SIXTH FRAMEWORK PROGRAMME

PRIORITY 2

Information Society Technologies

Innovative Cities for the Next Generation

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Introduction

This is a consolidated report on the ICING Project and its internal peer review process examining the extent to which it has achieved its objectives and the individual goals of the project's work packages. The work of self assessment was carried out as part of the WP10 Evaluation and Self-Assessment work package and itself meets ICING Objective 8 - "the project's evaluation of its own performance and the provision of contractually required data on workforce statistics, socio-economic issues, and science and society. In this context this report is an examination of the performance of each of the respective work package leaders.

Self Assessment Methodology

Evaluation of the ICING project has been a continuous activity across the lifetime of the project, although much of the work has taken place in the Testbeds in the final six months. To do this assessment common indicators were agreed and collected by all partners. In addition to this report the self-assessment work and the peer-review results of the evaluation activity feed back into the planning of the project and work within the work packages. Specifically, the evaluation has included activities to measure the degree to which the technical solutions provided by the project meet the requirements identified in the functional specification phase of the project.

This deliverable concludes the work of WP10.T2 Self Assessment and indicates the extent to which the project has meets its stated Objectives. A key method in this self-assesment has been the use of the deliverable 10.1 review and acceptance methodology.

Review and Acceptance Process

The review and acceptance process for any deliverable consists of three parts.

- Circulation of the draft deliverable to the relevant WP partners and the leaders of dependent WPs for review, commentary and correction.
- A formal Internal Peer Review by an appropriate internal expert not involved in the production of the Deliverable, who will write a report commenting on the appropriateness of the method and quality of outcome, drawing attention to any errors or omissions. This report should distinguish between major faults (which need to be rectified before submission) and minor defects.
- Acceptance of the deliverable by the Project Board.

To be accepted by the Project Board, deliverable must have been accepted by a majority of the voting members of the Project Board excluding the representative of the partner leading the particular WP. In case of significant disagreement, or where the Internal Peer Review results are not accepted by the Partner responsible for the Deliverable, the Board may commission an independent External Peer Review.

The review and acceptance process has itself been carried out on each of the deliverables and in each case the deliverable has been acceptable at internal peer-review. In practice the peer-reviewer has worked with deliverable authors and editors to correct mistakes and improve quality. It has also been the practice that the peer reviewer's comments have strongly guided the decision of the Project Board.

Self-Assessment Reports by Work Package

WP2 Research into eCommunity and the usability of eGovernment Services

The main goal of this workpackage has been from the begging to make it user centred and to assure a correct understanding of the usability, human factors and impact all throughout the project.

The user-centred approach implemented by this workpackage will consist of a process implemented through a series of actions grouped into three main task, which have been very complementary. While in T2.1 we laid the bases for the scenario development and the user requirements, in T2.3 we have ensure a co-design with constant citizen-driven interaction all though the project. The inputs of these two task were implemented in the interfaces created in T2.3, as well as gathering punctual information in usability test to improve these interfaces.

Target groups who will benefit from the project comprise citizens within a wide range of profiles. One the of the challenges of WP2 was to be able to translate the user feedback from different environments and very different cultures and counties into a set of concrete and homogeneous requirements and information that will guide the progress of the technology development; without losing any of the idiosyncrasy of the cultures involved. We have achieve that though gathering information all though the project from a wide range of different communities and citizens and organizing the information in the services with different user cases that will allow for the flexibility required in each city. A very close collaboration both within WP2 members from each city and with other WPs has been essential to achieve this goal. The success of our strategy has been assess by the fact that the technology development

has been kept following the user needs as it has been confirmed in user acceptance of the field trials. As an interesting anecdotic data in the project, one the pasterns have been awarded by one the city communities (namely the Pizarra de Raimunda women association in Barcelona) a prize as the best collaborator with the association as they felt that their voices have been heart and that gave them confidence in that they also, many of them elderly women, can use advance technological services to improve some aspects of their live.

In light of the above considerations, it is clear that the evaluation of the prototypes and field trials have been tested with a variety of users. In this report we explain in detail all the groups that have been part of the field trials and the information they gave us about the services tested.

Our deliverables, D2.1, D2.3 and D2.3, have followed the same peer review process as the rest of the deliverables from ICING; this method has been very important for enriching these deliverables. Several sections have been reformulated and sometimes questions raised from the review were inputs for the next round of the iterative process, when we covered this particular gap with more research with users.

