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Executive Summary

This document can be seen as a summary of the work done in WP1, and some implications to other project WPs, during the first innovation cycle of the project that covers 18 months, exactly half project has already gone and another 18 months are in front of us.

During this period, WP1 focused on working with the user's cities to select a number of applications for being migrated to the cloud and prepare the specific migration to be carried out in WP3. The selection of applications was carried out using an Open Innovation methodologies in order to gather the point of view of the different stakeholders. Along this period, project members in the teams of each Municipality were monitoring the whole process so we could learn from it and also extract conclusions for other organisations that are to get involved in similar processes.

The adequacy of Open Innovation methodologies for such a deeply technical process is discussed in this document. We firmly believe that this methodology is a good support for the process, provided that technical issues are communicated in the suitable way to all the involved stakeholders. This is, a final user may not be aware if an application is hosted in the City Hall or in a public cloud; but, for sure, he/she will be concerned about the implications on costs, flexibility or % of time that this application is up and running.

Monitoring the process has shown that it is easy to get stakeholders involved but it is harder to keep them involved over the time. A plan for this continuous engagement, including intermediate rewards or public communication activities is to be prepared for these purposes. It has also been detected to resilience to change in some employees at Municipalities. Change Management practises – already well known and used in business – are to be planned also in the process.

Validation of the new offered services has been faced from different perspectives as some applications were already in use and some other are new applications. For legacy applications, validation has taken place from a more technical perspective, as citizens perceived subtle differences as improved performance. In these cases, the opinion of internal stakeholders was the main asset. For new applications, both the internal stakeholder and the citizen had a word to say. The overall conclusion is that migrating to the cloud or having new applications in a Public cloud is seen as positive for most stakeholders.

About Analysis and conclusions, sections 4 and 5 of this document discuss the adequacy of the Open Innovation process, the need to identify all technical elements in advance, the change management strategies to be planned in some cases and the required communication actions for all stakeholders to see the migration to the cloud as a part of the modernisation and digitalisation trend in place in the Municipality.

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Abbreviations

Acronym	Description
DB	Data Base
DNS	Domain Name System
GIS	Geographic Information System
IaaS	Infrastructure as a Service
IT	Information Technology
NGO	No Governmental Organization
PaaS	Platform as a Service
PPGIS	Public Participation Geographic Information System
SaaS	Software as a Service
SME	Small and Medium Enterprise
SMTP	Simple Mail Transfer Protocol
SSL	Secure Socket Layer
TCP-IP	Transmission Control Protocol – Internet Protocol (suite)
VM	Virtual Machine
VPN	Virtual Private Network
WLAN	Wireless Local Area Network
WP	Work Programme

1 Introduction

The objective of this document is to present the monitoring and validation actions carried out on the applications that have been migrated to the cloud during the first innovation cycle.

Monitoring activities allow keeping track of important events during the whole process. From these monitoring activities all the partners are learning on how to face a cloudification process, the barriers to overcome, the selection criteria that provide better results, the stakeholders to be involved, etc. The final objective is to learn about the process and to provide these lessons learnt to future Cities, public bodies and organisations in general that may face a cloudification process.

Besides, the monitoring of the pilots will improve the understanding of the user-centric methodology, applied to real cases. End-users and stakeholders participate under this approach during the whole process, and also they will contribute to the monitoring and validation activities providing feedback.

Validation activities carried out are also reported in this document. Applications migrated to the cloud fall into two categories: legacy ones – like the UeR in Valladolid – or new applications like the Virtual City Mall in Thessaloniki. Therefore, the validation to be carried out is different. The latter case, validation will be carried out internally in the organisation from a more technical perspective, while in the former case the citizen is a key stakeholder in the validation process.

All these aspect contribute to generate a body of best practices, lessons learnt and experiences that will be very valuable for both the rest of the project – second innovation cycle – and future Municipalities facing similar migration processes. This document presents these conclusions that will also be incorporated to the work in WP5.

2 Monitoring of Services Deployment

During this first innovation cycle, activities within task T1.4 has been directed to collect and review the work that has been done during this first 18 months of the project which includes a complete innovation cycle.

The monitoring process implemented consisted on three steps

- Identify the aspects to monitor and specific indicators or criteria, depending on the task (stakeholder selection, application selection, ...)
- Gathering information throughout the entire process of cloudification, from the selection of applications or services for each of the pilot cities through the adaptation of these applications in the cloud.
- Analyze the usage and acceptance of the new applications and/or variations on usage patterns in case of legacy applications. We have monitored the use of applications in day to day, the problems that have been identified, acceptance by users (citizens or officials) applications, etc.

With this information in our hands we can draw from the experience a guide for solving problems, as normally these problems are recurrent, an aid to complete the deployment. Even more, the objective of the work in STORM CLOUD is to identify these situations before they may take place. This will be the real help for organisations facing future cloudification processes.

2.1 Monitoring Criteria

During the initial phases of the project, a number of criteria were elaborated to help cities in the monitoring of their activities. These criteria are rather general and each city must identify which ones are relevant to their internal structure, experience and objectives.

Nevertheless, the complete list is included here below as a reference for further usage in the project but also for future adoption in the overall project guidelines for applications cloudification.

The following scheme was provided to each of the cities as a support for the monitoring activities on the whole process. It is neither a form to be filled nor a Table of Contents to be followed accurately. It is a guideline that each city has studied and adapted to their needs.

- How the different stakeholders were selected
 - Criteria to select stakeholders.
 - Groups of stakeholders: citizens, public servants...
- How stakeholders have been activated and their participation maintained.
- How the initial selection of services to be cloudified was carried out.
 - Who participate
 - Which where the criteria
 - Technical
 - Economical
 - Organisational

- Other
 - Problems founds: For instance,
 - Manuals not available
 - The company that developed the application is not operating and we need to include some modification.
 - The modifications for the application to be sent to the cloud are expensive.
 - Training required to deal with technology

According to the results of these monitoring activities these tools will be updated and completed and sent to WP5 to be included as a part of the guidelines and best practices in a cloud migration process. The experience in the next project phase – 18 months ahead – will complement this scheme.

2.2 Cloudification Activities at Agueda

Agueda stated their cloudification activities with the selection of the stakeholders and applications. It is remarkable to express the strong commitment of the City Major on technological updating in all aspects in the city. This is a key asset because it eases the removal of some barriers that may be found in organisations.

Due to this support from the top level, different areas in the municipality participated in the project. This is particularly interesting because we had a large number of differently profile stakeholders, but it also made that sessions were more difficult to manage and consolidation of conclusions was harder.

