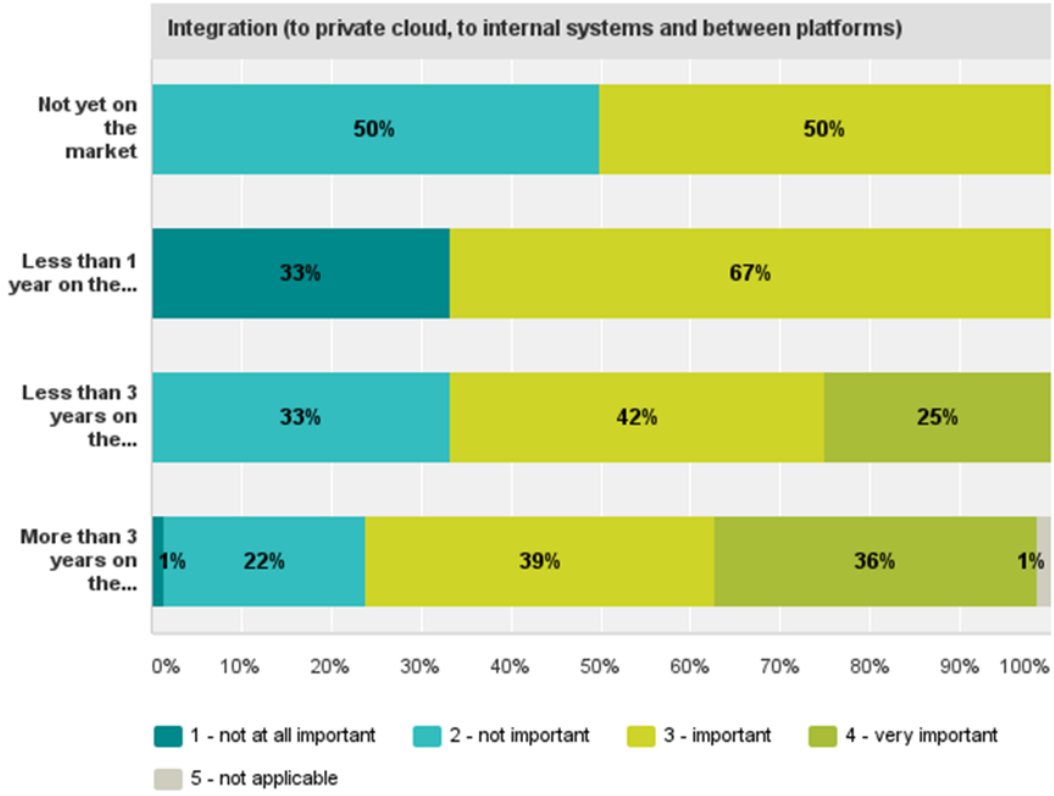

Fig. 9 Barriers to move to the cloud, by number of years on the market

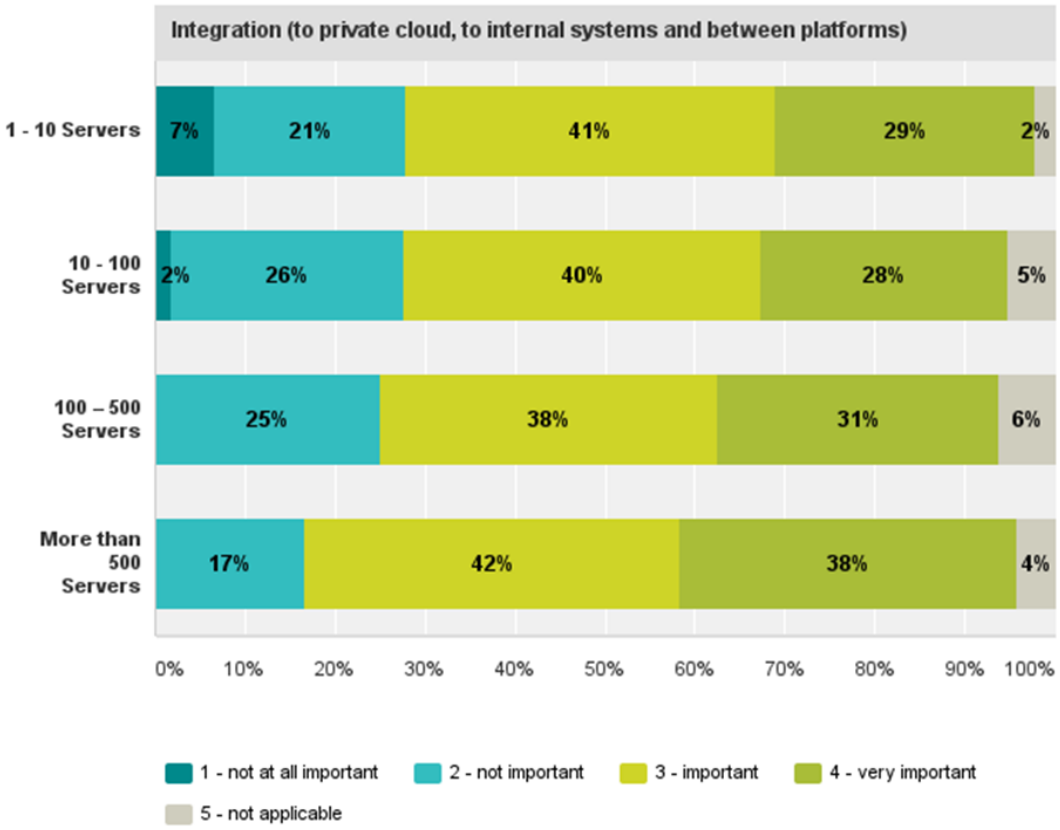

Fig. 10 Barriers to move to the cloud, by cloud demand

Compared to other industries, organizations operating in the banking consider the integration to private clouds and systems a bigger obstacle to adoption (Fig. 11).

Companies developing products in this industry can take note of this fact, and pay special attention to their integration capabilities.

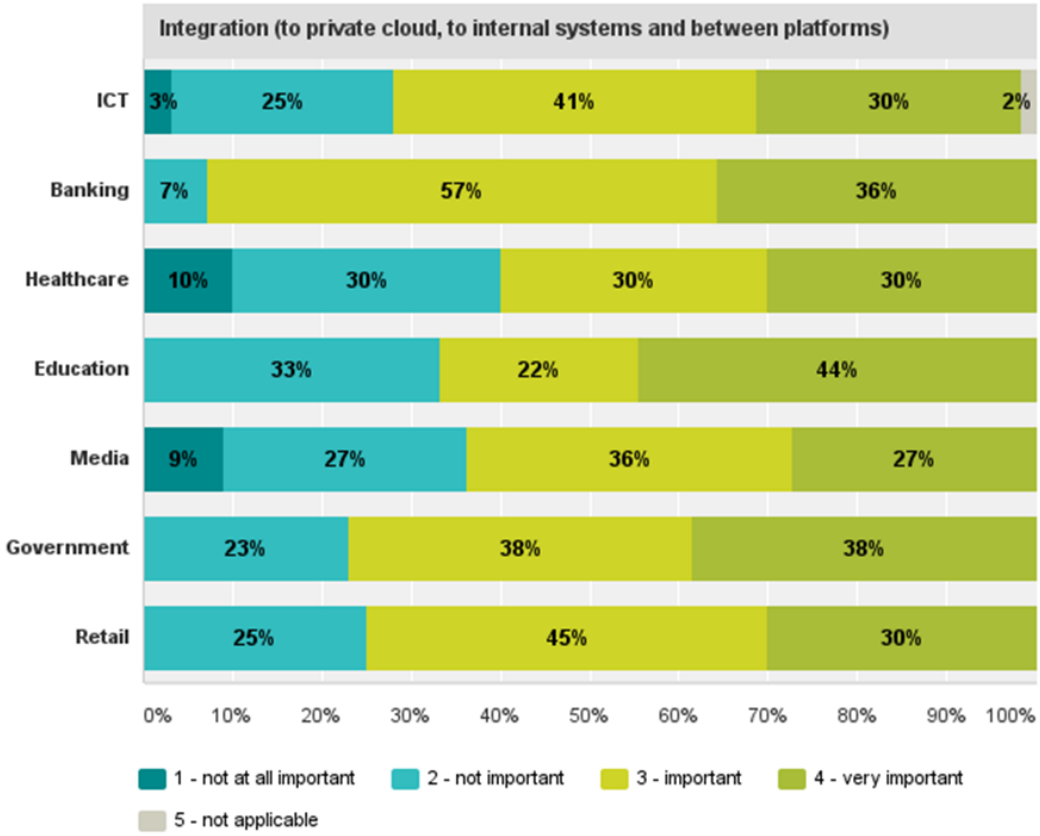

Fig. 11 Barriers to move to the cloud, by industry

Motivators for Cloud Adoption

- Companies will expect the benefits inherent to Cloud Computing: flexible and quick scalability, redundancy and high availability, fast deployments
- Small companies move to the cloud to avoid dealing with technical complexity in-house. If you target start-ups, advertize your product's **simplicity** to use and to operate

Barriers to Cloud Adoption

- Be aware of the main concerns that potential users have before adoptiong a cloud solution: **security**, vendor **lock-in**, and **integration** to existing infrastructure
- The **integration** with existing private clouds and internal systems is a bigger concern for companies with more years in the market, and high cloud demand
- Research your target market. For example, companies in the banking industry report integration to internal systems as a much bigger obstacle than other insdustries

4.3. Data Security

Having the possibility to keep the data in your own country, under the same legislation, is a very important issue. As Fig. 12 shows, 70% of the participants consider it important or very important.