Objective 1: To research the impact of social and human factors on ways of creating 'e-Communities' and the usability of e-Government services based on intelligent environments, to be achieved by work with users in WP2 'Research into eCommunity and Usability of eGovernment Services' and measured by the evaluation of user interfaces and response to services

Task WP2.T1: Communities Definition and Communication Needs

Indicators:

- User' requirements are well grounded on real user needs
  - Result: The D2.1 gathered and articulated the user needs based on the ethnographic work. In the scenario validation phase as well as the field trial the users confirmed that the services developed correspond to real needs.
  - Method:
    - Peer review from WP leaders inside ICING
    - Feedback gathered in conferences where we presented our work
    - Ethnographic studies in all three cities
    - User field trials in all three cities

- Completeness and quality of the sample used for ethnography studies.

  - Result: more than 20 different associations and groups have been contacted. We have reach a very wide range of citizens and city officials as we summarise the communities contacted in the following table:

Type of community	Associations contacted for D2.1
Elderly people-	- dones Àmbar Prim - la Pizarra de Raimunda
Women associations + 22@ "concell"	- Aula Oberta de La Bordeta -Pla de Desenvolupament Comunitari del Besós - Associació Casal de Gent Gran Taulat – Can Saladrigues.
Shop owners' associations	-De Palau a Palau - Barnacentre - Associació de comerciants de la Rambla de Poblenou,
4 workshops with residents Arabianranta	- parents association - house website moderators
2 workshops city officials	- planning office - building office
Citizens in meeting of the consultation process	-The ODG Project Office is the primary 'point-of-contact' for residents and the surrounding community. -The development of the Grangegorman site.

City planners	Grangegorman Development Agency is the primary agency responsible for the

Task WP2.T2: Co-design of citizen-driven interaction

Indicator : High usability and user acceptance of the UI mock-ups of he services

- Result: the D2.2 present the work done to ensure the user feedback gathered for the design of the ICING services after the initial set of user needs were gathered. This deliverable report the user acceptance of the prototypes in addition of the aspects that needed improvement and how we solve these issues.
- Method:
  - Peer review from WP leaders inside ICING
  - Feedback gathered in conferences where we presented our work
  - User studies in all three cities to gather design feedback: we list below the different organisations that were reach in co-design workshops

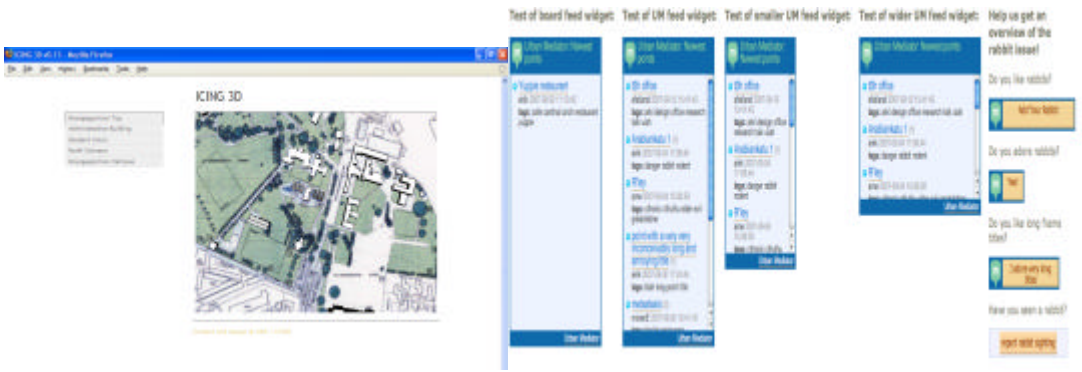
Communities	**Association reached for D2.2**
Women	La Pizarra de Raimunda.
	La Comunitat amb les Dones I les Famílies
Elderly People	FACEPA
	Casal de Gent Gran Taulat Can Saldrigues
New immigrants	Asociación de Venezolanos en Catalunya
	Asociación de ex alumnos peruanos de la UPF
Citizens	Workshop with "Art House Arabia" group
Citizens	UM alpha prototypes
Citizens	Media Lab Intra
Citizens	helka.fi
City officials	City of Helsinki Public Works dep.
City officials	City of Helsinki departments feedback

Young Citizens	St. Paul's C.B.S.Secondary School

Task WP2.T3: User Interfaces and Usability Study

Indicators:

- User interfaces for new ways of accessing content and services.
  - Result: the services provided in ICING have innovative interfaces which have been created following the co-design process previously reported. In particular the mayor user interfaces created and tested have been:
    - 3D interface for city planning and engaging citizens
    - Urban mediator interfaces both for PC and for mobile phone
    - Dindow, a social awareness interfaces for elderly people
    - Icing Messanger interface including representing location information and being able to report an issue with new technologies that only need one bottom press (DAEM)

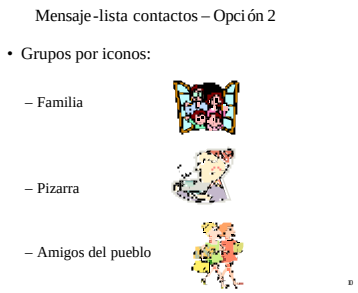


  - Method:

- Peer review from WP leaders inside ICING
- Feedback gathered in conferences where we presented our work
- Information gathered in the co-design process

? User studies with paper prototype interfaces

o Result: paper prototypes were done for most of the interfaces listed above, in particular several iterations of paper prototypes were used for the UM, and the ICING messenger.



o Method:

- User studies and usability test with real users where the paper prototypes were used to perform tasks from the scenario so that they can report their feedback.