How the initial selection of services to be cloudified was carried out

The applications with the potential to integrate the STORM CLOUDS project were the subject of internal discussion in Agueda. The participants were:

- Major of the municipality
- Division of Geographic Information Systems,
- Division of Information Technology
- Division of Administrative Modernization
- Division of Human Resources

During the discussions, the criteria for the selection of applications where established as:

- They must be owned by Agueda or Open Source Applications.
- Consequently, the code must be available.
- The applications must be implemented using a technology that is mastered by existing Agueda technical staff.
- Citizen personal data will not be managed to avoid Data privacy and security issues.

How the different stakeholders were selected

After listing¹ and present the applications to the project consortium, there have been internal meetings (Águeda´s STORM team) to define the potential stakeholders. The criteria used for these selections were

- Cloudification depends on their decision: i.e.: decisions makers, politicians ...
- Their everyday work is affected by the cloudification: i.e. technical staff, accounting, procurement processes personnel ...
- The results of the cloudification may affect their everyday life: Citizens.
- Have a word to say in the modernisation of the City: i.e. Politicians, citizens, Municipality staff,..

Using these criteria, there were defined three groups:

1. An group of stakeholders with internal members:
 - Major of the municipality
 - A group of internal stakeholders with members of:
 - Urban Management
 - One-Stop Shop
 - Administrative Modernization
 - Geographical Information Technology
 - Information Technology
 - Human Resources
2. An external group centred in three main areas:
 - Academia
 - Cities (municipalities)
 - IT Private companies involved in R&D activities.
3. External to the municipality:
 - Citizens
 - IT professionals related to the Municipality (mainly providers)
 - SMEs in the city.

A number of criteria to evaluate the process where also identified, these are:

- Acceptance of the cloudification from internal stakeholders

¹ D1.2. Compilation of available services and applications susceptible to being cloudified

- Number of users (citizens) and number of new users. This is increase in the number of users.
- Acceptance of the IT professionals related to the city.

For the time being, it has not been possible to define technical (e.g. % of availability time of applications) or economic indicators (comparisons to the costs of internal hosting) as these figures are not available in the existing applications in Agueda Municipality as they are considered all together. We are working to indentify a mechanism to measure the technical and economic impact of cloudification. On the other hand, we firmly believe that this situation is common to a large number of Municipalities and other organisations: There are no accounting systems that consider individually each application. Therefore, if we are able to arrive with a way of measuring this process, this conclusion will be useful for a large number of cities.

How stakeholders have been activated and their participation maintained

All the potential stakeholders were contacted directly, to avoid delays and to trying to obtain compromise from their side, besides to explain in a face to face basis, the project aim.

Meetings with the three different groups were organised and

At this step, we decided not to involve elements of the third defined group due the difficulty that we met when trying to involve persons from the second group. It is not an easy issue to understand, for citizens, the migration of public services to the cloud.

For framing and understanding the project was provided, to stakeholders, the project brochure and the link to the STORM website.

In order to select the first service to be cloudified we developed an online questionnaire to find out:

- Basic information such as age, gender, profession and city;
- Which service would be most relevant to undergo, considering the project and the available list of applications;
- Perception of their knowledge about the applications and possible interaction;
- Their opinion on the cloudification of services;
- On the willingness to participate in the project and contributing;
- On the growth of the project collaboratively;
- About the usefulness of this project for their organization or for different cities;
- Further suggestions;

Public Participation Geographic Information System – PPGIS² and Location Plants had more votes than the others. Internally, the Municipality decided to choose these two applications to move forward on the first and second innovation cycle, respectively.

We discussed with the stakeholders the issue of the application's name, which would be reflected in the DNS. So, after discussion it was realized that the application should have two names, one in Portuguese and another in English, to be more universal and more easily understood by the cities that opted for the installation of the application:

- Eu participo (in direct translation it means – I participate)
- Have your say (the expression used in similar situations in countries with English as native language)

On the internal meetings and isolated conversations we decided to commit several changes on the PPGIS application to give it more usability, versatility, among other advantages, in a way that could be more adoptable by others entities.

The most challenging changes to the application were: i) change it is logic to accommodate the requirements, preferences and expectations of a wider user community of international citizens from different municipalities; ii) make it sources available.

The “Eu participo/Have Your Say” application was designed to fill just the preferences and expectations of the Águeda municipality. To make it available to other municipalities, some decisions, for example, the geographic scope of the citizens' participation, can not be hard coded in the application. Some decisions must be options that each municipality can adjust at deployment time. Language and custom formats for date, time and money were also critical, because the application was not multilingual or multicultural by design.

The application was already open source, as any other software developed in the last 5 years for the GIS unit of the municipality of Águeda. But to make it really open in the sense that other developers abroad can read and understand the project, it is sources were moved to github³, and new documentation about it is development and deployment was prepared.

These challenges became new technical requirements for other projects within the municipality of Águeda.

Lessons learned

There are a number of lessons learned from the process:

- The involvement of the stakeholders is not homogeneous and we must enforce the mechanisms to keep them engaged. On the positive side an important share of stakeholder

² Although it was not indicated in D1.2 it was further decided to include this service in project by the Águeda STORM team

³ A web-based Git repository hosting service, which offers all of the distributed revision control and source code management (SCM) functionality of Git as well as adding its own features

(users) is identifying issues in the applications and informing us of them. We are taking notes on the issues pointed by stakeholders and citizens in order to correct small details that have occurred, such as for example in the multilingual file, and even to make small improvements compared to the initial design. These issues are being placed on GitHub.

- At this moment, we have the service in full production, only from the SCP@Enter (Production cloud of the project), with three “plans” in discussion where the online statistics show, transparently, the dynamics imposed by users. We have detected that showing transparency in these applications is very well perceived by the citizen and help us to keep them engaged.
- Most feedback received for the application is positive, although it is related to the application itself and not to where it is hosted.
- The cloudification process is not particularly relevant for the citizen. They are not interested in knowing the technical details of the application but to get the service. It seems a bit difficult to get feedback from users about validating the services based on cloud computing as this issue is not clear in their minds.
- The rest of stakeholders – internal personal of the Municipality – is also not particularly concerned by the cloudification process. In fact we have detected some resilience and resistance to change. In particular the IT department has some feeling of losing control and relevance internally.

2.3 Cloudification Activities at Thessaloniki

How the initial selection of services to be cloudified was carried out

The process of cloudification was deployed according to the following user centric methodology

- Thessaloniki Municipality decided from the very beginning to cloudify applications that are related to entrepreneurship and quality of life in the city of Thessaloniki. During the first stage (first 2 cycles) the city cloudified two applications, **Virtual City Mall** and **Cloudfunding**, while a third one, Virtual City Tour, is under development and is expected to be released soon. The detailed process for services selection is explained analytically in the previous version of the WP1, namely in Deliverables D1.3.1 and D1.3.2, in addition to information regarding the selection stakeholders and the strategy used to engage them.
- Thessaloniki Municipality, along with URENIO–AUTH followed the user centric methodology adopted in STORM CLOUDS, including meetings with stakeholders and municipal services, training sessions and validation sessions with end users, dissemination activities and so on. In these meetings/events the pilot partners also distributed informative material about the overall project and, in the case of Virtual City Mall, a manual of the service. The Table below (Table 1) presents an integrated view of all the meetings, events and other types of activities that took place during the first stage for each service in order to secure stakeholder participation.