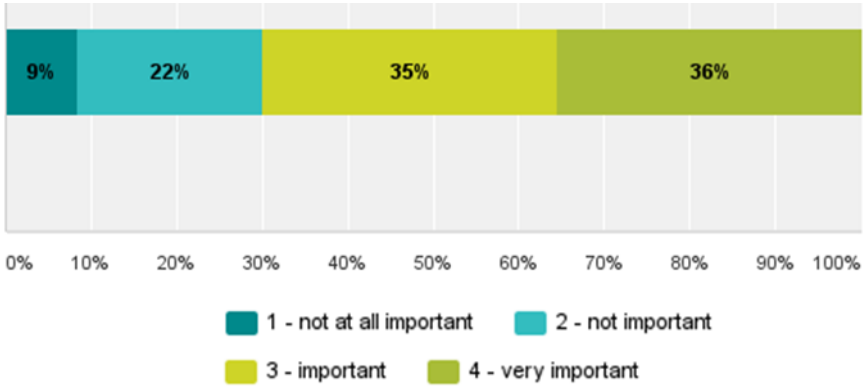

Fig. 12 Importance of keeping the data in the same country, global results

When the results are grouped by the number of employees (Fig. 13), the data shows that it is a more important consideration for bigger companies.

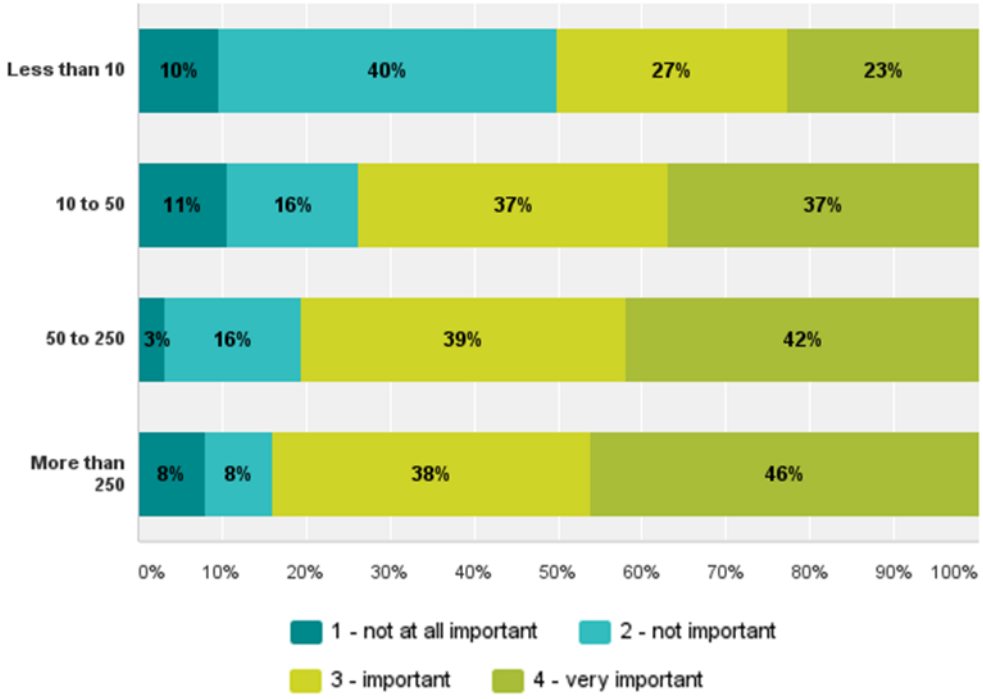

Fig. 13 Importance of keeping the data in the same country, by number of employees

Fig. 14 groups the results by the type of organization. Government and academia organizations are more concerned about whether or not the data is located in their own country.

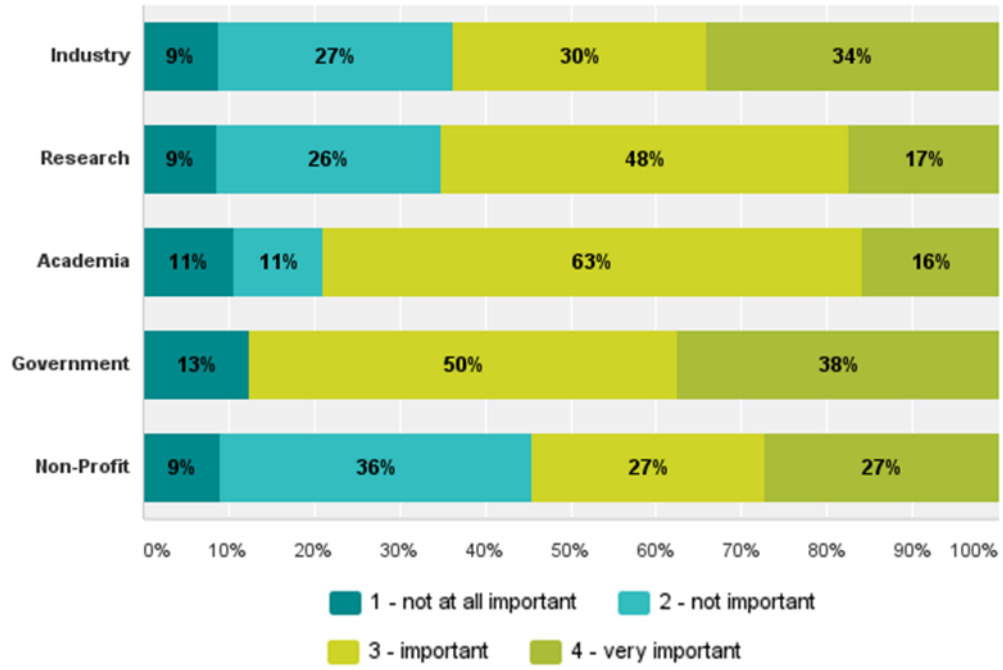

Fig. 14 Importance of keeping the data in the same country, by type of organization

Regarding data security, we asked the participants about the specific data protection clauses that they want to see in Service Level Agreements (Fig. 15). The results are:

1. Data privacy
2. Data ownership
3. Data location
4. Data portability
5. Data breaches
6. Legal/government requests to data

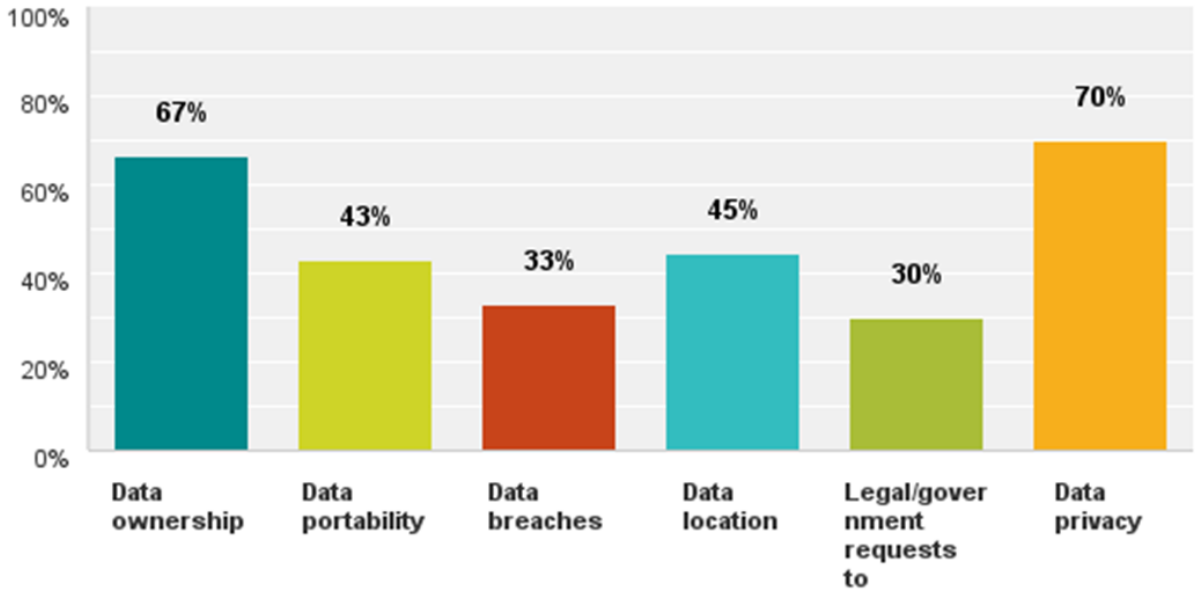

Fig. 15 Most desired SLA characteristics, global results

From the perspective of each Industry studied (see Fig. 16), we can see that companies working in **Education** and **Media** have a higher interest than the rest in both **Data portability** and **Data privacy**.