? Refined software prototypes

o Result: all the interfaces created were though a first software prototype phase before they were implanted.

- Method:
  - ✍ User studies and usability test with real users where the paper prototypes were used to perform tasks from the scenario so that they can report their feedback.

WP3 Functional Requirements & Service Scenarios for intelligent environments

There was a single deliverable, D3.1, as a result of the effort in WP3 and it presented both the process and the results of this work package. The main results of this work package were the definition and selection of the service scenarios that guided technology development in the ICING project.

A number of approaches to supporting citizen-led services and eCommunities were developed in the course of WP3 of the ICING project, Functional Requirements & Service Scenarios for intelligent environments. This was a six month work-package and all ten European partners were involved in the work.

Within WP3 the D3.1 peer review was carried out by FBM_UPF. The main areas for improvement reported were related to the incorporation of more examples in the text and the

scenarios in the appendix. These recommendations were acted on and are in the final deliverable as reviewed and accepted by the commission.

The process by which the Scenarios were designed and refined is described in D3.1. In summary the initial knowledge discovery phase the main city actors and project partner teams were identified. Each of the city partners were then responsible to lead the effort to define a broad set of **ICiNG Scenarios** applicable to the communities defined in WP2. These scenarios were the base of a very broad use case and helped the partners decide on which constituted **ICiNG Services.** Final the work package was to meet two of the ICING objectives.

- Objective 2: To design and test intelligent urban environments, with embedded microchip, sensor, positional, communications and display technologies as the basis for providing better services to all citizens, by developing functional requirements in WP3, environmental access and structures in WP4, the Urban Mediator in WP5, and test-beds in WP8.

- Objective 3: To define citizen-led services that increase social involvement and inclusion through the use of intelligent environments and the tighter integration between city and communications infrastructures, by developing requirements and scenarios in WP3.

ICING Objective 2 (WP3 Indicator No 1)

To design and test intelligent urban environments, with embedded microchip, sensor, positional, communications and display technologies as the basis for providing better services to all citizens, by developing functional requirements in WP3

In the process of work on D3.1 the ICING team identified the set of scenarios and services which underpinned the development of the functional requirements fully described in D7.1. Each of the city cases- Barcelona, Dublin and Helsinki, contributed a complete set of scenario descriptions of how ICING services might be developed in each of their cases. In several workshops the partners then refined and ranked these scenarios and services and rapidly developed a shared understanding of the service outcomes. This process was successful in facilitating the development of scenarios which would include the microchip, sensor, positional, communications and display technologies assigned in Objective 2.

The work package successfully identified services and components such as the ICING Location Client (positional), Multi-Access Gateway (communications), ICING 3D (display) and Image Recognition scanners (sensor) required to realise the ambitious scope of the scenarios. Equally in testbed planning and deployment the scenarios were used to identify test cases and the required communication paths.

ICING Objective 3 (WP3 Indicator No 2)

Define citizen-led services that increase social involvement and inclusion through the use of intelligent environments and the tighter integration between city and communications infrastructures.

WP3 identified how the ICING services could deliver improved social involvement and inclusivity. Many of the scenarios developed identified citizen-to-citizen services which, if fully deployed, would allow communities and neighbours to better interact with each other. Likewise the scenarios developed also helped to define the social groups and services to be targeted in the test beds. In the 22@ district of Barcelona women and elderly groups were

identified and targeted with specific services. In Dublin the city identified people with accessibility needs as a target for ICING services.

In the case of Barcelona a specific scenario was developed in WP3 which called for the integration of the citizen led services with the city issue tracking service (IRIS). This was felt fully meet the objective of city service integration by allowing mobile issue reporting to the city. These service scenarios demonstrates the end to end integration of scenarios with test bed deployment and shows the step by step process of scenario development, service identification, service selection and functional specification involved in the this work package. Furthermore the successful achievement of this objective facilitated overlaps with work in WP2 and allowed fuller community involvement.

