Configuration Management for eServices: A Lesson Learned in a R&D center

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Configuration Management for eServices

A Lesson Learned in a R&D center.

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***Abstract*—Configuration Management is a discipline which includes all activities related to the products evolution management throughout their life cycle. This requires identifying, organizing and controlling the product changes in order to increase productivity while minimizing errors and improving quality. Proper use of this concept is essential for innovation, so that organizations should pay attention to it. In this paper, we explain the lesson learned of a R&D center which has applied a set of suggested processes for configuration management in the delivery of eServices and a workflow tool to support part of it.**

configuration management; workflow; design management

I. INTRODUCTION

As we know, IT services are critical to the success of business initiatives. Thus more solutions are needed to facilitate companies understand their people, process, and technology problems [1].

Configuration Management (CM) integrates all the activities linked with the evolution management of products throughout their life cycle. To achieve this goal it is necessary to identify, to organize and to control the product modifications with the aim to increase productivity and to minimize errors while improving quality [2]. From a general point of view, we propose that CM is a useful concept not just to be aware of changes in the IT infrastructure but in the organization performance too. CM fosters awareness within organizations at different levels. Supporting awareness in this case means to keep update with IT infrastructure, ideas, knowledge and activities within the organization. The CM process also includes the definition of policies, role, responsibilities, technical tools, etc.

In this paper we present a design approach of a Configuration Management process which has been useful for a R&D center where new prototypes of eServices are created, overall for the health and education domains. These prototypes are innovation outputs of some research projects developed along with firms, public administration, and other kind of organizations [3].

We also present the description of a workflow tool implemented in the organization to trace, register and measure user activities within the IT environment developed.

The CM process described is not new but the result of practice in the last two years and the creation of our own web-based system denominated as COLS in the rest of the paper.

II. CONFIGURATION MANAGEMENT PROCESS IN COLS

A. *COLS*

COLS is a web-based system to support an Innovation & Learning Management Methodology. It combines technical resources with the aim to optimize knowledge management and collaborative work in projects.

COLS contributes to building and maintaining the learning base of an organization, where knowledge is published, giving priority to learning needs of persons in a creative context of projects. The platform has been designed as a SaaS-based framework which facilitates the following attributes: reuse, configuration, multi-user efficiency, scalability and fast delivery time. A first approach of this proposal can be found somewhere else [4].

Actually, the platform allows deploying separate instances for each tenant. Each instance may be configured to look different and show different characteristics.

CM in COLS has tight relationship with publication, learning, and project management process. So, CM process will access the infrastructure configuration data. Correct Configuration Data can help to identify problems, measure performance, planning costs, etc.

B. *Configuration Management*

The main objective of CM is to present a parsimonious model of the organization's IT infrastructure and provide information about the organization performance. This can be possible by identifying, controlling, maintaining and verifying the status and versions of Configuration Items (CI) in the IT environment. In this case, COLS is the IT

environment. Their instances can be treated as separated or inclusive in COLS.

A CI is a component of the IT environment. They are from different size, type or complexity. They can range from full service that consists of hardware, software and documentation, and a single program module or a minor hardware component or a simple task that must be complete [5]. All CI's are registered, tracked and monitored in the Platform Databases, which represent the current known functional and performance status of the IT Environment.

With an extensive understanding of the CI concept, we have defined in COLS three different elements of CI's: infrastructure configuration, environment configuration and progress (tasks) configuration. See Fig. 1. The first one includes all kind of CI's which represent technical changes in the IT environment. For instance, system updates, Database modifications, Software libraries installation and so on. The second group of CI's is related to the customization of environments (instances of COLS). It can include artifacts (applications) and content objects (video, images, documents, etc. Finally, the configuration progress includes tasks understood as CI's. A task has a unique profile and involves at least one person. It can be monitored and it also has the capability to affect the others CI's. Examples of task are: orders for modifying software, development of a business plan, interface design mock-ups, writing a paper and so on.

