

KIWI: Building Innovative Knowledge Management Infrastructure Within European Public Administration. The case of Prefecture of Milan

Lara GADDA¹, Valentina PERDONI², Alberto SAVOLDELLI¹

¹*Politecnico di Milano, 20133 Milano, Piazza Leonardo da Vinci 32, Italy*

Tel. +39 02 23992796; Fax. +39 02 23992720

lara.gadda@polimi.it

²*Sineura, 20038 Seregno, Viale dei Giardini 9, Italy*

valentina.perdoni@sineura.com

Abstract : The paper shows the case study of Prefecture of Milan, one of the users of KIWI project. This allows to present the improvement interventions in order to highlight the main user requirements for KIWI platform. It lets public employees access anywhere and anytime to relevant knowledge, transformed from implicit to explicit, through mobile devices. KIWI platform is an innovative, user-relevant, wireless technology which makes the relationship between Public Administration and citizens easier.

1 Introduction :

In the last few years, industrialised Countries faced up the necessity of reforming Public Administration (PA), a crucial problem since that context is quickly evolving. The change in progress is moving along two directions: on one hand, the users require a Public Sector's "product" risen in value and, on the other hand, there's the need to provide better services using the same resources (AIPA, 1999).

Public Sector reform started with the adoption of a new set of rules which led to the *decentralisation* and the *modernisation* (Klages, Loffler, 1995), but the mere political rules' transformation is not enough and it is necessary to develop a specific method in order to enhance organisations' performance, efficacy and efficiency (Hammer, Champy, 1993). The *technological innovation* and *web oriented technology* are the necessary starting point for improving Public Administration performance. They need to be constantly accompanied by complementary changes in administrative and organisational fields. There is the necessity to use a "*change management*" which should combine with information technology, change of organisation and human resources management (Osborne, Gaebler, 1993).

The dynamic environment, where Public Administration operates, requires the need to access information regardless of distance and language, paving the way to make mobile public services affordably and securely available by anyone, anytime and anyplace.

In this context KIWI project, a shared-cost RTD within Information Society Technologies (IST) programme, aims at developing innovative knowledge management (KM) infrastructures able to transform *public administrations* at any level inside Europe into knowledge driven and dynamically adaptive learning organisations and empower public employees to be fully knowledge workers.

The choice of focusing attention on KM arises from the fact that the *Knowledge is more and more becoming the most valuable asset within an administration and KM is the key to the administration reaching its potential*. Each government aims at making information easily accessible to everyone, including citizens, suppliers and partners, and converting that information into knowledge. Knowledge management can provide benefits to an administration's employee. Sharing and reusing intellectual capital increases effectiveness, productivity, and quality in many ways. The KM infrastructures are a *support to remote workforce*: it's essential to help public employees to access important information when they need to make decisions avoiding mistakes and learn from other employees' experience. Indeed, they provide efficient and time-saving solutions: leveraging the knowledge gained from experience enables a better workload distribution within organisations adding value to citizens' services.

The innovation of KIWI project consists of transforming relevant PA services in anywhere and anytime ones, leveraging the PA intellectual capital in their relevant processes, embedding knowledge management in the PA relevant processes and using mobile technology as enabler for managing knowledge in the PA relevant processes. In order to achieve its objectives, the project starts analysing the *user requirements* of the two Public Administrations involved in it: *Prefecture of Milan in Italy and Turku Local Authorities in Finland*. This article focuses its attention on the two field trials where KIWI solution has been applied.

2 KIWI System Architecture

As regards the general tools choices, Performance Comparison of Middleware Architectures for Generating Dynamic Web Content, derived from a few research papers that was recently published in which a web applications performance characteristics between PHP, Servlet, and Servlet/EJB implementations were tested, has produced the choice to use different languages to develop KIWI layers.

While Java servlets are less efficient than script languages (such as Perl or PHP), their ability to execute on a different machine from the Web server and their ability to perform synchronization leads to better performance when the front-end is the bottleneck or when there is a database lock contention. EJB facilities and services come at the cost of lower performance than both PHP and Java servlets.