The Work package contributes to the achievement of project Objectives;

1. O4 To create a citizen-driven, evolving social software interface to the city, through the development of the Urban Mediator, and through building links between it and the cities' other systems.
2. O2 To design and test intelligent urban environments, with embedded microchip, sensor, positional, communications and display technologies as the basis for providing better services to all citizens.
3. O3 To define citizen-led services that increase social involvement and inclusion through the use of intelligent environments and the tighter integration between city and communications infrastructures

   The Work package contains two Tasks:

WP4 Research and Development of access modes

objective 2: To design and test intelligent urban environments, with embedded microchip, sensor, positional, communications and display technologies as the basis for providing better services to all citizens, by developing functional requirements in WP3, environmental access and structures in WP4, the Urban Mediator in WP5, and test-beds in WP8

Task WP4.T1: Seamless and universal city and citizen's access modes

Indicator: High user satisfaction and easy to use services

All the services delivered to citizens have been designed taking into account common process and interaction tools, trying to avoid any new technological feature that may generate doubts or troubles in the using of the devices. The works carried out in respect of the usability of the services with the users, in an early stage of the services designing, granted the providing of usable tools and concepts. During the pilot some access modes were difficult to provide, mainly do to technical factor rather than usability problems, but the concepts have been explained with positive feedbacks from users.

objective 5: To develop universal access gateways and interfaces for citizens to the City services, systems and environment through the use of commodity technologies such as mobile telephones, television and IP, hand-held devices, residential gateways or public access points to provide availability on the move, in the city environment or at home by researching access modes and simplified communications in WP4, supported by spatial-based systems developed in WP6, and gateways in WP7

Task WP4.T3: Functional and deployment specifications for service embedding

Indicator: Specifications are consistent with the delivery of scenarios and services derived from WP2 and WP3

The mobility scenarios have been designed using innovative sensors for the mobility matrix generation: the Bluetooth devices scanning. This technology, combined with conventional traffic cameras and cell tracking system, provide real-time information to users (drivers and city planners) of how the people is moving and how it is expected to move in the near feature, allowing a correct planning of traffic lights and mid-term streets design. Output of the system is presented in standart devices, like PC, laptop and mobile devices, through the use of conventional browsers.

objective 6: To develop interactive, location-based, and web-accessible tools for process modelling, decision support and environmental modification, based on feedback from citizens and the environment, with geospatial technologies by RTD in WP4 and WP6, integrated with City systems in WP7.

Task WP4.T2: Interactive tools for process modelling and decision-making.

Indicator: Tools taking full benefit from the new sources of data and access to external city processes can be developed in the integration workpackage. Coherence to the complementary visions from the three cities involved, with of suitable convergence

The use of standard Bluetooth devices for the process modelling in the 3 cities enable the planning of the mobility in any environment, this data source has no geographical dependencies, so it may be used anywhere at anytime. Each city may integrate this

information into its own planning information system, allowing an easy and low-cost integration.

WP5 Citizen-Driven Intereaction with the City

WP5 Citizen-Driven Interaction with the City is meant to create interfaces, mediating tools and social processes between the city, the citizens and other stakeholders, between official and expert knowledge of urban infrastructure and the knowledge that is based on the lived experience of the city. WP5 has produce a working prototype of the Urban Mediator software (D5.1 and D5.3) as well as a report on citizen-driven interaction in the city and roadmap (D5.2). The Peer review of the deliverables was realized by IMI . General recommendations have been followed for the deliverables.

From a general perspective this WP addresses the following ICING objectives:

O2: to design and test intelligent urban environments with embedded technologies

O3: To define citizen-led services that increase social involvement and inclusion

O4: To create a citizen-driven, evolving social software interface to the city

ICING Objective 3 (WP5 Indicator No 1)

Identification of existing citizen-driven interaction in each city

Through work on D5.2 we identified the existing modes and practices of citizen-city interaction in Barcelona, Dublin and Helsinki. Each city gave a description of how various departments or units had organised their citizen participation and feedback modes. The various practices in each city had not been put together into a single document before; therefore this exercise has given each city a good look into the current state of affairs.

ICING Objective 3 (WP5 Indicator No 2)

Identification the need and potential for further development of citizen driven interaction in each city

D5.2 identified how ICING-type systems (digital interaction tools) could improve the situation in each of the cities. Most of the practices for city-citizen interaction in each of the cities were based on traditional modes of interaction: phone calls, visiting hours or on-line forms to be filled. Digital tools can take the interaction one step further which has been proven in the field trials of ICING. The system allows for both citizen led and city driven interaction. When cities identify knowledge gaps and the need for citizen participation in specific instances the information gathered can be used economically and efficiently to influence decision making. The field trials have proven this to work effectively.

ICING Objective 4 (WP5 Indicator No 1)

The architecture enables the development of a social software where every citizen has a possibility not just of accessing but of producing information.

This indicator is well addressed. Through the use of Urban Mediator (D5.1 and D5.3) citizens have the possibility to create, obtain, and share location-based information (points) that is organized according to topics set up and maintained by the users themselves. The component also provides a set of tools for users to process, share and organize this information (boards or topics). The service is accessed through the web, using a normal PC or any browser-enabled mobile device.

