CLOUDCATALYST
Cloud Trends and Critical Success Factors for European SMEs
INDEX

CLOUDCATALYST PROJECT:
BACKGROUND, OBJECTIVES, OUTPUTS AND TARGETS

CLOUD COMPUTING TRENDS:
SURVEY DEMOGRAPHICS, KEY FINDINGS

CRITICAL SUCCESS FACTORS:
OVERCOME TECHNICAL CHALLENGES FOR CLOUD EXPANSION
WHY CLOUDCATALYST?

PROJECT BACKGROUND

Cloud Computing adoption will contribute to increase the competitiveness of EU economy

The challenges of cloud computing expansion imply huge entrepreneurial opportunities

Partners have launched successful cloud initiatives and reach a vast network of stakeholders

Companies have a clear advantage in using cloud computing – more flexibility and lower fixed costs. Startups can get started in no-time with a pay as you go model

It is fundamental to develop highly efficient go-to-the-market strategies, focused on entrepreneurship acceleration and business exploitation.

CloudCatalyst initiatives will foster collaboration between cloud stakeholders interested in the creation or expansion of innovative products and services.
CloudCatalyst is a team of 5 partners from complementary areas:

- **INDUSTRY**: Portugal Telecom and Si-MOBIL
- **INCUBATOR**: Science and Technology Park of the University of Porto (UPTEC)
- **ACADEMIA**: Universidad Complutense of Madrid (UCM)
- **ASSOCIATION**: EuroCloud Association
WHAT ARE CLOUDCATALYST OBJECTIVES?

OBJECTIVE 1
Support entrepreneurs, researchers, and software developers to create value-added Cloud products and services

OBJECTIVE 2
Increase the awareness of Cloud Computing benefits and positive impact in the European economy

ACTIONS TO FOSTER THE EMERGENCE OF A STRONG AND ENTHUSIASTIC COMMUNITY OF CLOUD ADOPTERS AND SUPPORTERS IN EUROPE
### WHAT WILL BE CLOUDCATALYST RESULTS?

**MAIN OUTPUTS (1|2)**

| SUPPORT ENTREPRENEURS, RESEARCHERS, AND SOFTWARE DEVELOPERS TO CREATE VALUE-ADDED CLOUD PRODUCTS AND SERVICES |
| MAJOR CLOUD TRENDS | STRATEGIC PLANNING FOR CLOUD ADOPTION | CLOUD ACCELERATOR TOOLBOX | GO-TO-THE-CLOUD SERVICE |
WHAT WILL BE CLOUDCATALYST RESULTS?

MAIN OUTPUTS (2|2)

<table>
<thead>
<tr>
<th>Increase the awareness of cloud computing benefits and positive impact in the European economy</th>
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<tbody>
<tr>
<td><strong>Bootcamps for Startups and SMES</strong></td>
</tr>
<tr>
<td><strong>Dynamic Website for the Cloud Community</strong></td>
</tr>
<tr>
<td><strong>Workshops and Annual Conferences</strong></td>
</tr>
<tr>
<td><strong>Strong Exploitation Strategy</strong></td>
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CLOUD COMPUTING TRENDS

AN ONLINE SURVEY HAS BEEN CONDUCTED IN JULY AND AUGUST 2014

THE OBJECTIVES OF THE SURVEY WERE TO:

✓ Identify broad-based cloud adoption trends
✓ Identify drivers and barriers to adoption
✓ Identify decision making patterns according to different target groups

PRIMARY GROUP OF RESPONDENTS

Organizations using or planning to use cloud computing

TOTAL NUMBER OF RESPONDENTS:

GLOBAL 308
STARTUPS 32
SURVEY DEMOGRAPHICS

Role of Respondents
- Business: 166
- IT: 135

Responses by Organization Type
- Academia
- Government: 28
- Industry: 25
- Non-Profit: 16
- Non-Profit: 144
- Other: 14
- Research: 74

Position of Respondents
- Director/Manager: 105
- Executive: 84
- IT: 41
- Other: 71

Type of Cloud Stakeholder
- Provider: 122
- Developer: 122
- End-User: 164
UNDERSTANDING THE CLOUD COMPUTING STACK