Following this benchmark analysis, it has been decided to use:

- PL/SQL for business logic layer near DB. PL/SQL code is very efficient and sturdy when business logic can be implemented inside the DB Engine. A great amount of work is done, inside KIWI KDWH logic, using the DB engine to perform work. The DB used is the well-known open source MySQL DB;
- Java for Back End and general workflow management. Java is the leading open source language for web applications: powerful, flexible, easy to manage, modular, object oriented, able to generate documentation (Java doc) etc. In particular, the *J2EE (Java2 Enterprise Edition)* framework has been used. The similarity of the approach to distributed applications (software reuse, composition, simple integration) of Java has led to the choice of this language. In the last years, J2EE has become, de facto, the standard platform for multi-tier applications based on components and for internet and intranet enterprise applications. Java is the right choice to implement back end layer and workflow management because of its ability to perform actions through the three tiers of a classical application (DB, applications, web);
- PHP for a few front end applications. The groupware framework has a few functionalities where the reply velocity is crucial. A few elements, like chat, forum, news are largely available inside open source world and are very easy to manage using PHP. So,

considering these two points, a script language has been adapted and few front end applications have been developed, managing the deeper layers with Java.

The J2EE version of Java language supports easily the implementation of Web Services architecture. As defined by the W3C, a Web Service is “a software system identified by a URI, whose public interfaces and bindings are defined and described using XML. Its definition can be discovered by other software systems. These systems may then interact with the Web service in a manner prescribed by its definition, using XML based messages conveyed by Internet protocols”.

That is, a web service is an interface (a service, in the general meaning of the term) that describes a collection of operations that are:

- accessible over the Web using HTTP or another standard messaging protocol (e.g. SMTP);
- identified and invoked using Web technologies, including a URI and a message described via an XML-based protocol: SOAP;
- defined via an XML-based interface, the WSDL document, that hides the implementation details of the service, but defines the details necessary to interact with it, including message formats (that detail the operations), transport protocols and location.

The main guidelines in development have been the following:

1. *platform independence modularity and integration*: the definition of the interfaces hides the implementation details of the module considered, allowing it to be used independently of the hardware or software platform on which it has been implemented and also independently of the programming language used. This approach allows applications to be integrated more rapidly, easily and less expensively. Integration occurs at a higher level in the protocol stack, based on messages centred more on service semantics and less on network protocol semantics, thus enabling loose integration of functions. These characteristics are ideal for connecting applications across the Web, both between organisations and within organisations (as in the case of KIWI platform). They provide a unifying programming model so that application integration inside and outside the organisation can be done with a common approach, leveraging a common infrastructure;
2. *use of Standards*: the KIWI Platform is based on a common program-to-program communications model, built on existing and emerging standards such as HTTP, Extensible Markup Language (XML), Simple Object Access Protocol (SOAP), Web Services Description Language (WSDL) and Universal Description, Discovery and Integration, UDDI. This allows organisations to reduce the cost for mobile and electronic government, to deploy solutions faster and to open up new opportunities. The use of standards is also consistent with KIWI platform implementation goals. In fact, “*KIWI will support the adoption of standards languages and technologies*” and the tools implementation “*must be conformed to existing and upcoming standards*”;
3. *composition*: the separation between the interface and the realisation of service and the independence by the hardware or software platform allow and encourage Web Services-based applications to be composable, that is, loosely coupled, component-oriented and cross-technology implementations. As previously underlines, a Web Service fulfils a specific task or a set of tasks. It can be used alone or with other Web Services to carry out a complex aggregation or a transaction;
4. *software reuse*: software reuse reduces costs of new implementations, minimizes time and improves reliability, since existing parts have experience and real data that testing phase can't provide. Public Administrations, in fact, encourage the use and development of reusable software inside their information systems and infrastructures (such as, for

example, the case of Italian Ministry of Innovation and Technology that published in 2003 a Regulation on the “Software reuse in Italian Public Administrations”);

5. *integration with existing systems*: most organisations have an enormous amount of data stored in existing organisation information systems (as in the case of KIWI Public Administrations environments), and the cost to replace these systems is such that discarding these legacy systems may not be an option. Web services lets organisation application developers reuse and even commoditize these existing information assets by providing developers with standard ways to access middle-tier and back-end services, such as database management systems and transaction monitors, and integrate them with other applications. In addition, because these services are provided consistently, developers do not need to learn new programming models or styles as integration needs expand;
6. *support more client types*: since a main objective of Web services is improving interoperability, exposing existing applications or services as Web services increases their reach to different client types. This occurs regardless of the platform on which the client is based. In short, a Web service can help developers to extend their applications and services to a rich set of client types.
7. *security*: network security is supported by through the usage of secure transport mechanisms such as SSL and HTTPS that provide confidentiality (i.e. the property that information is not made available or disclosed to unauthorized individuals, entities, or processes, and guarantees that the contents of the message are not disclosed to unauthorized individual) and data integrity (i.e., the property that data has not been undetectably altered or destroyed in an unauthorized manner or by unauthorized users thereby insuring that the message was not modified accidentally or deliberately in transit).