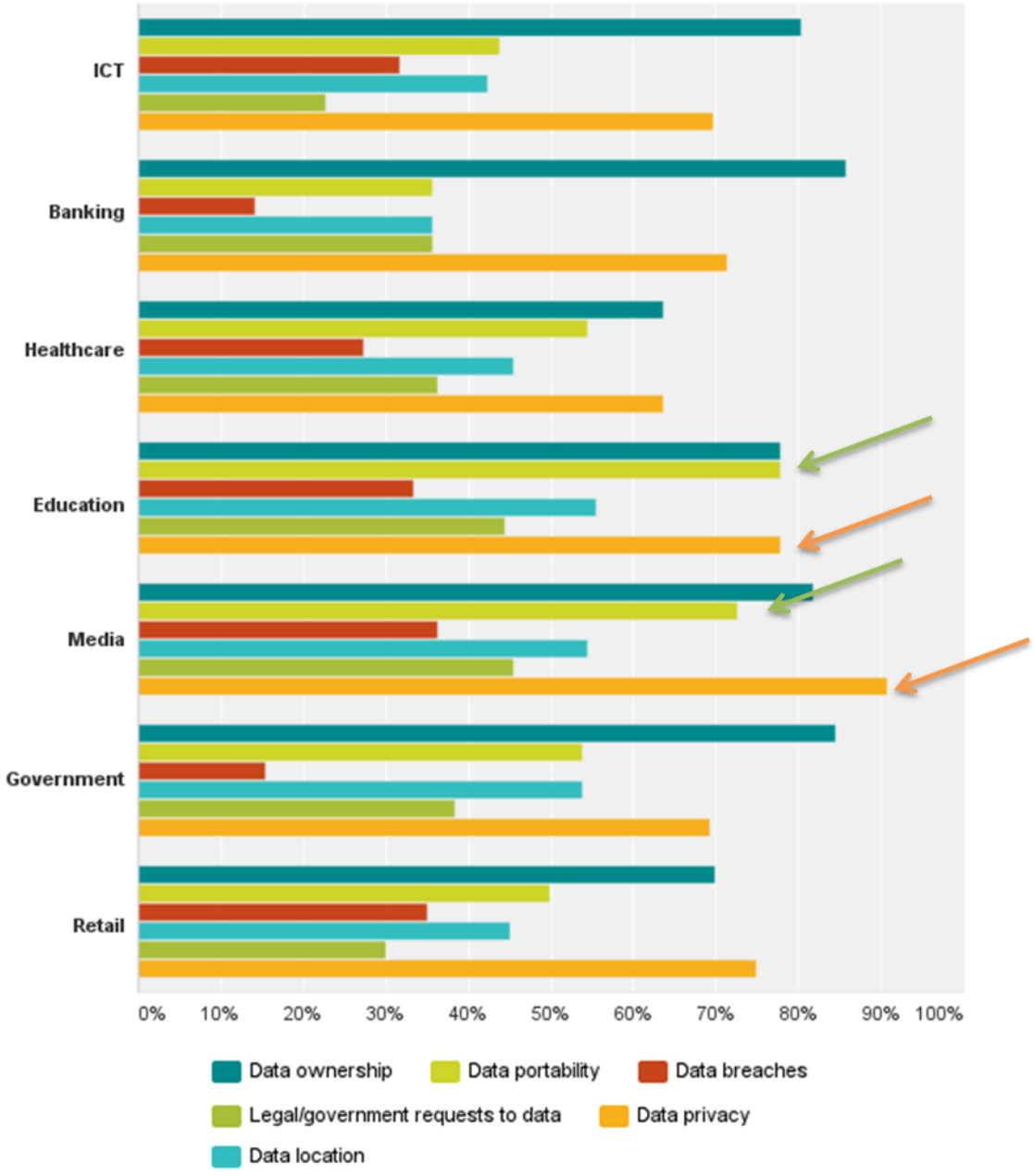

Fig. 16 Most desired SLA characteristics, by industry

Data Location

- The location of the data in the customer's country, under the local legislation, is a very important issue
- It is more important for bigger companies
- Government and academia organizations are more concerned about it

Data Protection

- Users want to see data protection in the Service Level Agreements
- The most requested clauses are data **privacy** and **ownership**
- Companies working in Education and Media industries have a higher interest in both data **portability** and **privacy**

4.4. Security Control

For the security and control mechanisms required from a service provider, the participants chose user authentication control, backup and confidentiality as the most important aspects.

The list of answers from Fig. 17 is reproduced here for better readability:

1. User authentication control
2. Backup
3. Confidentiality
4. User Rights (authorization)
5. Integrity
6. Threat detection
7. Logs and audit trails
8. User authentication integration with current organization identity management system
9. Workload and data isolation

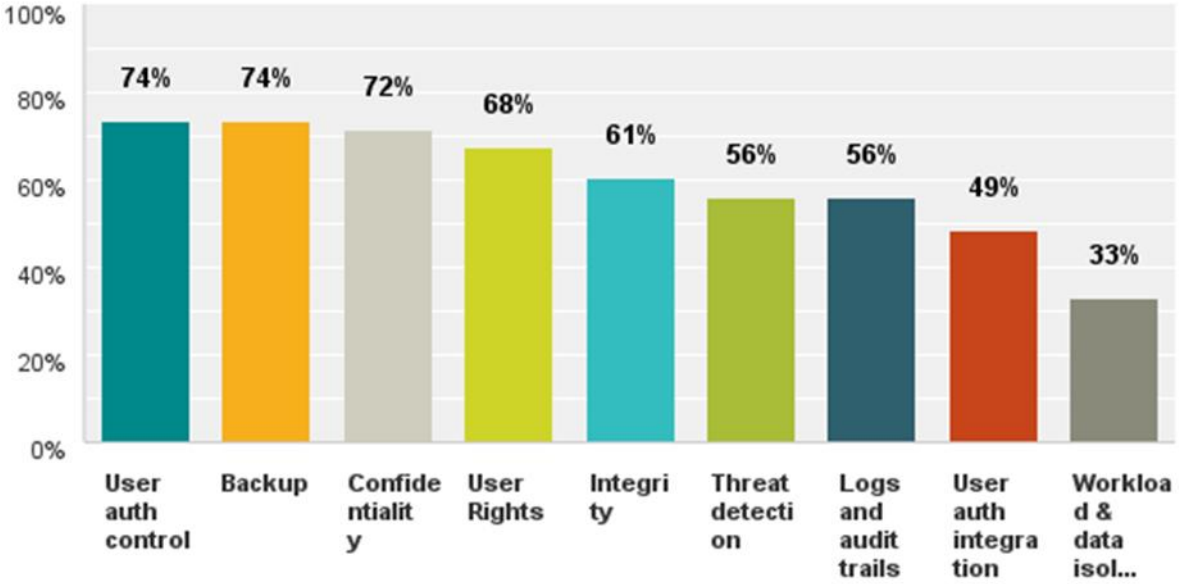

Fig. 17 Type of security and control required, global results

The types of security required by companies are similar regardless of the company size (Fig. 17), although for **start-ups** (less than 10 employees) **Backup** support is relatively more important than the other security features.

Fig. 18 Type of security and control required, by number of employees

Security and Control

- The most valued security and control features are: user authentication control, backup, and confidentiality
- Small companies have a bigger interest in backup support

4.5. Regulatory Compliance

Clearly, **personal data privacy** is the most common regulation that companies have to comply with, regardless of their size.

All the other regulations are more common for bigger companies.