#1: CHOOSE THE CLOUD SERVICE MODEL USED IN YOUR ORGANIZATION

- Cloud adoption predominantly focused in SaaS and IaaS.
- It reflects the main Cloud adoption drivers, concerning criticalness and investment, merging the basic needs of a common business:
  1) Infrastructure (storage and processing capacity)
  2) Software

GLOBAL

Answers 224

STARTUPS

Answers 25
There is a **paradigmatic shift from** the classical deployment models – Public and Private Cloud are clearly predominant in the market – **to a new trend, the Hybrid Cloud** which collects the **biggest intention of future adoption**.

- This applies both to the **Global** and **Startups** samples.
TOP RATED CLOUD SERVICES

#4: CLASSIFY THE SERVICES BELOW, ACCORDING TO THE ADOPTION RATE IN YOUR ORGANIZATION

### GLOBAL

<table>
<thead>
<tr>
<th>Top 5 Already Adopted</th>
<th>No Plans to Adopt</th>
</tr>
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<tbody>
<tr>
<td>E-mail</td>
<td>HCM or Talent Management</td>
</tr>
<tr>
<td>On-line Storage w/ back-up and/or DR</td>
<td>Accounting/Back office</td>
</tr>
<tr>
<td>Infrastructure/ compute power</td>
<td>Business intelligence and analytics</td>
</tr>
<tr>
<td>Sales management</td>
<td>Security</td>
</tr>
<tr>
<td>Content management</td>
<td>System &amp; network management</td>
</tr>
</tbody>
</table>

### STARTUPS

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</tr>
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</table>

- **Already adopted**: E-mail and Online Storage are the **most commonly adopted services**, reflecting a significant maturation in its adoption.

- **No plans to adopt**: Security and business intelligence are the services that are still on hold, once most companies identify them as **low priority services to move to the cloud**.
Amazon Web Services stands out as a reference in the Public Cloud market, leading in both “already using” and “aware and likely to consider” which shows their competitiveness in this field, both in Global and Startups sample.

Competition from players such as Google, Rackspace and others is likely to intensify – market expansion is an imperative for profitable growth.
• **European Public Cloud providers** seem to have **low recognition from the market** as the majority of observations are related to “not aware”. **SAP is the first identified** and notable provider in **Global** sample, **but only few** of the enquired companies are using its **Cloud solutions**.

• **Startups** seem to prefer **CloudSigma** solutions, instead of **SAP’s**, maybe due to **prices**.

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**PUBLIC CLOUD MARKET AWARENESS**

#5: INDICATE IF YOU ARE AWARE/USING THE FOLLOWING PUBLIC CLOUD SOLUTIONS

![Cloud Catalyst Logo]

## GLOBAL

<table>
<thead>
<tr>
<th>Provider</th>
<th>Already Using</th>
<th>Aware and Likely to Consider</th>
<th>Aware of and Not Considering</th>
<th>Not Aware</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAP</td>
<td>24</td>
<td>92</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>CloudSigma</td>
<td>14</td>
<td>47</td>
<td>125</td>
<td></td>
</tr>
<tr>
<td>HP Cloud</td>
<td>25</td>
<td>94</td>
<td>66</td>
<td></td>
</tr>
<tr>
<td>Gigas</td>
<td>6</td>
<td>32</td>
<td>140</td>
<td></td>
</tr>
<tr>
<td>Arsys</td>
<td>9</td>
<td>37</td>
<td>138</td>
<td></td>
</tr>
<tr>
<td>Flexiant</td>
<td>8</td>
<td>40</td>
<td>135</td>
<td></td>
</tr>
<tr>
<td>Avalon</td>
<td>7</td>
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## STARTUPS

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<td>5</td>
<td>15</td>
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<tr>
<td>Gigas</td>
<td>3</td>
<td>17</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Filter: no plans to adopt any solution

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**Answers**

- SAP
- CloudSigma
- HP Cloud
- Gigas
- Arsys
- Flexiant
- Avalon
- CloudSigma
- HP Cloud
- SAP
- Arsys
- Flexiant
- Avalon
- Gigas
The awareness of Public Cloud Providers is higher than of the ones offering Private Cloud.