Date	Type of Meeting/ Participants/ Location	Service reviewed	Results
06.02.14	URENIO members and Vice Mayor/ Municipality of Thessaloniki	All services	Agreed on three priorities and services
27.03.14	URENIO members and Vice Mayor/ Municipality of Thessaloniki	All services	Establishment of a working group with members from different municipal departments Roadmap planning
07.05.14	Working group meeting/ Municipality of Thessaloniki	All services	Decision to organize a general meeting with all stakeholders
03.06.14	General meeting with all stakeholders/ Municipality of Thessaloniki	All services	Presentation of the project and services to all stakeholders/ discussion

30.10.14	Meeting with the Commercial Association of Thessaloniki, Professional Chamber of Thessaloniki/ Municipality of Thessaloniki	VCM	Collaborate with the two stakeholders Adopt a district strategy for the Thessaloniki Virtual Mall service Explore the possibility for online purchases
17.12.14	Informative-Training session / Businesses of Proksenou Koromila street/ Electra Palace Hotel, Thessaloniki	VCM	First training session of the Thessaloniki Virtual Mall service First feedback from local businesses - collection of suggestions for improvement
16.03.15	Presentation of the Virtual Mall at the Board of Professional Chamber	VCM	Discussion on sustainability models and geographical expansion to the wider metropolitan area of Thessaloniki
18.03.15	Meeting with the new Vice-Mayor responsible for the Department of Entrepreneurship	VCM and Cloudfunding	Discussion on managing procedures within the Municipality for distribution of PIN codes to the shops/professionals Discussion on payment procedures and the role of Thessaloniki Municipality in this service
22.04.15	Presentation of STORM services in Smart Cities Conference, Maroussi Plaza, Athens	All services	Dissemination and community awareness
14.05.15	Meeting with the Department of Volunteerism in Thessaloniki Municipality	Cloudfunding	Common actions and list of reliable NGOs which we should contact in order to find/register projects
15.05.15	Presentation of STORM services in Thessaloniki Science Festival, Thessaloniki	All services	Dissemination and community awareness
20.05.15	Informative-Training session / Businesses of Mitropoleos street/ Thessaloniki Municipality	VCM and cloudfunding	Second training session of the Thessaloniki Virtual Mall service - Feedback from local businesses - collection of suggestions for

improvement			
22.05.15	Meeting with the President of Metropolitan Development Company	with the Cloudfunding of the	Decision on payment system and overall management of the app

Table 1: Meetings held in Thessaloniki

The table 2 describes a full list of meetings and events that were held in Thessaloniki pilot during the first stage of the cloudification process.



Figure 1: Pictures of the meeting for training professionals (20.05.2015)

The figure above shows two pictures of the meeting for training professionals and shop owners of Mitropoleos street (20.05.2015) with the Vice Mayor providing at the beginning of the meeting some general information on the STORM project

Problems founds

During the cloudification process, a number of problems were detected and are explained in detail below. In the case of Virtual City Mall, there were some organisational issues regarding:

- The **management of the PIN numbers** that would secure that the person uploading or changing information is indeed the shop owner. It was decided that it should be kept to a stakeholder (Municipality, Chamber of Commerce, Association of Professionals) that has a list of existing shops with specific details (name of owner, address etc) and is able to cross check accuracy of data.
- The **overall geographical coverage of the service**, given that there was a strong interest from specific stakeholders to expand it to other areas of the wider metropolitan area of Thessaloniki and not only the city center. These stakeholders were interested in sustaining the service after the end of the program.
- The **entities that will be able to be present to the marketplace, the catalogue and the promotions page**. It was decided that while professionals will be able to present themselves

to the catalogue and will be able to make offers, they could not be present to the marketplace which should be restricted only to shops and not service providers like for example technical companies.

- The **type of business model** that will secure that the service is sustainable after the end of the project. The most prevailing business model so far is multiple ownership with different stakeholders managing different areas of entities (e.g. shops or professionals).

In the case of Cloudfunding, a significant problem was faced in using the original open source application and the developing team had to search and select a different open application, which however needed alterations and further development, as it was available only in Spanish. The problem of the initial application was related to the inability of conducting payments in euro and the lack of information of the specific part in the code.

Beside the above, there were also a number of technical issues faced by the municipality during the cloudification process of the two applications which relate to back up, network, DB, file transfer, SSL certificate, SMTP server etc. These issues are reported extensively in Deliverable 5.1.1.

Monitoring of Thessaloniki pilot services

In order to monitor the services of the first stage, Thessaloniki Municipality along with URENIO-AUTH established a four dimensions group of indicators for each service separately analyzing supply, demand, dissemination and the level of validation. More specifically, the indicators proposed to monitor the services cloudified in the first cycle are shown in Figures 1–3.

Supply	Demand	Dissemination	Validation
Nbr of shops participating in the app	Total nbr of users – visitors	Total presence of the platform in third party websites	Number of users providing feedback for the application
Nbr of shops per category	Total nbr of registered users	Total e-mails/newsletters sent	Number of stakeholders providing feedback for the application
% of shops participating in the platform/shops in the area (total)	Mean nbr of visitors per shop		Number of modifications (new characteristics that have been modified based on the feedback received)
% of shops participating in the platform/shops operating in the area (category)	User demographics (area, age, education level)		
Nbr of shops that have extended their online presence in the platform			
Nbr of shops making online transactions through the platform			
Nbr of offers per shop			
Nbr of synergies between two or more shops			

Figure 2: Indicators for Monitoring Virtual City Mall

Supply	Demand	Dissemination	Validation
Nbr of projects being registered in the crowdfunding platform	Total nbr of users	Total presence of the platform in third party websites	Number of users providing feedback for the application
Nbr of projects per category	Total nbr of registered users		Number of stakeholders providing feedback for the application
Nbr of projects being funded/completed	Nbr of users providing funding to the projects		Number of modifications (new characteristics that have been modified based on the feedback received)
Total funding received through the platform	Mean funding per user		
Mean funding per project	Minimum funding per user		
Min funding per project	Maximum funding per users		
Max funding per project	User demographics (area, age, education level)		