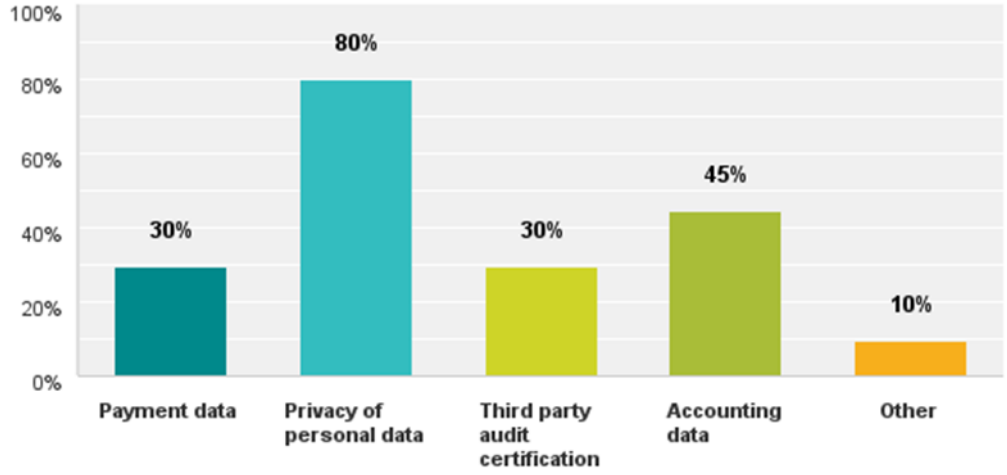

Fig. 19 Regulatory compliance requirements, global results

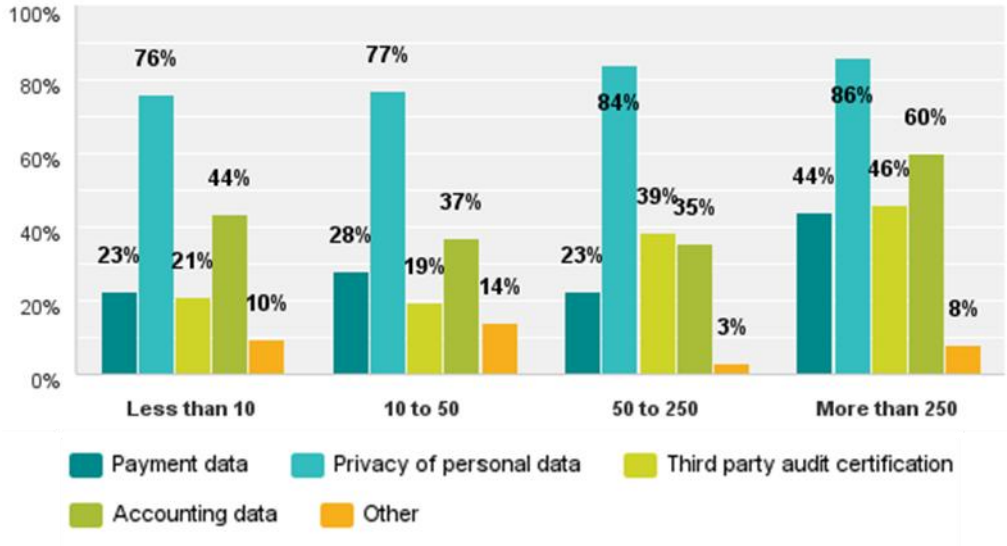

Fig. 20 Regulatory compliance requirements, by number of employees

Regulatory Compliance

- Companies have to comply with many different regulatory requirements.
- **Personal data privacy** is the most common.

4.6. Interoperability

The availability of **Standard APIs** is the most valued interoperability aspect that organizations look for in a cloud offering. Having support for standard APIs opens the door to integrations with third-party products that can provide added value. For example, an IaaS provider may not have advanced Virtual Machine orchestration like scalability and load balancing, but this could be accomplished by third-party software if they offer a standard API for their infrastructure.

Data portability is the second most valued aspect. It is the ability to retrieve and put the user's data into a new provider.

Entrepreneurs developing new products may want to force the lock-in of their users making it impossible to export the data once it enters their infrastructure. We recommend them to consider the opposite. If their product is not yet an established competitor in their sector, new users will be more willing to try out their offering if they are reassured that the work they put into the new platform can be completely exported to other platforms. On a related note, it will be easier for customers to transition to a new platform if it has a way to import their existing data from similar services they may be using currently.

The portability of **PaaS applications** and **IaaS appliances** are similarly important to our participants. Examples of PaaS portability would be Tomcat containers or Phusion Passenger applications.

Virtual Machine contextualization comes last. This refers to the method used to customize the Virtual Machine instances when they are launched using, for example, cloud-init.

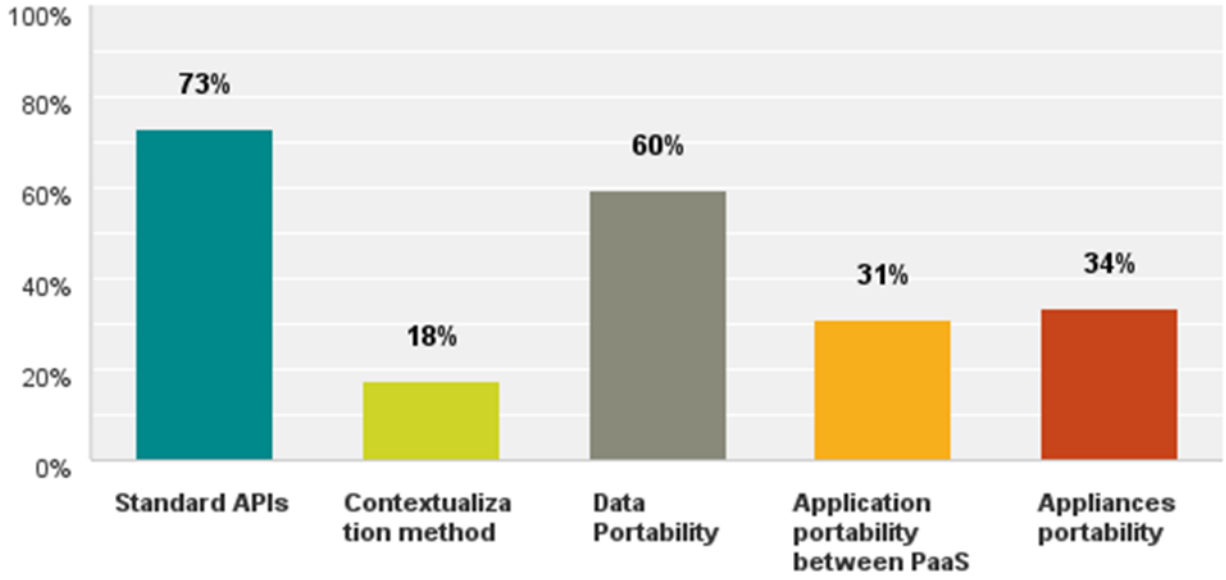

Fig. 21 Most valued interoperability aspects, global results

Bigger companies, and those with more years on the market, value **PaaS and IaaS appliance portability** more than small, young companies.

We have addressed the importance of **data portability** from the perspective of an entrepreneur developing a cloud product, but it is also something important to consider from the perspective of a startup using cloud services. The importance of **data portability** is not affected by the company size, but it is more valued by companies with more years on the market. A recently created company should expect that in the next years they may have to migrate their data to a new cloud solution.