OpenStack and VMware collect the higher results for notability followed by Microsoft and CloudStack, both in Global and Startups samples.

OpenNebula stands out as the European provider with higher market awareness.
Scalability and availability seem to be the top two motivators for companies move to the Cloud.

The availability of technical resources is not a key differentiator in the Cloud services.

Through we are still in the middle of an economic crisis, cost savings don’t stand out as a driver for cloud adoption. This should be a bigger concern for startups than for larger and more mature companies.
BARRIERS TO CLOUD ADOPTION

#8: RATE THE TOP BARRIERS TO MOVE TO THE CLOUD

- Security stands as the top barrier for cloud adoption, both in Global and Startups samples, which reflects that that businesses are reluctant to trust in Cloud security capabilities.
- Lack of information appears to be a relevant barrier for Startups, which reflects that there should be targeted information for Startups that should be widespread.
The great majority of the enquired companies is aware of their data location.

In global terms, the majority of the companies think that keeping data in their countries is important or very important.

65% of the startups say that it is either not important or not at all important, probably because they are price takers, and not influential enough to negotiate prices in favor to location.
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OVERCOME TECHNICAL CHALLENGES FOR CLOUD EXPANSION
• Identify technical challenges and how to overcome them

• Does European research meet cloud technical Challenges?

• Guidance on use, adoption and Migration to cloud computing
KEY CHALLENGES IN CLOUD COMPUTING

- Interoperability and portability across cloud providers
- Seamless migration of workloads across cloud providers
- Trusted computing
- Proactive autonomic computing
- Elastic management of complex multi-vm services
- Power-efficient applications
- Networking across cloud sites
- Dynamic SLA negotiation
- Dynamic configuration and automated provisioning
- Data integrity, localization and confidentiality

SOURCE: The future of Cloud Computing, January 2010
Advances in Clouds, May 2012
A roadmap for advanced Cloud Technologies under H2020, December 2012
Internet Computing, Key Challenges in Cloud Computing: Enabling the Future Internet of Services, July-August 2013
Tools: Survey through email and online questionnaires
Target: Key experts participating in EU funded projects

Key survey statistics:

• All respondents = 29
  FP7 projects respondents = 25
  Other respondents (CIP, AAL and eInfrastructures) = 4
• FP7 projects response rate = 36%
  From a universe of 69 coordinators (Call 5, 8 and 10), 25 responded to the questionnaire

The survey questions:

• “Rank the technical challenges for Cloud expansion according to the priorities addressed in your project”
• “In case you think your project addresses other important challenges that are not on the list, please describe them”
• “Define critical success factors to overcome the top 3 technical challenges that you have identified”
THE EXPERT’S VIEW
RANKING THE CHALLENGES

CHALLENGES AT A GLANCE

THE MOST IMPORTANT
"Interoperability and portability across cloud providers"
"Dynamic configuration and automated provisioning"

THE LEAST IMPORTANT
"Seamless migration of workloads across cloud providers"
"Power-efficient applications"
INTEROPERABILITY AND PORTABILITY ACROSS CLOUD PROVIDERS

KEY RECOMMENDATIONS

Competitive infrastructure cloud market
• Ability for users to compare cloud offerings
• Possibility to select the offer that best suits their needs
• Easily change providers if they are unsatisfied with the service
• Ability to find a more competitive offer

CRITICAL SUCCESS FACTORS

Avoid Lock-in
• Reducing lock-in to proprietary solutions through means of increased portability and interoperability

Assure standardization
• Standardized formats for transferred data, billing and identity management

Business strategy and support tools
• Creation of practical guidelines and best practices’ catalog
• Identification of key elements in applications that ease or prevent their migration to the cloud

Open clouds and federation
• Creating bridges between global communities
• Massive adoption of open source Cloud Computing projects
• Cloud federation, sustainable collaboration schemes
• Ability to build full-fledged multi-cloud applications
TRUSTED COMPUTING