As regards the KIWI tools overall architecture, the platform is composed by the following components:

- *Mobile Groupware Tools* which implements the specific logic of communication and collaboration services executing all the tasks required to complete the service request. *Groupware Services* includes different services such as: Calendar services (Group shared Calendar, ToDo list, Workflow), Groups services (Groups and members creation and management) and Community services (E-mails, Forum, Polling). *Communication Services* concerns of Instant Messaging and Presence Service management;
- *Knowledge Datawarehouse Tools* which implements the specific logic of knowledge data warehousing services executing all the tasks required to complete the service request. It is the component that directly interacts and updates the KIWI KDWH both for KDWH services and Mobile Groupware services. In particular, the KDWH services can be grouped in three main functionalities, i.e., application controller, content handling and user profiling. *Application Controller*, which is in charge of retrieving user requests, creating the whole service and then sending the final content, personalised according to the user profile, preferences and device capabilities. Application Controller interacts with the rendering and security environments. Application Controller is the component that connects the KIWI platform logic. *Updater* which enables the Datawarehouse model, gathering all kinds of information from all the DBs involved in KIWI platform, storing and re-organising them in a unique warehouse. It creates historical with added knowledge value derived applying intelligence on gathered information. Updater module contains two main components, the Organiser and Smart Profiler. *Content Manager* which has the task of filtering the information according to the context, which is composed by the user profile, the device profile, the user location and time. The Content Manager filters the

information and it is also able to offer suggestions. It contains two important modules, i.e. Search Engine and Recommender.

It is worth highlighting that during the KIWI Prototypes the following modules will be implemented:

- *GUI Manager*: component which will be in charge of getting the services request and delivering the result according to the user device properties. In particular this component will interact with the KIWI Application Controller over HTTP protocol;
- *Session Manager*: component which will be responsible of creating and managing sessions within the KIWI platform. It will manage both the internal session;
- *Security Manager*: component which will offer functionality to satisfy typical security requirements: data confidentiality, user authentication and authorisation.

3 The case of the PREFECTURE of MILAN

The Prefecture of Milan is one of the 103 Italian Prefectures based in Italy depending by the Ministry of the Home Affairs. The Prefecture is a local body of the state Administration in charge of general affairs and government representative at provincial level.

With regard to KIWI project, it's important to underline that the Ministry of the Home Affairs, and subsequently each Prefecture, is especially interested in *making its employees professionals knowledge workers and gaining more efficiency*. Already equipped with laptops and mobile phones, *the public employees are a highly mobile workforce with high information and communication needs*. Indeed, employees need to communicate each other country-wide, need to exchange data, documents and opinions with other Government administrations at local, regional and national level.

The introduction of a *Knowledge Management* system within Prefecture allows to increase the efficiency of the knowledge management process (eliminating duplicate and inefficient activities), to increase the usefulness and the effectiveness of existent knowledge (improving its diffusion and usage), to favour the communication and the sharing of knowledge among different public bodies (facilitating the co-operation), to increase the uniformity among sectors (introducing common methods of work to ensure high quality services), to facilitate the organisation of training courses and improve their effectiveness.

The usage of mobile device makes the time, spent by civil servants outside Prefecture, productive time and doesn't stop the procedures, saving time and cost in decision-making. It allows to increase collaborative working and the quality of the delivered services.

3.1 Knowledge management and problem addressed

The Prefecture of Milan manages six different kinds of knowledge that result indispensable for the developed activity.

The *operative rules* are, for their own objectives, explicit and easily transferable. This knowledge is structured, almost fix, and can be easily communicate to employees. These rules are fix in the sense that they are rarely changed, because once a procedure is accepted it normally passes quite long time before to modify it.

The distinction between operative rules and Best Practices is very weak, in general it can be said that *Best Practices* become directly from the experience on particular problems, so they are generally less structured and verified, and they need some common background and/or context explanation to be properly understood. Moreover, this knowledge is continuously developing, depending on the actual needs and activities of various sectors.

The *basic information* and the *in-depth knowledge* of laws and rules required are other two examples of explicit, mainly fix, and easily transferable knowledge. Currently, various sectors have already arrange manuals and reference documents to collect this information and support the training and the daily activity of each activity.

The *historical data* are a whole of data and information that are used for various activities. In general, these are explicit and well structured information, so they are easily storable and transferable, even if these data are continuously developing and increasing.

The *experience* is the most difficult to manage because of its complexity. In fact, it is a whole of information that help the employees (usually at high level) to take the best decision on line with the context. In general, these are tacit and not well structured information, so they are hardly storable and transferable, also because these data are continuously developing and increasing.