ICING Objective 4 (WP5 Indicator No 2)

The information content of Urban Mediator evolves through its use

The UM component provides standard mechanisms for feeding and syndicating the information (RSS, GeoRSS,IISYS feeds) and several other conscious user interface strategies to encourage and facilitate links from other systems in the form of UM widgets and UM tools. As part of the Complete ICING System, UM is able to connect specific topics to legacy systems of the city and reach the administration efficiently

UM renders its content accessible to all viewers, submissions are available and transparent to anyone who either contributes or visits the site out of curiosity, so remixes are encouraged and supported by different features. The threshold of setting up a project (both for city and the citizens) is low as it is lightweight, non-critical mission infrastructure and can be deployed fast, without compromising security, while keeping visibility and accountability towards the initiators.

ICING Objective 4 (WP5 Indicator No 3)

The performance of Urban Mediator evaluated and developed in an iterative and interactive co-design process

UM design and development has followed a highly iterative approach. The design team has build early prototypes using repurposed software to quickly start workshops with communities. Envisioned features and functionalities have been turned into new prototypes (D5.1) that have been tried out in controlled situations (workshops and co-design sessions docemented in WP2 deliverables) as well as broader public trials with the first stable releases (D5.3) of the software. Three considerably large public trials were realized in Helsinki in 2007-2008 (docemneted in D2.2 and D2.3). Five department of the City of Helsinki have been

involved at different stages, various organized communities and more than 600 unique users (participants in public trials and small scale workshops) have been engaged in the process.

WP6 Spatial based decision support and environmental interaction

WP6 Spatial based decision support and environmental interaction creates a set of software components providing location services used by the other components of ICING to provide capabilities to users.

WP6 had two deliverables:

1. D6.1 Novel Cellular Location and Route Finding Technology

2. D6.2 Technology Demonstrator of Location Attribution Service, Community Definition Services and Graphical map Interaction Services, Geospatial event analysis facilities and notification service with Online Help

Both of these were delivered. These deliverables were reviewed by DIT and were found to be satisfactory.

This Work Package primarily addresses the following ICING objectives:

1. O6: **To develop interactive, location-based, and web-accessible tools** for process modeling, decision support and environmental modification, based on feedback from citizens and the environment, with geospatial technologies by RTD in WP4 and WP6, integrated with City systems in WP7.

2. O5: To develop universal access gateways and interfaces for citizens to the City services, systems and environment through the use of commodity technologies such as mobile telephones, television and IP, hand-held devices, residential

gateways or public access points to provide availability on the move, in the city environment or at home by researching access modes and simplified communications in WP4, **supported by spatial-based systems developed in WP6**, and gateways in WP7.

3. O7: To install and validate Test-beds incorporating social software, multimodal access gateways, sensor and communications networks, **location-based support systems** and City technology platforms in high-profile city locations as means of researching, evaluating and demonstrating technologies and services by designing and integrating technology platforms and interfaces in WP7, setting up communications systems and Test-beds in WP8 and evaluating them in WP10

ICING Objective 6 (WP6 Indicator No. 1)
To develop interactive, location-based, and web-accessible tools *for process modeling, decision support and environmental modification, based on feedback from citizens and the environment, with geospatial technologies by RTD in WP4 and WP6, integrated with City systems in WP7.*

To meet this objective, the following location services were identified as being needed by ICING, specified (following or extending standards where appropriate), and implemented in the WP6 deliverables:

1. **D6.1 Novel Cellular Location and Route Finding Technology**
    1. **Location Services**:
        i. **Directory Search Service / Location query** – Find issues based on search criteria.
        ii. **Geocoder Service**– Resolve textual address / location descriptions to and from co-ordinate geometries
        iii. Route Finding Service – Provide a shortest path over roads between two defined places. **(***Delivered with D6.2***).**

2. **Icing Location Client (ILC) prototype–** used on a mobile device to determine and report location of the device using a variety of mechanisms including GSM, Wi-Fi, Bluetooth and external GPS.
3. **Location Services in "Multimodal Access Gateway" (MAG) (developed by TID as part of WP8):** ("Terminal Location Query & Monitoring") **–** providing high-level access to low-level telecommunications infrastructure including location services to report the location of one or of a group of devices (mobile phones).