Figure 3: Indicators for Monitoring Crowdfunding

Supply	Demand	Dissemination	Validation
Nbr of registered Points of Interest (POIs)	Total nbr of users	Total presence of the platform in third party websites	Number of users providing feedback for the application
Nbr of shops which relate to the POIs	Total nbr of registered users		Number of stakeholders providing feedback for the application
Mean nbr of shops per POI	Nbr of users that have uploaded digital content (photo, description)		Number of modifications (new characteristics that have been modified based on the feedback received)
Nbr of POIs created from users	User demographics (area, age, education level)		
Supply indicators per target group (Turkish-Muslim community, Israeli community, Russian-orthodox community)			

Figure 4: Indicators for Monitoring Virtual City Tour

Indicators measured by the end of the first stage (end of second innovation cycle)

Given that out of the total applications selected for the first stage of the STORM project, only Virtual City Mall was released early enough for validation, the most completed dataset of indicator values can be found for this app. The following table summarizes the results obtained:

Supply	Nbr of shops participating in the app	62
	% of shops participating in the platform/shops in the area (total)	25.72
	Nbr of shops that have extended their online presence in the platform	27
	Nbr of shops making online transactions through the platform	0
	Nbr of offers per shop	0.24 (total=15 offers)
	Nbr of synergies between two or more shops	0
Demand	Nbr of users - visitors (since 01.01.2015)	3.893
	Nbr of registered users	41
	Area, Age	See figures 5, 6

		below
	Sex	Female 45.85% Male 54.15%
	Total presence of the platform in third party websites (until 28.07.2015)	42
	Nbr of users providing feedback for the application	≈ 50
	Nbr of stakeholders providing feedback for the application	5
	Nbr of modifications (new characteristics that have been modified based on the feedback received)	3
Dissemination	Total presence of the platform in third party websites (until 28.07.15)	42
Validation	Nbr of users providing feedback for the application	≈ 50
	Nbr of stakeholders providing feedback for the application	5
	Nbr of modifications (new characteristics that have been modified based on the feedback received)	3

Table 2: KPI results from Virtual City Mall

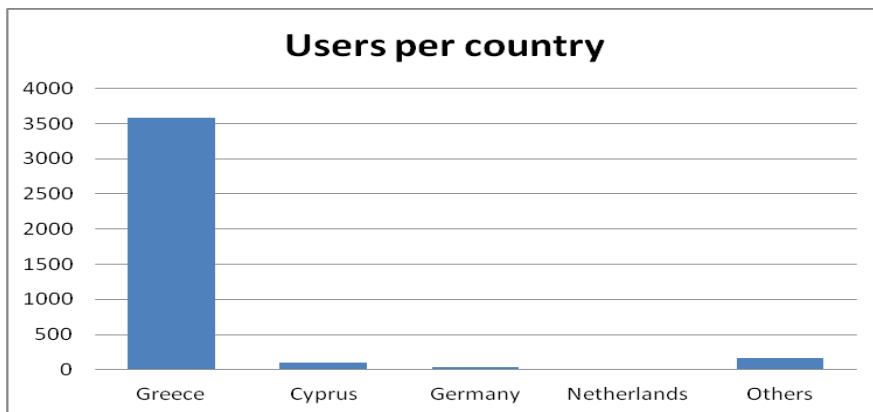


Figure 5: Number of users per different countries

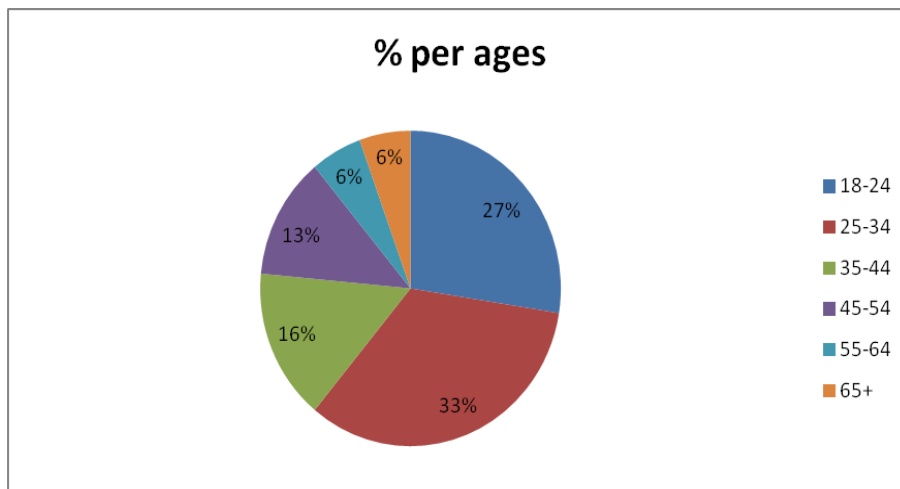


Figure 6: Number of users per age ranges

Regarding the last set of indicators (indicators on validation), we need to clarify the following:

- Given that the specific indicators were defined at later steps of the first cycle, no analytic record was held beforehand that would give us a correct number of the users providing feedback for the application (participants of the events and training sessions giving comments, individuals representing stakeholders and municipal employees proposing improvements etc).
- Although more stakeholders were involved in the whole process of services' selection, only five stakeholders were interested in providing feedback for this specific application: the Commercial Chamber of Thessaloniki, the Association of Professionals of Thessaloniki and the three departments of Thessaloniki Municipality – the Department of Entrepreneurship, the Department for Volunteerism and the Department of Tourism.
- Finally, as regards the number of modifications based on the feedback received, these have been tracked after the first release of the application, when end users and professionals started using the application. In previous steps, feedback received and the respective modifications were somehow more informal and were not recorded in detail.

Problems with cost measurement

As already mentioned, all three applications that are either already cloudified or will be cloudified for the purposes of the project for Thessaloniki pilot are new applications. Since the applications never existed in the private servers of the City of Thessaloniki and were never executed in the informatics infrastructure of the city of Thessaloniki, any cost comparison would be inaccurate and could lead to erroneous conclusions. Besides that, there are no applications that are similar to these services. Specifically:

- 1) Thessaloniki Municipality servers' are mostly running Windows instead of Linux. They also inter-operate with Active Directory Windows servers for authentication (Single Sign On).
- 2) Most of them are three-tier or more-tier applications and are much heavier.
- 3) None of the existing applications is using Mysql. They either use Oracle, Sybase, MSSQL and other non-free DBs.
- 4) In most cases, the applications don't use a web server. They use either an application server or custom made servers.

In addition, a cost estimation task for an application's participation would require estimating separately the cost of:

- 1) Buying hardware, software, operating systems, virtualization software (actually a yearly depreciation plan for each item)
- 2) Maintenance with personnel within the Municipality and with subcontractors.
- 3) Power consumption in case of hardware (ups, servers, routers, switches, antennas, coolers).
- 4) Telecom charges for internet connection.
- 5) Systems architecture and interoperability design.