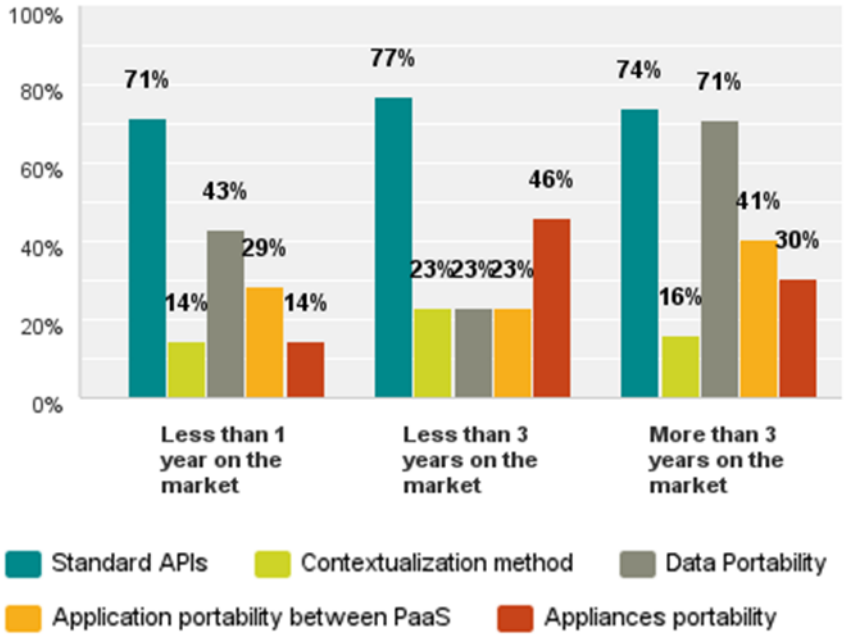

Fig. 22 Most valued interoperability aspects, by years on the market

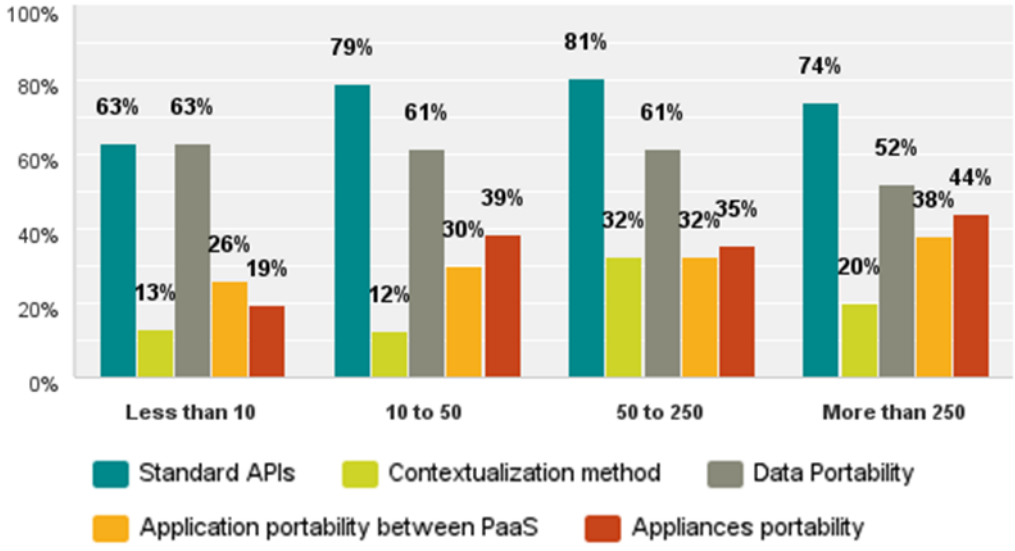

Fig. 23 Most valued interoperability aspects, by number of employees

Interoperability

- The availability of standard APIs is the most valued interoperability aspect
- Data portability is the second one. Forcing lock-in is a tempting strategy, but being able to export the data from the platform may convince new users

4.7. Integration Support

The most valued integration support from a cloud provider varies greatly by the type of organization. The global results are (Fig. 24):

1. Identity management
2. Database
3. Internal Processes
4. Accounting
5. Billing

Research institutions value database and identity management integration more than other types of organizations.

Governments value integration with the organization **internal processes**, but don't have any interest in **billing**.

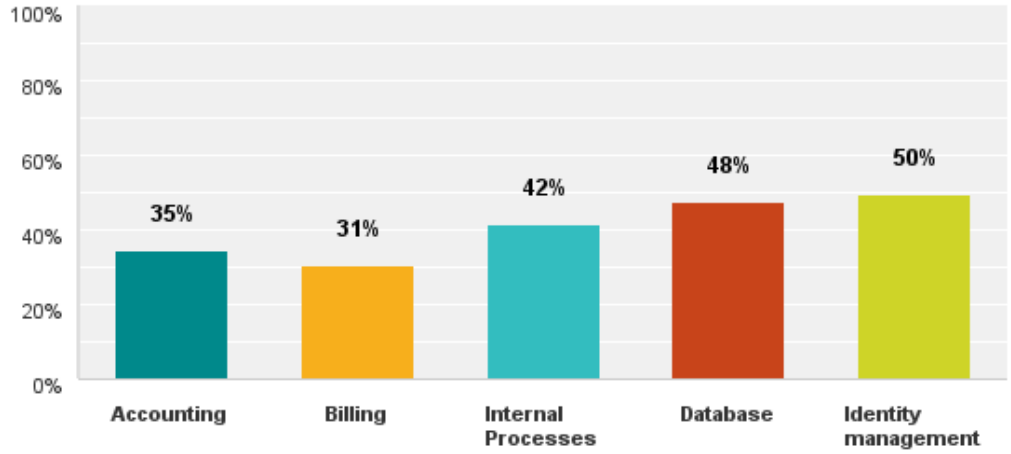

Fig. 24 Most valued integration support, global results

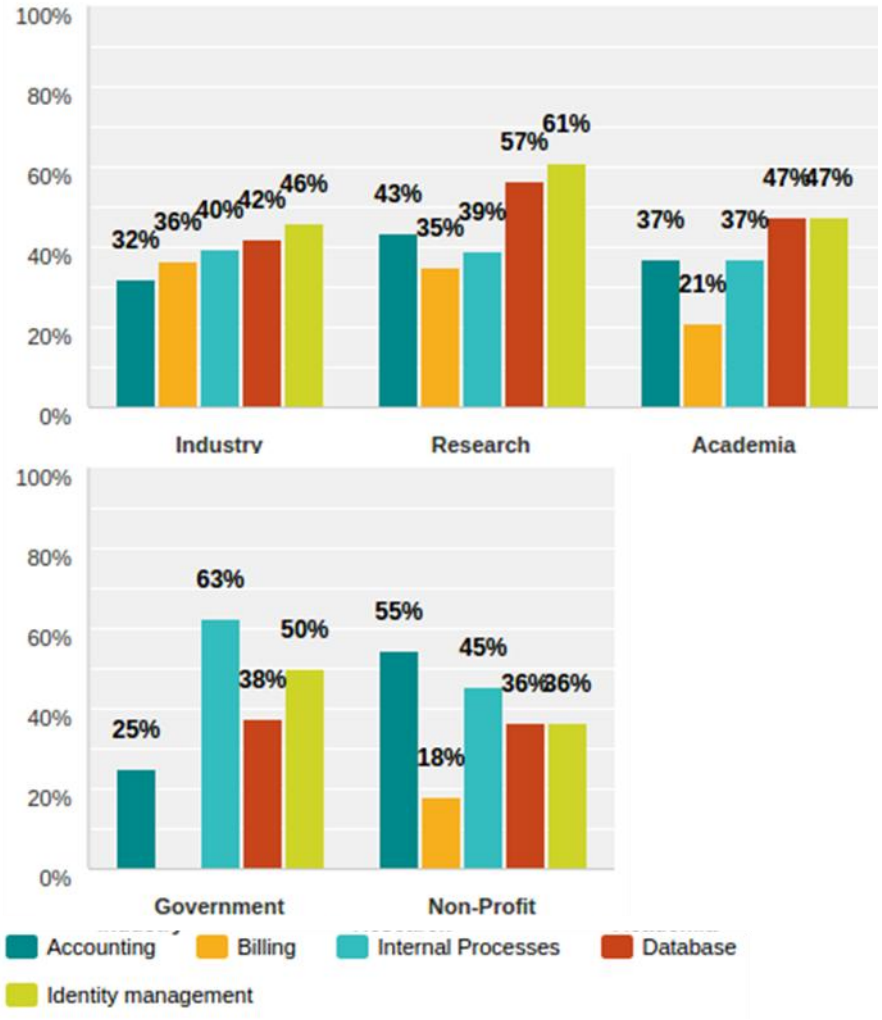

Fig. 25 Most valued integration support, by type of organization

As expected, companies with a high number of employees put more value to the integration with their existing **identity management** systems (Fig. 26).

Companies with more years in the market also value the integration with their **internal processes** (Fig. 27).