2. D6.2 Technology Demonstrator of Location Attribution Service, Community Definition Services and Graphical map Interaction Services, Geospatial event analysis facilities and notification service with Online Help

The following user services were delivered (with the relevant Software Components indentified in **bold**):

1. Location Attribution – recording issues for locations, using:
   i. **Location Data Accessor** – for use with IISYS. (*Delivered with D6.1*)
   ii. **OGC[1] WFS-T service** - an implementation of the OGC "Web Feature Service" standard.
2. Community Definition - provided by notifications based on geographic regions in the **Event Analysis and Notification Service**, and by the ability in the **IISYS** to define groups of users for notification purposes.
3. Graphical map Interaction:
   i. **Map Portrayal Service (OGC Web Map Service)** – to provide a map image for a location. (*Delivered with D6.1*).
   ii. **Thematic Service** – An extension of the OGC Web Map Service to support display of thematic map layers.
   iii. **Temporal Map Service** – An extension of the OGC Web Map Service to support requests for maps for a supplied time.
4. **Event Analysis and Notification Service** - Allowing users to specify rules for events of which that are to be notified, event-analysis to monitor events on the basis of the rules, and notification service to notify users of events, either by email, or – via the MMG – by messages to other devices.
5. Technology Demonstrator – the above are demonstrated using the ICING **Urban Mediator**, and by using a **demonstration application**.
6. **On-line Help**- provided on the project wiki web site.

These services have been integrated into the ICING systems in the cities, as follows:

- Urban Mediator (UM) uses:
  - ICING Location Services:
    - Map Portrayal Service (WMS).
    - Directory Search – to get incident locations and text to display.

[1] OGC = Open Geospatial Consortium

- Geocode Service – to resolve addresses to locations.
- ICING Location Data Accessor – to record incident locations and details with Location services.
- Thematic Map Service to display thematics in the Urban Mediator
- WFS-T Service to delete issues
- WFS Service to synchronize issues created with Issue-Reporter

- IISYS calls:
  - ICING Location Data Accessor– to record incident locations and details with Location services.
- iMessenger:
  - ICING Location Client (ILC) – integrates with ILC to determine phone location.
  - (via iMessenger Services / IISYS) calls ICING Location Data Accessor– to record incident locations and details with Location services.
- iMessenger Services uses:
  - Location Data Accessor– to record incident locations and details with Location services
- Traffic Monitor Application (in Barcelona) uses:
  - Web map Service
  - Thematic Map Service
  - Temporal Map Service
  - WFS-T – to update traffic information for street segments

ICING Objective 5 (WP6 Indicator No. 2)

To develop universal access gateways and interfaces for citizens to the City services, systems and environment through the use of commodity technologies such as mobile telephones, television and IP, hand-held devices, residential gateways or public access points [...], ***supported by spatial-based systems developed in WP6****...*

The location services are being used successfully from both PC web browsers and from mobile phones.

ICING Objective 7 (WP6 Indicator No. 3)

To install and validate Test-beds incorporating social software, multimodal access gateways, sensor and communications networks, ***location-based support systems*** *and City technology*

platforms in high-profile city locations as means of researching, evaluating and demonstrating technologies and services by designing and integrating technology platforms and interfaces…

The location services have been integrated with the ICING technology platforms, as described above. Additional work was done to use the services for the trials – setting up maps, address data, and other location data, for each city, and putting infrastructure in place for the trials. The location services worked successfully for the trials.

WP7 Functional Requirements & Service Scenarios for intelligent environments

WP7 had 4 deliverables, all of which were related to the development of the software systems in ICiNG. As an integration work package, work included negotiating and cataloguing interfaces and interfacing technology as well as service governance. Hence, work delivered here included and/or benefit from efforts of all other work packages.

WP2, WP3, and WP4 provided for software requirements for WP7. WP4, WP5, WP6 and WP8 implemented systems or generated system specifications that have software interfaces with WP7 systems and were in need of integration efforts. Finally, in WP10, criteria for testing and evaluating WP7 work have been defined.

The main output of WP7 is actual binaries and documentation, corresponding to the following deliverables:

? D7.1 Functional and Technical analysis document and deployment guide, which presented a functional analysis of the different subsystems making up the whole of the IT infrastructure to be developed in ICING.

- D7.2 A pilot in a production environment for the 22@ district in Barcelona, which was done after these systems had been integrated. It gave an overview of the software which had been implemented in terms of tailor-made software and reused components and showed where and how the systems could be accessed.

- D7.3 System testing plan and results obtained, which described how testing methodologies and tools employed by the different subsystems.

- D7.4 Binary & source code files of each module and component of the tested and adjusted Demonstrator with User Documentation, the final deliverable of the work package, which corresponds to the actual delivery of the code and documentation to the European Commission.

Under the umbrella of WP7, SW systems from the all software-developing partners have been integrated. The work package ran from T4 up to the end of the project and involved all of the project partners, with T-Systems serving as the work package leader and responsible for the deliverables.

Peer review was carried out by Telefonica I+D. The extensive feedback about issues such as structure of the documents, figures or methodology have been processed and integrated into the final deliverables.

The deliverables built upon one another and correspond to the principal phases of software development according to the waterfall model: analysis and design (D7.1), construction (D7.2), test (D7.3), and release (D7.4), though it should be emphasized that in reality these stages were overlapping and not closed with the release of the corresponding document. Whenever

new ideas were introduced, analysis efforts had to be undertaken. Accordingly, until very late in the project, both software construction and testing continued.