However, such a task would be infeasible and if tried it would provide very erroneous and questionable results, as gathering the total cost for the whole Municipality for each one of these costs is extremely difficult since most of the times pieces of each one of the above costs are

coupled together in one contract and there is no per item cost even in the procurement documents. Also, there is no depreciation plan for hardware, software, operating systems and virtualization software that may last for years, since the Municipality most commonly uses them until they don't work anymore or cannot fulfill the purpose for which they were bought. In addition, a lot of services are offered by more than one employees of the Municipality which also have other duties that don't involve the maintenance and operation of informatics hardware and software. The informatics services are also mostly offered together by Municipality employees and subcontractors. Finally, the Municipality has many different applications with very diverse average power consumption, average network – internet traffic and average storage requirements.

2.4 Cloudification Activities at Valladolid

How the initial selection of services to be cloudified was carried out.

In Valladolid Pilot, initially were selected four different applications by its internal staff involved in the project, in order to present to the stakeholders a wide range of candidate applications to be cloudified. During this first step, the field of the applications/services was considered as a priority in the innovation strategy for the municipality. The specific criteria for the list definition depended on

- City situation of the city and most relevant problems identified.
- Citizen's demands and users' request.
- Municipality strategical lines for development both technical and citizen services.

These four applications considered were the following:

1. Blue Parking – App for metered parking areas
2. Ideal Innobarometer – Location of best places for new businesses
3. LocalGIS – Mapping services for municipalities
4. UeR (Urbanismo en Red) – Urban planning information for cities

How the different stakeholders were selected

Project stakeholders were selected among two very different groups, internal and external to the municipality. In the internal group, they were selected both services users and horizontal departments as stakeholders.

Also the criteria for the selection was different. For the internal users the main criteria is that the movement to the cloud of some applications can affect their job in one way or the other. For instance, the procurement department work is different to buy hardware than to contract a cloud service.

For external stakeholders the criteria is to have a representation of the different groups of citizens in the city: people from different ages and professional skills, local SME, entrepreneurs, etc. This was complemented by organisations that play a key role in the coordination of city actors.

In the internal group, service users were selected as the actual public servants who really know the importance of each application and can suggest what improvements should be made to application functionality. The internal stakeholders selected were:

- Urban Planning Department
- Traffic Management Department
- Entrepreneur Promotion Department

Some **others horizontal departments** working within the municipality were also selected. These units usually provide service for the rest of the city departments and they own a global vision of

municipality needs and strengths from their point of view. The stakeholders selected within this group were:

- Information Technology Department
- Accounting Department
- Legal Services
- Local Innovation Agency

The **external stakeholders** group was composed of different profiled citizens, small companies and associations with a clear focus on innovation. Using this latter criterion, there finally were selected three members:

- Agile CyL (a regional community of agile technologies developers)
- ePunto (a company devoted to fostering innovation in Castilla y León and linked to the local Chamber of Commerce)
- Geocyl (a startup in the field of geographic information systems consulting).

How stakeholders have been activated and their participation maintained.

All the stakeholders were contacted by email and by phone, in order to get them involved in the project and they were held some regular short meetings in order to apply the open innovation methodology. Although all the stakeholders are very committed to the project, they have been motivated with small incentives:

- Municipal theatres tickets
- Invitations to cultural events organised by the municipality.
- Communication events where the strategic lines in terms of Smart City activities in Valladolid were presented and their participation to STORM CLOUDS valued as an important element.

Problems founds

During service deployment of the selected application, **Urbanismo en Red**, some problems were found for the selected applications:

- The first one was that it only was available an unsuitable manual for the application installation procedure. This issue led to a small delay in the task planning and it also was necessary to hire some external expertise to cope with the cloud application installation.
- Another issue to be faced was the fact that the municipality wasn't the owner of the selected application (it is property of Spanish Ministry of Industry) and for the implementation of any additional feature it's required a declaration of conformity from the Ministry, in order to be used by other municipalities. Fortunately, in this case, stakeholders considered that the current application functionality was well

enough for Valladolid needs and it wasn't necessary to suggest any application modification.

2.5 Monitoring the Cloudification Processes

The previous pages summarise the work carried out in the cities in the past months. From this monitoring there are a number of lessons that can already be learnt both for the future processes in the cities, but also for other organisations that may be willing to move applications to the cloud.

Most relevant issues are:

- I. The fact that an application is in the cloud or not is normally transparent to the final user. A citizen is not aware if the site used to book sport facilities – for instance – is hosted in a cloud provider, in the IT of the City Hall or wherever else. Therefore, there are two options here:
 - a. Not to consider the final user as a stakeholder. This means that, in the case of a Smart City application, we will not involve the final user in the process of cloud migration. This is an option, but we firmly believe that some advantages of cloud can be perceived by the citizen, so there is a second option.
 - b. The Municipality staff will work on the consequences that having a system hosted in a cloud environment means for a final user: flexibility, greater availability, additional security procedures ... This is a complex work to be carried out to transform technical specifications into its consequences to the final user: it is not always easy to work out the consequences of technical decisions and, even more, this work can be presented to the final user in a way that they can be convinced to one decision or the other.
- II. Stakeholders in a cloud migration process are personnel of the Municipality at different levels:
 - a. Politicians. Top leaders in the Municipality have a lot to say to express on how they want to set up and maintain the ITC infrastructure in a way that it allows them to provide the best service to the citizens.
 - b. Financial personnel, the depreciation of a hardware installation is very different than having a cloud service every month. Therefore there are implications on the things that can and can not be done due to internal regulation for financial rules in the Municipality.
 - c. IT department and IT managers. The existence of their own production infrastructure vs the outsourcing of a cloud is very different in terms of teams composition and organisation of a 24x7 support team.
- III. Stakeholders must also include citizens, local entrepreneurs and other actors in the city involved as explained in point I.
- IV. Related to point II, it has been detected that some Municipality employees may be reluctant to change and have strong positions against the process. In many places it will be required to put in place techniques for change management to ensure the success of the process. Among these techniques, the most relevant are communication to ensure that the IT transformation process is well understood by all employees as well as training activities in those cases where the role of a specific person is to be modified and their capacities must be updated.

- V. Monitoring and validation aspects does not differ particularly from the monitoring and validation activities that are to be carried out when launching any application into production regardless its location.
- VI. It is particularly interesting the fact that SCP@HP – pre-production or testing cloud – and SCP@Enter – production cloud – are similar so the migration from one to the other can be done seamlessly. This is particularly remarkable when talking about cloud because the different configurations of the vendors sometime s barrier when migrating from development to production environment. This fact has been identified as key for the success – at least, for the good performance – of the whole process.
- VII. The experience from STORM CLOUDS shows that is particularly relevant to be sure of
- a. Having the source code and documentation available in case any modification is required
 - b. It is important to contact de provider/developer
 - c. It is important to have personal with the different skills to modify configurations if required
- VIII. From the administrative point of view procurement processes are quite similar to buy hardware than to contract a service. The hardware process may be more complex because involves maintenance that can be provided by the same vendor or by another provider. But there are not many differences.