KEY RECOMMENDATIONS

Security parameters management
• Cloud interoperation opens new challenges in the management of security parameters between cloud providers
• Authentication across multiple clouds (each cloud can use a particular authentication mechanism and technology)

CRITICAL SUCCESS FACTORS

Fulfilment of SLAs and implementation of certification schemes
• Check the existing security measurements and SLA metrics
• Fair and safe contract terms
Check transparency and interoperability among providers
• Management of security parameters between cloud providers
• Step-by-step analysis of the full cloud service supply chain
• Proven data provenance and enforcement of related policies
Verifiable devices
• Overcome security / privacy challenges from IoT devices through cloud based processing
NETWORKING ACROSS CLOUD SITES

KEY RECOMMENDATIONS

**Federated cloud networking**
- Unify and consolidate data-centers in a virtual way, so that different distributed data-centers can be exposed as a single cloud-like virtual data-center, and networks of different data centers can be interconnected in a virtual overlay.
- Automatic provision of inter-cloud networking to support the automated deployment of applications and services across different clouds and data-centers.

CRITICAL SUCCESS FACTORS

**Discover the shortest paths in an overlay network with the minimum monitoring effort**
- Networking across cloud sites should be based on a self-healing and self-optimizing overlay network between cloud sites.

**Overcome limitations on networking, such as data import/export bottlenecks or service disruptions**
- Identify at real time components of a composite application which have failed and switch to an alternative component without overall application disruption.
DATA INTEGRITY, LOCALISATION AND CONFIDENTIALITY

KEY RECOMMENDATIONS

Privacy, confidentiality and trust
- To avoid privacy and confidentiality risks, cloud providers should be adapted to different legislations, and some standards of good practices, policies and procedures should be defined
- Security vulnerabilities need to be better understood and handled to overcome the lack of trust in utilizing clouds and the fears of privacy invasions and confidentiality breaches

CRITICAL SUCCESS FACTORS

Overcome barriers related to different legislations
- Assure consistency in data schemas migration (by using data models), fulfillment of SLAs, and implementation of privacy warranty mechanisms

Implement an open cloud philosophy
- Adoption of open standards and open format in cloud-related solutions
- Cloud standardization needs to happen the OpenStand way

Foster awareness raising actions
- Create a new culture around the importance of data security and new competences to empower the end-users

Promote certification mechanisms
- Implement certification schemes for applications and services offered in the cloud
DYNAMIC CONFIGURATION AND AUTOMATED PROVISIONING

KEY RECOMMENDATIONS

Service oriented capabilities
- Enable the dynamic provisioning of multi-tier services on top of cloud infrastructures
- Service oriented capabilities needed to manage services (i.e. groups of interconnected compute, network, and storage elements) as basic entities, and to provide elasticity and quality of service (QoS) for a broad range of multi-tier applications deployed in the cloud

CRITICAL SUCCESS FACTORS

Proper analysis/prediction of adaptation actions
- Use of model-driven and software patterns, intelligent software, context-aware systems

Mapping the services dynamically on the resources
- Applications and services running in a cloud environment must provide interface endpoints for provisioning, configuration, and monitoring
- Applications must be classified by compliance levels

Reduce the degree of human intervention in provisioning
- Monitoring must be done continuously and SLA levels should be described so that automatic reactions can be deployed

Dynamic configuration and automated provisioning of analytics as a service
- Enable this through simple interfaces that do not require the specification of low-level details about a cloud deployment
## FINAL REMARKS

The Top 10 technical challenges for cloud adoption were identified by the consortium based on European Commission reports.

Experts participating in EU funded projects were asked to rank these challenges and identify others:
- **Most important**: Dynamic configuration and automated provisioning
- **Least important**: Seamless migration of workloads across cloud providers

For each of the 10 technical challenges:
- Experts identified critical success factors
- The consortium outlined key recommendations for companies addressing these challenges

The key challenges, success factors and key recommendations identified will facilitate the detection of new market opportunities for EU businesses.

This study aims to encourage actions leading towards EU cloud research, complementing the work done by the experts’ group developing the cloud computing vision for Europe and future research and policy directions.