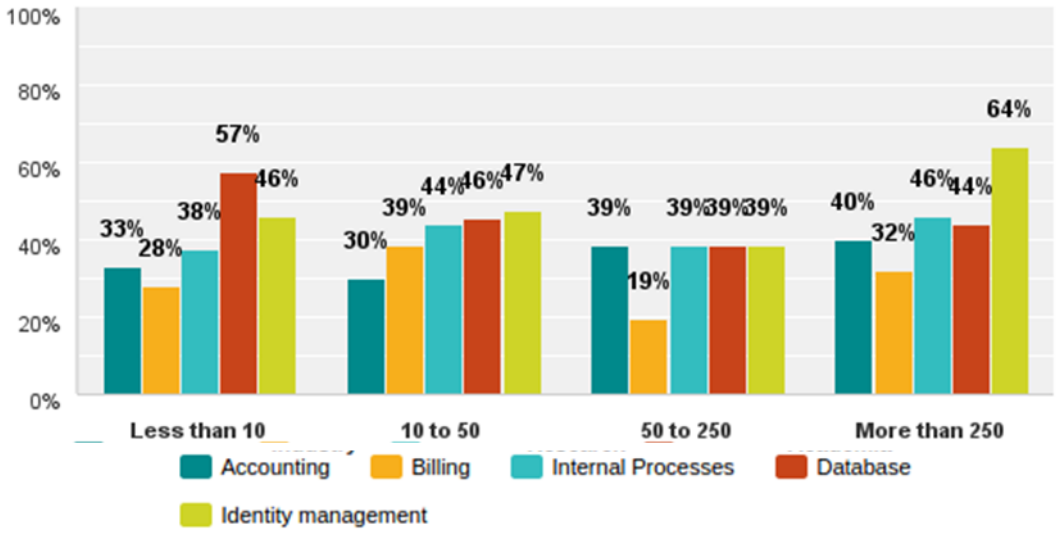

Fig. 26 Most valued integration support, by number of employees

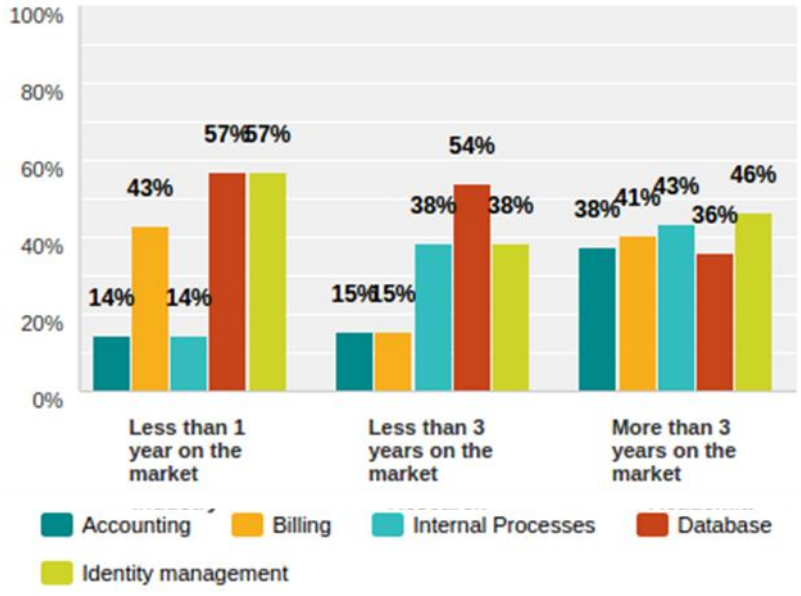

Fig. 27 Most valued integration support, by years on the market

Integration

- The most valued integration support from a cloud provider varies greatly by the type of organization
- **Research** institutions value database and identity management integration more than other types of organizations
- **Governments** value integration with the organization **internal processes**, but don't have any interest in **billing**
- Companies with a high number of employees put more value to the integration with their existing **identity management** systems
- Companies with more years in the market also value the integration with their **internal processes**

4.8. Open Source

The use of Open Source technologies is overall very important for the companies that participated in the survey. It is significantly more important for younger companies (Fig. 29).

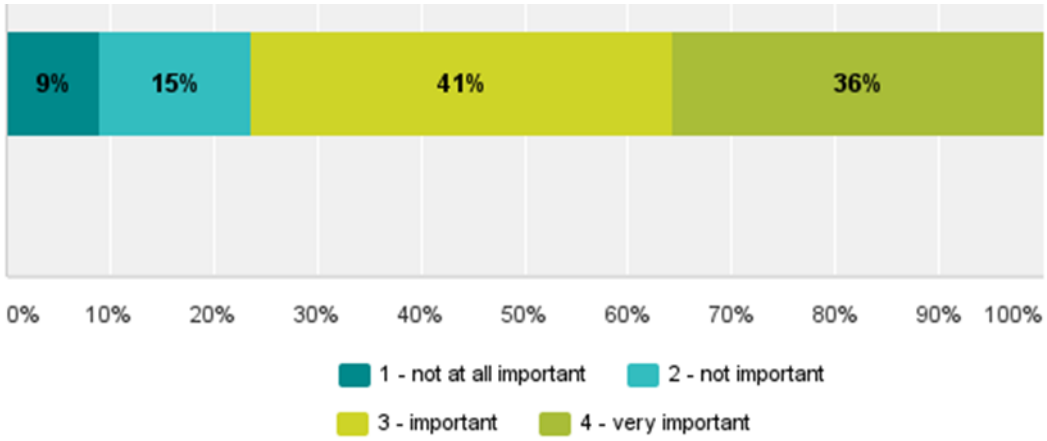

Fig. 28 Appreciation of open source solutions, global results

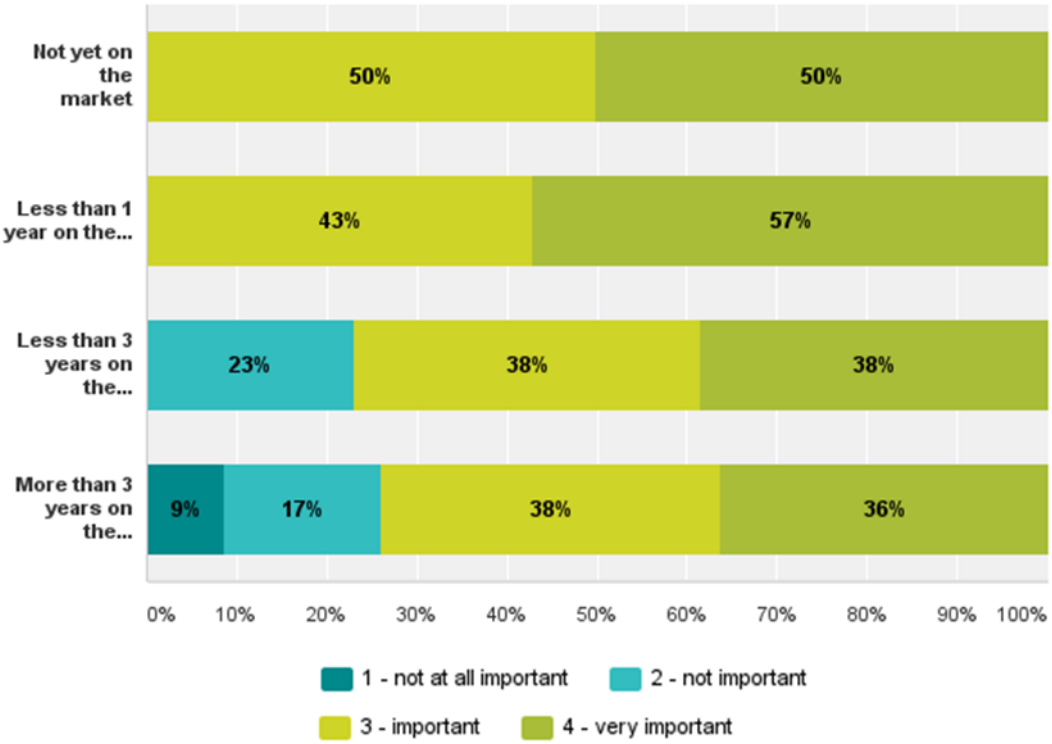

Fig. 29 Appreciation of open source solutions, by years on the market

Companies working in **banking** and **media** are the ones that gave more importance to open source. Healthcare is the industry where Open Source was less valued, although still over 60% of the participants consider it important or very important.