However, from the financial point of view it is quite different to hire a service than to buy hardware. A cloud service has a clear cost per year/month that is clearly charged to one or several applications or services. On the other hand, hardware that has a depreciation period that typically is defined for three years but

- IX. This previous point directly faces the problem of costs: What is more cost-efficient: running an application in-house or in a cloud. The reality is that the accounting systems that each of the cities has in place currently does not allow to exactly determine the cost of running an application in-house. Hardware is acquired for a number of applications and, in some cases, shared among applications for the public and internal ones. Cost of maintenance personal depends on the city may be internal personal or hired to subcontracted companies. In this latter case, contracts are normally for a global amount that includes maintenance of all the IT or, at least, a large part. No specific cost is placed to each application.

About hardware, it is normally depreciated in three years, but it is also normally used more time. So, from the accounting point of view an application running on top of a 4-years-old computer has a hardware cost equal to zero. This is obviously not true.

Internet connection is normally included in a global telecommunication contract that included telephony, mobiles phones for key personnel, etc. Similar can be said about Electrical power consumption.

The overall impression that every company has when moving to the cloud is that costs are reduced but, it is not always possible to provide an accurate measure of that.

3 Validation of Services and feedback gathering

The user-driven methodology is focussed on the interaction between all the stakeholders and end-users involved in a project in order to improve it with their suggestions, feedback and opinions.

This section includes information about how end-users and stakeholders have work with the applications in the cloud. There is classified the kind of feedback obtained depending of the stakeholders, because each group may be involved in some specific parts of the project. In concrete, in each Pilot section will be described (where available):

- Feedback from final users
- Feedback from Municipality technical personnel
- Feedback from Municipality political management.

3.1 Services Validation at Agueda

Agueda is getting some feedback only about the application, positive by the way, but not on the cloudification process that seems doesn't stimulate much interest for now. It seems a bit difficult to get feedback from final users about validating the services based on cloud computing as this issue is not clear in their minds. The same could be said for the majority of stakeholders.

- Regarding Municipality technical personnel and political management, there have been collected the following information:
- The internal organization make each unit highly dependent of the internal IT unit, regarding anything related with IT. To deploy any application, all procurement and decisions are made by the internal IT unit. The process takes time and they always lose some functionalities for the sake of security.
- Deploy the same application on the cloud was much faster and easier, since they didn't have to negotiate with their IT department. The resources were ready to be used and all the security threats were already handled by the cloud infrastructure.
- Regarding benefits associated to the cloudification, right now, the most visible benefit is the possibility to deploy an application in a very fast and easy way, independently of the Municipality internal IT department. Besides that, there are no great benefits, since Agueda is using the cloud just as an IaaS provider. The city has already an internal infrastructure where servers are virtual machines. There are no great performance differences or new technological issues. They already used to deal with virtualization.
- They are producing open source applications that can be shared and improved by all. When they start to offer these applications to other municipalities as a SaaS cloud service, the benefits will become more interesting. The Municipality hope seeing these benefits later, during the project.
- Regarding technical issues about the cloudification to the public cloud, there were no technical issues mainly because the city was already familiar with virtualization and the

documentation received was very easy to follow. The mentioned documentation is a step by step guide to create instances using an OpenStack interface. The only thing they needed from the local IT unit was a small DNS configuration.

About the criteria defined for measuring the cloudification process, the data gathered is included herebelow:

- Acceptance of the cloudification process, depending on the profile of the user, the following data has been obtained

Profile	Positive	Neutral	Negative
Political representatives:	5	0	0
Administrative staff:	2	1	
Information Technology staff	4	1	2
Human Resources staff:	3	0	1
External IT specialist related to the Municipality (Academia and companies):	9	0	2
Citizens	6	27	2

Table 3: Success criteria for Agueda cloudification

- Number of users (citizens) and number of new users. There has been no particular increase in the number of users related to the fact that the application is in the SCP.

3.2 Services Validation at Thessaloniki

Since all services cloudified in Thessaloniki pilot are new services, meaning that they did not exist before the STORM project, feedback from users mainly focused on improving aspects of the services, making them more functional and user friendly. During the meetings and training sessions a number of recommendations were proposed: some of which have been already considered, some of them will be considered during the next steps and some of them cannot be undertaken due to specific restrictions. More specifically, regarding Virtual City Mall, the catalogue with recommendations and solutions is given in the table below.

More shop categories/ the possibility to add new categories	1 st meeting	training	DONE
A shop adding more categories	1 st meeting	training	NA

Add the possibility to search a shop based on the street/district	1 st meeting	training	TBD
Add the possibility to search a shop using a keyword (which can be found in the description)	1 st meeting	training	NA
Add Instagram in the social media links	1 st meeting	training	DONE
Add portrait view in the pictures' slide	1 st meeting	training	DONE
The ability to change the order of slider images using drag and drop	1 st meeting	training	TBD
The ability to change the order of pages	1 st meeting	training	TBD
Add a small explanation in Greek for QR code	1 st meeting	training	TBD
Send e-mails with the weekly offers from all stores in the application	1 st meeting	training	TBD
Organise training sessions for learning purposes	2 nd meeting	training	TBD
Development and registration of small malls (Modiano market, Bit Pazaar, Kapani etc).	2 nd meeting	training	TBD

Table 4: Feedback received from the Virtual City Mall validation process



Figure 7: Shops interested in Virtual city Mall application

The figure 3.1 shows photos from Modiano market in Thessaloniki and Kapani. Shops located in these markets are interested in a group filing in Virtual city Mall application.

Regarding the Cloudfunding, although the application was developed and cloudified before the end of the first stage, it could not be used due to uncertainties and limitation regarding payment and overall administration. The Municipality of Thessaloniki has not been able to undertake the

role of the application administration due to legal restrictions in using funds and administering bank accounts. Currently, there is a discussion with a Municipal enterprise, 'Mitropolitiki Thessaloniki', but it is still in progress.

3.3 Services Validation at Valladolid

Feedback from final users of Urbanismo en Red application cloudified version shows that performance application is similar to the traditional one and the information supplied it's exactly the same, as it should be. So, for final users its absolutely transparent using either physical or cloudified application version.

It was observed that the number of user after the cloudification process kept stable, in the range of 600–800 monthly hits. This figures can be seen as not very high, but they are similar to the previous traditional version and according to the type of urban information published.

Technical staff from the Municipality expresses that using a cloudified version of applications gives them more flexibility in service providing. With this approach, a temporal upgrading is feasible, cheap and easy to use during limited periods of time, like urban plans submitted to public debate for a time.