Finally, *legal competencies* are often maintained at an informal level, even when it could be explicated, because it requires a certain effort to formalise and explicate it. Moreover, it's a developing knowledge, continuously increased and enriched by new experiences, new studies, or new situation. This requires an additional effort for maintaining information and knowledge constantly updated, otherwise it would lose its usefulness. At the same time, these competencies are quite difficult to communicate and transfer, because they need a specific and professional background to be understood.

Considering this description, the civil servants of the Prefecture of Milan needs to manage different kind of knowledge. Various instruments and interventions are necessary to reach these objectives, also because each typology of knowledge requires proper solutions. In general, it's possible to identify four major kind of interventions:

- a *standardisation intervention*, aimed at increasing the formalisation of information facilitating the processes of explication, collection, storing and diffusion of knowledge;
- the *definition of rules and procedures* common to all sectors, in order to increase the uniformity of action, obtain a common quality level, and facilitate co-operation and co-ordination among bodies;
- the introduction of *proper electronic databases* for collecting, storing, and sharing information in an effective and efficient way. These “repositories of knowledge” should be useful also for training the new employees;
- the introduction of the use of the *new mobile devices and methods of work* aimed at increasing and supporting information sharing and co-operation among bodies.

3.2 Description of the scenario

In July 2002, the Italian Government approved the *law of modification of the normative on the subject of immigration and refuge* – Art. 33 concerning the declaration of emerging of irregular work of extra-community in charge of home help or assistant. Moreover, the Senate undertakes the Government to issue a measure which foresees the possibility to legalise the extra-communities who do a subordinate work. The number of the regularisation procedures sent to all Prefectures-UTG is 702.156 files: 341.121 are related to the home help or assistant, while the others 361.035 to the subordinate work. Lombardy (whose administrative centre is Milan) and Lazio are the Regions which received the higher number of procedures. By the end of December 2003, the first phase of regularisation is ended. Following, the second phase consists of the standardisation of the process.

In order to give a more concrete analysis of the Italian scenario, in the following, the description of the procedure related to a request of family reunion:

1. a non-EC immigrant submits his request of family reunion on paper format to Ms Manzo, the filing clerk of the Immigration Centralised Desk inside the Prefecture of Milan. Ms Manzo protocols the new procedure in the KIWI system;
2. Ms Manzo, in order to start the new procedure, opens a new Workflow (WF) involving 5 operator clerks of the Immigration Centralised Desk of the Prefecture of Milan with full rights on it;

3. Mr Albergoni, one of the operator clerks of the Immigration Centralised Desk of the Prefecture of Milan, automatically receives from KIWI system a notification about the new WF. He opens the WF, takes in charge the procedure and closes the process;
4. first of all, Mr Albergoni needs to receive the authorisation from the Police Headquarter in relation to the criminal record of the non EU-immigrant. Therefore, Mr Albergoni opens a WF with an operator of the Police Headquarter (Mr Osvidi), using notes to ask him to check the criminal record of the non-EC immigrant;
5. Mr. Osvidi accesses to CEN system (which has to be separated from KIWI system due to the sensible data stored) to verify the position of the non EU-immigrant and provides the authorisation, through the WF notes;
6. Mr. Albergoni analyses the delivered documentation and notices the presence of an anomaly: the income tax return is missing. Checking deeply the documentation, Mr Albergoni understands that the non-EC immigrant is in Italy less than one year and he is not able to present this kind of document. Mr Albergoni doesn't know how to manage the procedure;
7. first of all, Mr. Albergoni decides to search, in the KIWI system, for a legislative document which could help him to solve the problem. He finds one, he reads it, but, unfortunately, the retrieved document is not exhaustive;
8. therefore, Mr. Albergoni decides to contact an Officer of the Prefecture who is on line. He finds Ms Loizzo and he starts and IMPS with her. He submits her to problem trying to solve it together;
9. Ms Loizzo suggests to involve a person belonging to the Ministry of Home Affairs (Mr Chiodi);
10. In the meanwhile, a new document, related to the previous search carried out by Mr Albergoni, has been uploaded by another operator and, so, KIWI system notifies it to Mr Albergoni. The last one checks the document, but it doesn't solve its problem. Therefore, he decides to contact the expert of the Ministry (Mr Chiodi);
11. Mr Albergoni starts a WF with Mr Chiodi, involving also Ms Loizzo and the Deputy Musolino, and explains his problem to all invited people;
12. Mr Chiodi, become aware of the problem, browses his own device to search a document which could be suitable. He finds a file and puts it inside the WF notes;
13. Ms Loizzo looks at the document and approves the proposed solution;
14. Deputy Musolino, after Ms Loizzo's approval, gives his authorisation and allows Mr Albergoni to proceed;
15. Mr Albergoni puts the document on KIWI Knowledge Datawarehouse and closes the procedure;
16. Mr Albergoni fixes an appointment with the non-EC immigrant to deliver him his paper permission of family reunion.