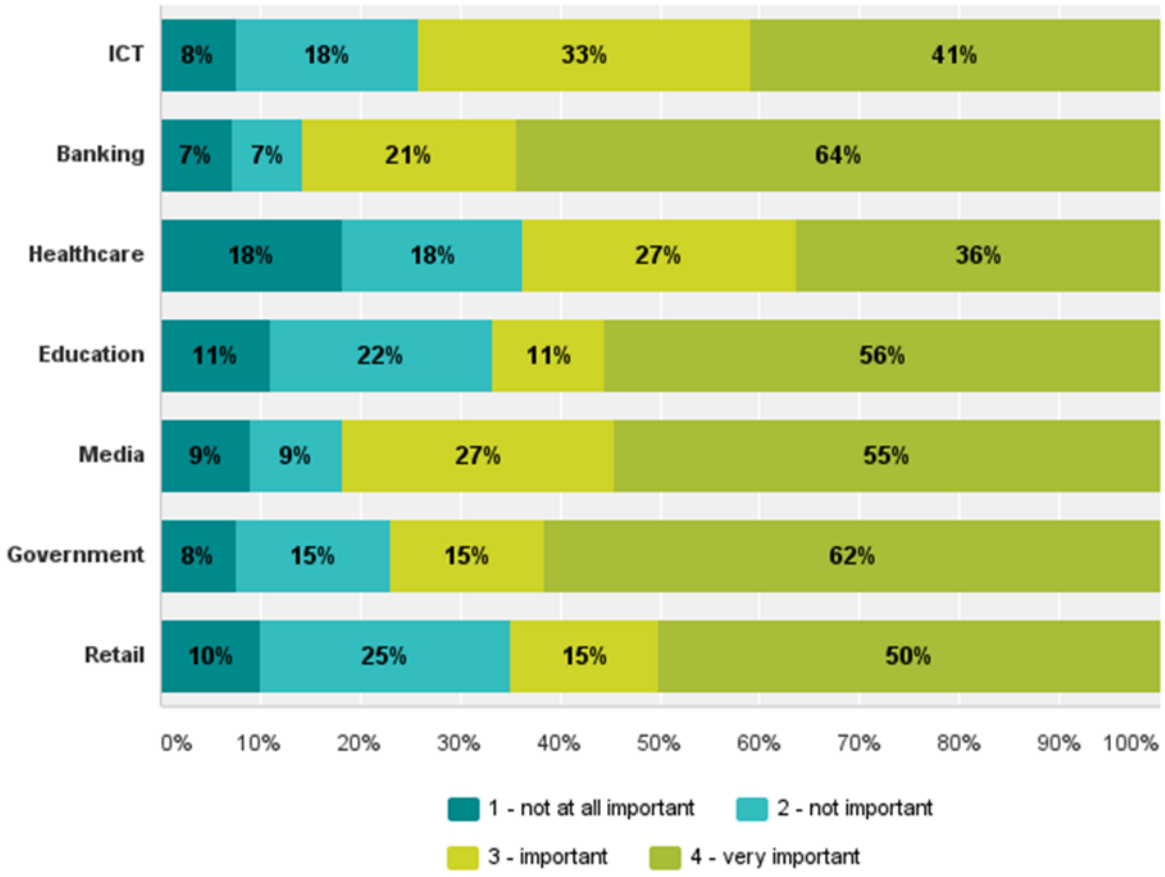

Fig. 30 Appreciation of open source solutions, by industry

If we group the responses by the participant's role in the company, we see that Open Source is more valuable to employees working in IT roles than business.

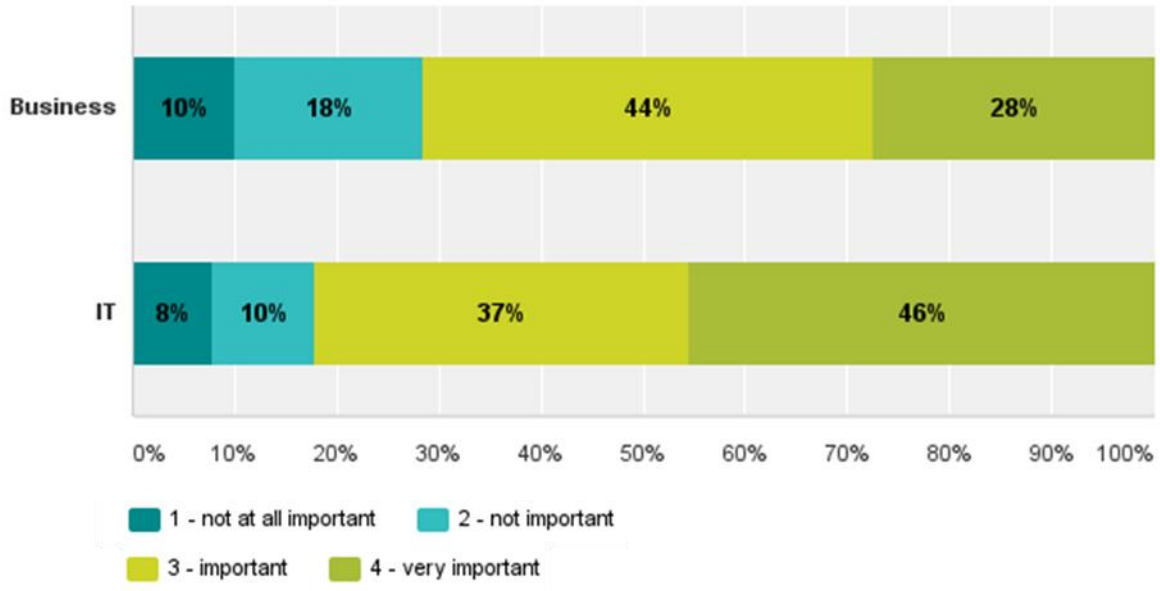

Fig. 31 Appreciation of open source solutions, by role

Fig. 32 shows the main private cloud solutions, and their awareness. The answers were filtered to show only the ones from organizations that are currently using private clouds.

In line with the results of the open source appreciation question (Fig. 28), **open source** solutions such as OpenStack and OpenNebula are among the top positions.

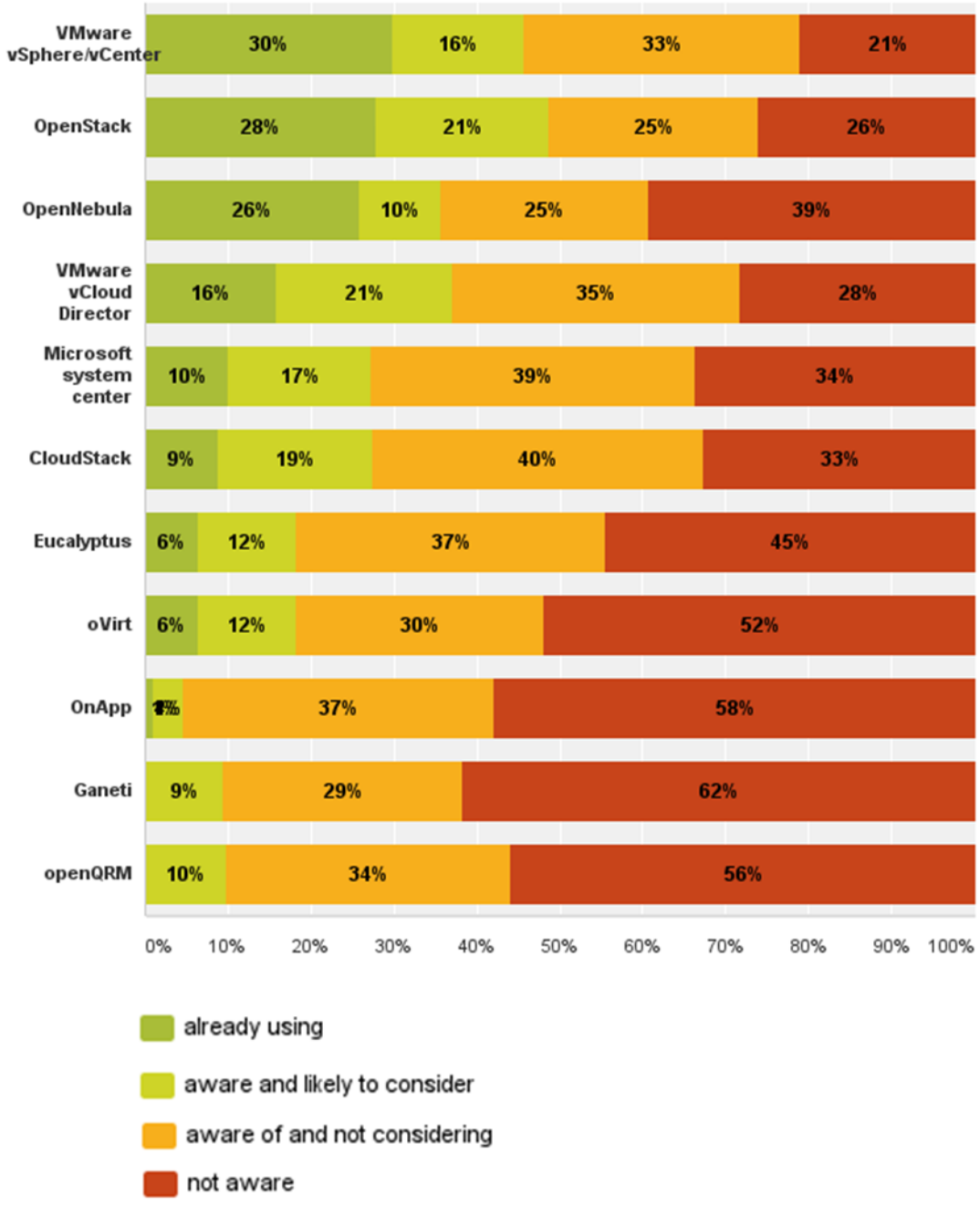

Fig. 32 Awareness of main private cloud solutions

Open Source

- The use of **Open Source** technologies is overall very important
- It is more important for younger companies
- Open Source is reported as more valuable by employees working in IT than the ones in business roles

4.9. Public Cloud APIs

Participants were asked about their usage of public cloud APIs, and the results are (Fig. 33):

1. None
2. AWS
3. OpenStack
4. VMware vCloud
5. OGF OCCI
6. DMTF CIMI

In Fig. 34 the results show that most of the companies with a small amount of servers do not use any public cloud API. As the cloud demand grows, so does the need to access an API to automate processes.