After the presentation and test period by specialised staff (8 people), all of them valued the application as positive. 6 out of 8 (75%) considered it very positive, while the other 2 rated it only as positive for their work.

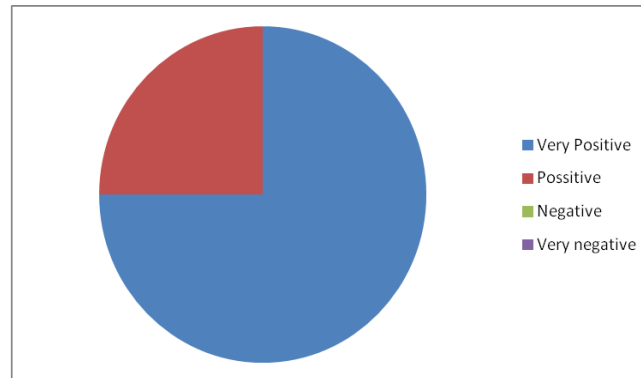


Figure 8: Cloudification impact from the technical perspective

Technical effort for systems maintenance is lower with the cloudified version, as most of the tasks that are routine job are simply over and the staff can be devoted themselves to more creative work.

It's also remarkable for the technical staff, the **easiness to get service recovered from a crash**, just restoring the instance in a short time and reducing downtime period; telecommunications service providing is another major advantage that avoid news contracts with partners for using their services only for some weeks, e.g.

Political management level appreciate application cloudification as a positive trend, as it allows to consider hiring application providing as a service, more appropriate for the municipality than to own not only the required hardware, but also the associated staff for its maintenance.

It were also gathered some feedback form the management level of the municipality, which shows that 80% of interviewed managers (10 people from different municipality departments) appreciate

this application as very useful for the deployment of municipality policies and for enhancing transparency to citizenship on urban projects in the city. Some other 2 people (20%) expresses a bit sceptic about the impact of cloudification on citizen lives.

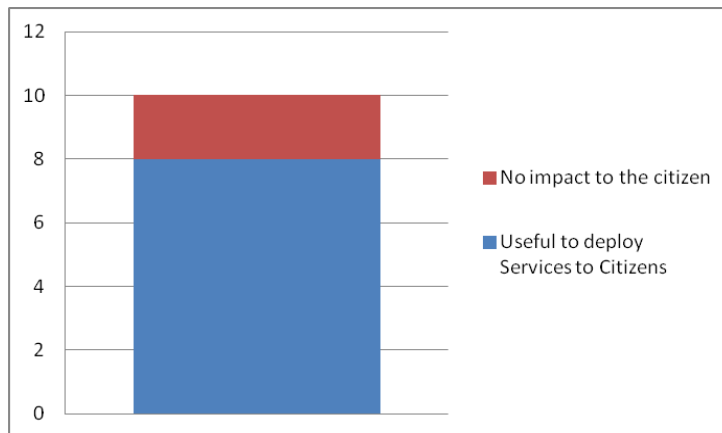


Figure 9: Cloudification impact from the Political Management perspective

The following table summarizes all the interesting parameters that the Municipality has noticed changed after the cloudification:

PARAMETERS	AFTER CLOUDIFICATION
Performance	<ul style="list-style-type: none"> No variations
Information Supplied	<ul style="list-style-type: none"> No variations
Flexibility in service providing	<ul style="list-style-type: none"> Improvement
Improvement possibility	<ul style="list-style-type: none"> Improvement A temporal upgrading is feasible, cheap and easy to use
Technical effort	<ul style="list-style-type: none"> Lower. Simple and routine jobs Easier to get recovered from crash Easier to telecommunication service providers relation
Political Management	<ul style="list-style-type: none"> Positive trend Possibility of hiring application providing

Table 5: Differences after cloudification of services in Valladolid municipality

4 Analysis of Feedback

The experience gained during the cloudification processes in the three pilot cities has been deeply analysed in the project and major conclusions are included in this section.

This information is relevant to the existing pilot cities, as well as, to the new STORM CLOUDS cities that will join the project via the Call for Cities and for future actors that can face cloud migration processes as well. All this material is being consolidated in the project within WP5 activities and it will be a part of the final project results.

In order to carry out the analysis of the cloudification process we will review the process stages, including the conclusions obtained at each of them:

1. Selection of possible applications to migrate to the cloud. Key actors in the Municipality were selected: Political representatives, administrative and technical personnel. This group of participants have proposed a list of candidates applications following these considerations:
 - Strategical plans for the City
 - Benefits they bring to the city / citizens
 - Ease of moving to the cloud
 - Benefits to move the application to the cloud
 - Open Source Systems

Analysis:

The initial selection of applications is particularly relevant as it will direct the whole project as it may restrict the opinion of the stakeholders. From the information gathered it is not clear if a more publicly available process could have been implemented at this stage.

For future recommendations the open innovation process should include

- Initial explanation on cloud migration benefits for non-technical people
- Participation of broad groups of people since the initial stages of the project, probably by implementing on-line participation mechanisms.

2. Selection of stakeholders and end users to participate actively in the process of cloudificación. These groups include council staff (technical and administrative), citizens, businessmen, entrepreneurs, .. representation of all the collectives that may be interested in the application and in the Storm Clouds platform.

Through meetings and questionnaires, the stakeholders selected the service or services to be cloudify within the initially proposed list. This selection is made based on the opinions obtained, being relevant issues including:

- Degree of interest for applications
- Knowledge of applications
- Ease of use by users
- Benefits it will bring to the city and citizens
- Cost savings comparing the application in the cloud with the application on its local version. These costs can be associated to hardware, energy consumption, communications, premises costs, etc.

Analysis:

We firmly believe that a deeper implication of the personal of the Municipality is required as they are the key stakeholders in the cloud migration process. The extensive involvement of final users (citizens, local entrepreneurs, ...) is very positive but it is hard to get them involved over the time if they don't feel a difference from an application hosted internally vs hosted in the cloud.

For future recommendations the stakeholders engagement process is to be enforced using different incentives and a communication campaign in the City that allows them to understand that they are participants to an important modernisation process taking place in the city.

3. After selecting the applications, even if the application has been used in the municipality previously, there are some unexpected situations that may appear:
 - Property of the application: The Municipality may be the owner of the application or it may have a use license with restrictions for migration.
 - Availability of technical documentation, in particular Installation manuals. In some cases, the application was originally deployed by a subcontractor that may be active in the market or not. This situation is to be considered and solved.

One lesson learnt in STORM CLOUDS is that these situations can make the whole migration process fail. Therefore, it is to be considered at a very early stage of the application selection. Once we are absolutely sure that the application and all the support material is available, a number of improvements or adaptations for migration are to be carried out.