- O5 To develop universal access gateways and interfaces for citizens to the City services, systems and environment through the use of familiar commodity technologies such as mobile telephones, television and IP, using hand-held devices, residential gateways or public access points to provide availability on the move, in the city environment or at home.

- O7 To install and validate Testbeds incorporating social software, multimodal access gateways, sensor and communications networks, location-based support systems and City technology platforms in high-profile city locations as means of researching, evaluating and demonstrating technologies and services.

ICING Objective 5 (WP7 Indicator No 1)

O5 To develop universal access gateways and interfaces for citizens to the City services, systems and environment through the use of familiar commodity technologies such as mobile telephones, television and IP, using hand-held devices, residential gateways or public access points to provide availability on the move, in the city environment or at home, by establishing an overall system architecture as a layered SOA, guiding functional analysis efforts for each software system and re-aligning system interfaces, defining and proposing testing methodologies and tools, and leading integration efforts.

The initial idea of the complete ICiNG system (CIS) was to build something similar to a web-based operating system – where a robust infrastructure would provide common services,

whereas other services could be added on the fly. This soon developed into the idea of using a SOA.

However, due to the heterogeneity of systems and environments involved, it was not possible to connect all of the systems via Web services. Especially systems running on mobile devices needed to be considered separately and integrated indirectly, via mediating layers.

Once this picture had been outlined, interfacing partners were asked to reconsider and define their dependencies and to negotiate interfaces between them. Functional analysis documents were created. End-to-end scenarios were written in order to support both testing and integration. Testing was done on subsystem and system-wide level.

Not only Telefonica I+D, but all of the partners contributed to the reviews and discussions of the achieved results at each stage of the project. The feedback formed valuable input to the improvement of the system.

Unifying development processes across all partner and system boundaries was found to be impossible. This was due to the different settings in which development took place. E.g. some of the university partners employed rapid prototyping approaches, whereas industry partners favoured to follow existing, company-dependent development processes.

In order to establish common ground for software development at the different partner sites and for deliverable creation, templates were created and discussions held, either face to face in dedicated workshops or via online communication tools. As far as possible, open standards were applied. The set of applicable standards were discussed and decided upon by development partners.

Specific processes and methodologies (such as for realignment) were conceived to support all of these efforts.

ICING Objective 7 (WP3 Indicator No 2)

O7 To install and validate Testbeds incorporating social software, multimodal access gateways, sensor and communications networks, location-based support systems and City technology platforms in high-profile city locations as means of researching, evaluating and demonstrating technologies and services, by defining deployment models, guiding integration and testing and ensuring interface compatibility between different partners.

Before installing a suitable test bed, different deployment models were proposed by WP7 and then discussed on a project-wide scale. The chosen option was verified by system partners in terms of feasibility and applicability, before a model where each system would stay close to its developers was approved.

How integration, testing and interface compatibility have benefited from work done in WP7 has already been described.

Besides O5 and O7, WP7 contributed to the following objectives:

- *O3: To define citizen-led services that increase social involvement and inclusion through the use of intelligent environments and the tighter integration between city and communications infrastructures, by developing requirements and scenarios in WP3.* WP7 has provided feedback which helped shape the scenarios and has evaluated their technical feasibility.

- *O4: To create a citizen-driven, evolving social software interface to the city through the development of an Urban Mediator, and through building links between it and the cities' other systems, in WP5.* WP7 has provided services – in particular the IssueReporter and user- and group management – that were integrated into the Urban Mediator platform.

- *O6: To develop interactive, location-based, and web-accessible tools for process modelling, decision support and environmental modification, based on feedback from citizens and the environment, with geospatial technologies by RTD in WP4 and WP6, integrated with City systems in WP7.* With the IssueReporter, WP7 has developed a service that replicates data to a GIS-aware data repository and a city system.

O8: To evaluate the usability and usefulness of the technologies and services, with particular reference to social and human factors, in trials with significant sample groups of users in the Evaluation work package WP10. Usability tests have been run on software that has been integrated by WP7.

WP8 Test-bed set-up, adjustment, trials and testing

The main goal of WP8 was to develop and then validate the infrastructures needed for project development and usage. This task was divided in two main parts: establishment of the testbeds and technology validation. The efforts during WP8 resulted in the production of two deliverables regarding the testbed infrastructure deployment and evaluation, both reviewed by T-Systems:

- D8.1 Testbed Plan and Test Methods: a descriptive report of the communications infrastructure and the systems that are to be deployed and integrated in the three

participating cities (Barcelona, Dublin and Helsinki) and the test methods to be used for the validation of the City Testbeds.