In the current API landscape, there isn't a clear *de jure* standard, and entrepreneurs should also consider supporting the *de facto* APIs in their products.

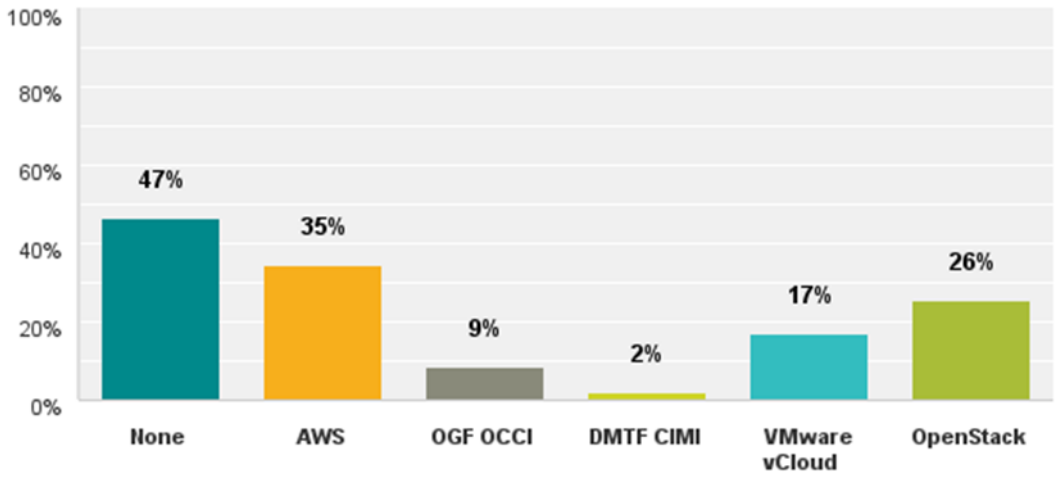

Fig. 33 Usage of public cloud APIs, global results

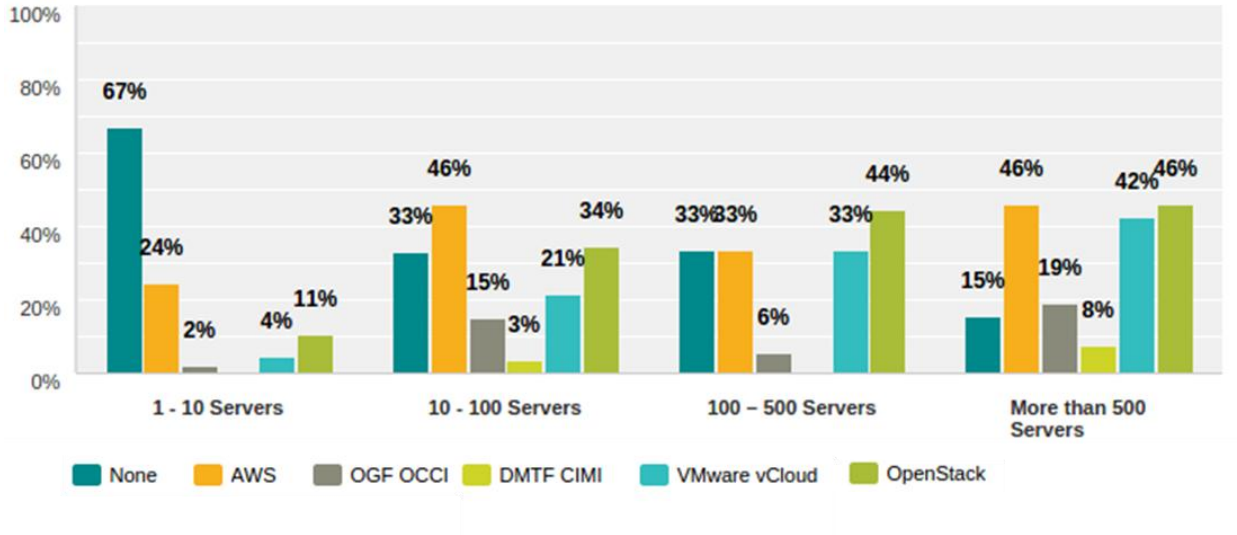

Fig. 34 Usage of public cloud APIs, by cloud demand

Public Cloud APIs

- Most of the companies with a small amount of servers do not use any public cloud API
- As the cloud demand grows, so does the need to access an API to automate processes
- In the current API landscape, there isn't a clear *de jure* standard, and entrepreneurs should also consider supporting the *de facto* APIs in their products

5. Summary of Main Guidelines

In this section we have compiled all the main guidelines and findings from previous sections. These boxes will serve as a starting point to create dissemination material in the form of cheatsheets for entrepreneurs and start-ups, to raise interest about the Cloud Catalyst project.

Cloud deployment model

- IaaS is the cloud type with fastest growth
- Hybrid cloud will be the main deployment model, increasing interest in combining private and public clouds for performance and security reasons.

Top reasons for using the cloud:

- Agility
- Scalability
- Cost Saving

Main barriers to cloud adoption:

- SLA
- Control
- Security
- Performance
- Interoperability (no lock-in)
- Regulatory compliance
- Integration with existing services within the organization

Cloud Model Adoption

- SaaS is the most used model at 67%, followed by IaaS (58%) and PaaS (37%)
- Big companies with high computing demands show a bigger adoption of the IaaS and Private cloud models
- Private and public cloud deployments have a similar adoption rate
- There is a clear market opportunity for the Hybrid model. It is likely to experiment a significant growth in the future

Motivators for Cloud Adoption

- Companies will expect the benefits inherent to Cloud Computing: flexible and quick scalability, redundancy and high availability, fast deployments
- Small companies move to the cloud to avoid dealing with technical complexity in-house. If you target start-ups, advertize your product's **simplicity** to use and to operate

Barriers to Cloud Adoption

- Be aware of the main concerns that potential users have before adoptiong a cloud solution: **security**, vendor **lock-in**, and **integration** to existing infrastructure
- The **integration** with existing private clouds and internal systems is a bigger concern for companies with more years in the market, and high cloud demand
- Research your target market. For example, companies in the banking industry report integration to internal systems as a much bigger obstacle than other insdustries

Data Location

- The location of the data in the customer's country, under the local legislation, is a very important issue
- It is more important for bigger companies
- Government and academia organizations are more concerned about it

Data Protection

- Users want to see data protection in the Service Level Agreements
- The most requested clauses are data **privacy** and **ownership**
- Companies working in Education and Media industries have a higher interest in both data **portability** and **privacy**

Security and Control

- The most valued security and control features are: user authentication control, backup, and confidentiality
- Small companies have a bigger interest in backup support

Regulatory Compliance

- Companies have to comply with many different regulatory requirements.
- **Personal data privacy** is the most common.

Interoperability

- The availability of standard APIs is the most valued interoperability aspect
- Data portability is the second one. Forcing lock-in is a tempting strategy, but being able to export the data from the platform may convince new users

Integration

- The most valued integration support from a cloud provider varies greatly by the type of organization
- **Research** institutions value database and identity management integration more than other types of organizations
- **Governments** value integration with the organization **internal processes**, but don't have any interest in **billing**
- Companies with a high number of employees put more value to the integration with their existing **identity management** systems
- Companies with more years in the market also value the integration with their **internal processes**

Open Source

- The use of **Open Source** technologies is overall very important
- It is more important for younger companies
- Open Source is reported as more valuable by employees working in IT than the ones in business roles

Public Cloud APIs

- Most of the companies with a small amount of servers do not use any public cloud API
- As the cloud demand grows, so does the need to access an API to automate processes
- In the current API landscape, there isn't a clear *de jure* standard, and entrepreneurs should also consider supporting the *de facto* APIs in their products