Examples of these adjustments carried out in STORM CLOUDS are:

- Translation of the application in multiple languages
- Including different date formats, currency.
- Guarantee security and authentication of users in applications if required.
- Business model regarding applications used by companies.
- Specific technical issues, deeply reported on D5.1.1.

The specific documentation for all these modifications must be produced for future maintenance.

Analysis:

During the cloud migration process a number of technical actions on applications was required in some cases they had been previously foreseen but in some other they arise when the initial set of users started with the application.

This situation is common in every production launching process and it must not be considered a specific problem of the cloud migration process. However, having the need for a revision and migration of the applications is a good opportunity to review the existing applications. IT Maintenance work should include a periodical revision of all applications to see if they can be improved, but in many cases, there is lack of resources for doing it. Cloudification is a good opportunity to carry this out.

4. Once the applications are deployed in the cloud, usage monitoring is started, collecting feedback from stakeholders and users and level of Involvement of them in the process.

All cities have defined a **success criteria** that is called “criteria” in Agueda, “indicators” in Valladolid and KPIs (Key Performance Indicators) in Thessaloniki. The selection of these is coherent with the process followed in each city and involved internal and external stakeholders.

Analysis:

We can extract conclusions from results of analysis of each of the Pilots and services:

Eu Participo (Agueda)

- A minority of the internal stakeholders show some reluctance to change. This fact can be considered normal but it shows that Change Management actions are to be considered when facing a cloud migration process.
- External stakeholders show a positive view of the process if they come from the IT industry, while, the average citizen is neutral with respect to the process.
- Comparison of Technical/Financial impact is hard to carry out. In particular financial, as existing figures include all the applications in the Municipality.

Virtual City Mall (Thessaloniki)

- Number of end-users feedback and involvement can be increased with more incentives as some promotional offer.
- Number of users involved is mainly young people, used to mobile applications. Normally, people that doesn't use online applications is because it is afraid of using it or does not feel capable. A good way to improve the number of users can be placing employees situated in the shops or near that can explain and help these people to use the application in situ.
- Low level of dissemination activities, presence of other websites and social network must be increased for this kind of application. Even publicity in others ways as television, radio, etc.

UeR (Valladolid)

- The usage of the application in the cloud does not differ particularly from the previous situation in Valladolid.
- However, most of the internal stakeholders (80%) believe that the cloud is a useful mechanism to carry out a more dynamic service provision to citizens. This is, using cloud based services the needs of the citizens will be fulfilled in a shorter time frame.

4.1 Adequacy of the methodology for Cloudification activities

The second part of the analysis is to discuss if a user-driven open innovation process is the most suitable methodology to face cloud migration.

User-driven Open Innovation processes have been defined to support the design of a service / product. We are not repeating here how the whole process is, but it is obvious that having the involvement of the person that will use a product in its design will help to better understand their needs. In this sense, involving the citizen in the definition of the public services that the city will provide is a wise decision that is providing excellent results. Citizens are involved in their city and they perceive that their city is interested on covering their needs in the best possible way. There are additional benefits when they are aware of the cost and other implication that are involved with their demands.

In STORM CLOUDS Project, from the very beginning of the project we noticed that having a public service available in a computer owned by the Municipality at their buildings or, on the other hand, having this public service in a cloud service is not perceived by the citizen.

Cities report little Involvement from stakeholders. In addition to regular meetings, people responsible in the pilots try to encourage users with gifts and benefits related to the municipality. For example: cultural events or activities for free. These actions have been implemented with satisfactory results in some cases, but in general the citizen involvement is hard to maintain.

Considering this situation it can be thought that Open Innovation methodologies are not relevant for a project like STORM CLOUDS.

Once this situation has been analysed in detail within the context of Task 1.4, we firmly believe that this methodology can be used and provides good results, on the other hand, and a number of countermeasures to avoid the above mentioned situation can be proposed.

Why the methodology is valid?

Nowadays, most people is particularly involved with technology. Mostly from a final-user perspective but the reality is that everyone can understand that Municipalities are involved in technological evolutions. Already in this first phase of the project, the selection of stakeholders has been different than in other project for public services definition. We have given the first step.

The next step is to put in place the appropriate communication actions. It must segment the different type of stakeholders.

- Public servant must be informed on how technological change will benefit them and, they must be trained to adapt their competencies, if required. Thus, we will avoid change resistance.
- And, definitively, **we need to make the citizen an active part of the technological evolution of their City**. Citizens must be informed that the Municipality is involved in a technological evolution process that will produce benefits for the city in terms of quick availability of new services for citizens, cost reduction, improved flexibility and transparency in procurement processes.

In addition, there are additional measures to take as Mix different type of stakeholders in the same presential session. If meetings and presential dynamics are used in the process, having mixed profiles may enrich the whole process and increase the interest of stakeholders.

Even there are some issues explained before related to the user-driven methodology applied during this project, it is identified that this methodology has also add some benefits to the Pilot cities.

The selection of services / applications to be cloudified is made taking into account the opinion of the actors. In a project like STORM CLOUDS, that concerns the interaction between public administration and citizens, it is very important that both citizens and the other actors (such as public servants) are involved in the process. This helps make citizens feel more involved in the management of their city, they feel that there is more transparency in the management of the municipality and that officials feel more valued for their work.

In the end, involving all actors in the environment of the management of a municipality will cause more and better relations between the actors are created and this will result in not only get cloud services, but also in the management overall more efficient.

5 Conclusions

The conclusions from the first innovation cycle are included in this section

- I. The Open Innovation methodology can be applied to the cloudification process, provided that it is adapted to the situation. Most frequently this methodology is used for product definition where the final user / customer is clear. In a cloud migration process, the final „customer“ is not so easy to identify. Therefore it will be required to select the suitable stakeholders and to make them clear the implications of every decision.
- II. There may be internal personal in the Municipalities that is reluctant to change. Therefore change management policies must be foreshadowed and put in practice from the very beginning. These actions may require training activities on personal to adapt their competencies to a new IT environment.
- III. It is particularly important to have a detailed technical plan to be absolutely sure that all the required elements will be available prior to face the migration. We refer to aspects as:
 - a. Source code, documentation,
 - b. Availability of technical support either internal or external.
 - c. Similarities/differences between the existing IT environment and the cloud environment and how to cope with these differences (O.S. versions, ...)
 - d. Coordinate these activities with specific technical partners that give the necessary help and support to obtain a successful cloudification of the services.
- IV. From the financial staff it is important to plan the actions to be taken:
 - a. On the hardware that will become unused in the Municipality: depreciation, selling, etc.
 - b. Hiring personal with specific technical qualification.
 - c. Providing with specific formation to technical staff in the Municipality.
 - d. Considering costs from an incentive plan for stakeholders. These incentives may be from current activities or benefits from the municipality but also, others specific for stakeholders can be organized.