KIWI platform represents an innovation solution for the Public Administration activities. In fact, it improves the process of the "immigration policy" in the sense of:

- it is a technological support to the process:
 - *reduction of the cost of the information*: more people will have the knowledge ⇒ transformation from tacit knowledge to explicit knowledge;
 - *increase of the access speed to knowledge*: the "push" system will help the employees to find easier the right information. Indeed, it will assure a more completeness of the information and avoid any loss;
 - *increase of the digital track of the procedure status*: the monitoring on the procedure status will allow to evaluate the efficiency of each step of the process ⇒ the explicit

knowledge will be increased because it will be possible to understand who will waste time;

- it will allow to manage the exceptions:
 - the *front-office could communicate with back-office and experts* (even if they don't work inside the back-office or Prefecture) and interact with them using mobile devices such as PDAs or smart-phones. In this way, KIWI solution will allow to manage the exceptions: up to now, when there is a problem, the procedure stops and it takes many weeks or months to solve it.

4 Conclusions

The Knowledge Management results into a decisive improvement in inserting an information database. This allows the public employees to access easier to the needed data, independently from the place where they are.

Concerning the exploitation of project outcomes for the industrial component of the Consortium, this will mainly result in the commercialisation of the prototypes produced within the project. Indeed, all prototypes will be used as basic elements to develop and produce marketable results: as in-house developments by each partner and in collaboration with project partners. A quick process of research transfer in production will assure to the Consortium partners an essential competitive advantage for a further consolidation of the respective positions on the market. Moreover, the specific techniques implemented in the project will be used by most of the Partners to enhance the techniques already in use, contributing to consolidate a competitive advantage.

Once the innovative technologies are implemented, the idea is to realise a mobile groupware which let in-house functions be used at distance. It involves an organisation and a management changes between headquarter and branches.

The KIWI deployment strategies, will be mainly presented as open source distribution of the KIWI software; KIWI will be distributed to the market according to a specific licence; this license not restrict any party from selling or giving away the software as a component of an aggregate software distribution containing programs from several different sources. In order to provide effective returns on their co-funded investment in the project and to meet the requirements also of the smallest organisations which need a customised applications, two different strategies will be followed; the constitutions of a Public Private Partnership (PPP) involving both the KIWI Consortium and others Regional Public Administration Local Public Institutions and the porting of the KIWI applications customised and adapted to the specific local PA technical infrastructure and process; the customised applications will be offered in Application Server Provider (ASP) modality.

5 Reference

AIPA, “*La reingegnerizzazione dei processi nella pubblica amministrazione*”, (1999)

Fakta, “*om social-och halsovarde i Finland*”, http://www.stakes.info/files/pdf/Raportit/Taskutieto_2003ru.pdf, (2003)

Hammer, M., Champy, J., “*Reengineering The Corporation: A Manifesto for Business Revolution*” HarperCollins, New York, (1993)

Java 2 Platform, Enterprise Edition (J2EE), java.sun.com/j2ee

Klages, H., Loffler, E., “*Administrative modernisation in Germany – a big qualitative jump in small steps*”, *International Review of Administrative Sciences*, pp. 373-384, (1995)

MySQL DB <http://dev.mysql.com/>

National Research and Development Centre for Welfare and Health. "Data supplier feedback", [online], http://www.stakes.info/files/pdf/tiedonantajapalautteet/2002/Tp07_02.pdf (2002)

Osborne, D., Gaebler, T., "*Reinventing Government. How the entrepreneurial spirit is transforming the public sector*", New York, Plume, (1993)

Regional Council of Southwest Finland, "Multifaceted operating environment", <http://www.varsinais-suomi.fi/uusiwww/en/interest/englanti/toimintaymparisto.html>

Simple Object Access Protocol (SOAP) Version 1.2 Part 1: Messaging Framework. W3C Recommendation 24 June 2003, www.w3.org/TR/SOAP

Software reuse in Italian Public Administrations,
www.innovazione.gov.it/ita/intervento/normativa/allegati/indagine_os/6_5.shtml

UML, Unified Modeling Language, www.omg.org/uml/

Web Services Description Language (WSDL) 1.1. W3C Note 15 March 2001, www.w3.org/TR/wsdl

World Wide Web Consortium, W3C, www.w3.org

XML Path Language, www.w3.org/TR/xpath