- D8.2 Wireless Broadband network and Sensor network for test-bed: covers the methodology and procedures for proper technology testing and validation. This document renders the tests and their respective results obtained verifying that the chosen technological solutions meet or exceed the required performance and/or suitability levels.

ICING Objective 7 (WP8 Indicator 1)

To install and validate Testbeds incorporating social software, multimodal access gateways, sensor and communications networks, location-based support systems and City technology platforms in high-profile city locations as means of researching, evaluating and demonstrating technologies and services.

The objective for the first part of the WP8 tasks, those regarding the established in D8.1, was to verify and ensure the proper installation and integration of the diverse components that would form the city infrastructure. The Urban Mediator (UM) was set up so citizens could address issues to their respective city councils using either the direct interface of via the Multi Access Gateway (MAG) that allows users to access the system through any wired or wireless internet capable device. This layer also provides location information that would allow users to be aware of the proximity of their contacts and community members, using the mobile application developed for Java capable phones. The services within the MAG are offered to the back-end through a standard Web Service interface that can ensure easy redeployment and specifications compliance according to the interfaces used by most operators.

The flow from MAG to UM also goes through the Multi Modal Gateway (MMG) in charge of properly formatting the messages both incoming and going back and forth from users to the city council. On top of the MMG lay the ICiNG integration system (IISYS) that will allow communication between services and users.

ICING Objective 2 (WP8 Indicator 2)

To design and test intelligent urban environments, with embedded microchip, sensor, positional, communications and display technologies as the basis for providing better services to all citizens

As a result of the efforts detailed in D8.2, the evaluation of both suitability and performance of the chosen technologies and infrastructures proved them to be adequate for the necessities of the project. This meant that after having deployed the services environment and tested the available solutions, it was verified how the newly implemented infrastructure would offer a range of new services for the citizens providing easier and more direct communication with the city councils. This new communication channels would allow citizens to report issues regarding trashcans in Barcelona, bunny sightings in Helsinki and accessibility issues in Dublin. This way, and by using their handheld devices, citizens are able to quickly communicate with their respective city councils to make themselves heard.

It will also be possible for citizens to interact with members of their communities, friends and relatives by using the extra information the location enabled instant messaging client provides. This way, people can ask for advice, pop questions or just meet up easily.

When all the 3rd party infrastructures are deployed, it will be possible to provide the council with data regarding traffic matrixes, citizen movement and sustainability information. This

data permits to analyse the movement of groups or masses of people, or even vehicles, and control and react to the new events in almost real time.

WP9 Dissemination and Exploitation Planning

objective 9: To publicise and disseminate results to city administrations, professional communities and citizen' groups, to raise awareness and develop appropriate training to further the development and implementation of intelligent city services through the Dissemination activities in WP9.

Task WP9.T1: Dissemination.

Indicator: Reaching four target groups: the research community, IT Companies, Administrations and citizens.

Partnerships with the EU, Local and Regional Authorities, Universities to promote the results; participation in local and international events;

Published information about the project; Conferences or public events.

A prototype "Intelligent Street Sign" as an information point at conferences, trade shows, public meetings etc

Extended dissemination works have been carried out by all partners, reaching many different interest groups in local and international context, and specially the research community, IT Companies, Administrations(Municipalities) and citizen. Apart from the press releases, conferences and papers made all along the project timeline, the final ICING event held in June in Barcelona provided to the project a unique opportunity to promote the ICING

results and benefits, with the attendance of IT companies and municipalities chief officers from Portugal, Spain, Italy, Ireland and Finland.

objective 10: To create a roadmap for the exploitation of results through real services, development of public policy and future research directions, and the conduct of further RTD, contributing to the standardisation process and developing exploitation plans by the technology providers, system integrators and public administrations through the Exploitation planning activities in WP9.

Task WP9.T2: Exploitation will have sub-tasks covering the development of the Initial IPR Management strategy and defining the Exploitation and Use of Knowledge plan definition.

Indicator: Exploitation group set up. Roadmap for future RTD, Implementation and Use plan and the Final Exploitation and Use of Knowledge Plan for projects and its different components or individual results, mapping them onto the actual market needs and realities.

The potential use of EU structural funds for further exploitation will be explored, particularly as a means of helping societal inclusion for less advantaged communities.

In deliverable D9.3 IPR management have been carefully studied, covering all patners developments and pre-existing/proprietary software. This IPR management is the basis for the exploitation plan and the business models proposed. The ICING Cookbook has been launched as a roadmap for possible new ICING cities.

Regarding the exploration of EU structural funds for further exploitation, as this exploitation highly depends on the services built up by new ICING city, there is an important possibility for the future ICING developments to match specific EU programs, and specially when the targeted community has some risk of social exclusion. The currently provided accessibility service represents an example of a disadvantaged community which obtains an important benefit from ICING, as a demonstrator of the social impact ICING may have in any city.