The progressive implementation of CM in COLS looks to strength the ability of the organization to:

1. Identify the components that make up an instance so that vendors understand the possibilities of the platform.
2. Assess the impact of a change request in the platform or in an instance.
3. Evaluate the development performance of projects.
4. Supervise student progress.
5. Design its internal workflows for improving the quality of their e-Services and increase the satisfaction of clients.
6. Etc.

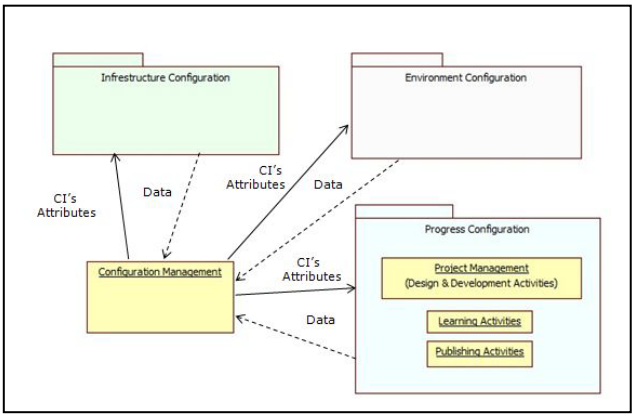

Figure 1. Configuration Management Packages in COLS.

C. *Preparation of Configuration Management in COLS*

The CM process begins with the definition of the scope and depth of the COLS infrastructure that needs to be covered. In our case we have defined three processes to be enclosed. The first one would imply to gather, analyze and present data linked to the configuration of the platform. The technological design of the platform has been developed following the Model-View Controller (MVC) design pattern. See Fig. 2. The aim is to differentiate and to separate data elements and specific functions of the platform from the presentation of data in the user interface and business logic.

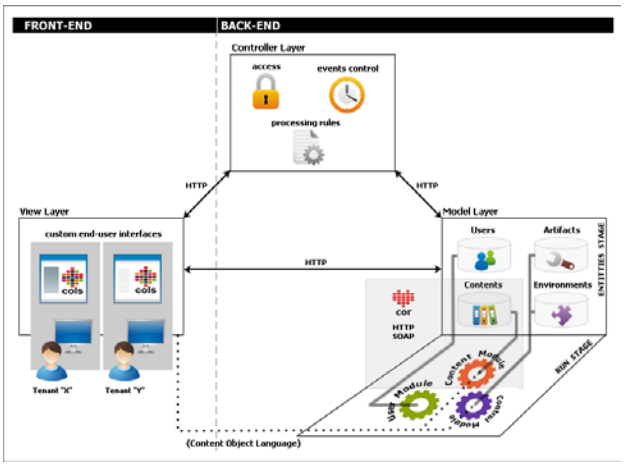

Figure 2. Technological Design of COLS. Basis for the Infrastructure Configuration.

More specifically, MVC implementation is represented as: model (users, environments, artifacts, contents); view (php pages, and CSS layers implemented in appropriate formats to interact with users) and controller (communication between the model and view layers, control of events and access to contents). From this, three modules are created: (1) User Module: represents a single module that manages user data across a centralized platform. (2) Content Module: represents a single module that manages centrally the contents of the entire platform. The environments are interpreted as instances (or communities) that live within the platform. Artifacts are interpreted as applications (features or tools) that facilitate the users' tasks of a specific environment. Both, environments and artifacts are configured in the Control Module. By now, we haven't implemented a tool that facilitates covering evolution in any of these modules and we still require indentifying the CI's managed by this configuration process.

The second process to be covered is related to environment configuration. In our platform, COLS tenures several customized environments. Each environment use instances of artifacts with its own configuration. Artifacts can be understood as applications (features). This is the case of a forum manager, a video conference manager, or a blog manager. Each of these artifacts can be used in one or more environments at the same time. They also require configuration. Like in the first process, we also require identifying the CI's managed by the configuration of

environments. Some examples of CI's in this process includes: the user profile in order to use an artifact, artifacts used in a specific environment, contents produced by a specific artifact, etc.

Regarding the third process, it includes assessing tasks progress. It can be oriented to publishing, learning and project management activities. In this case the CI's includes: the task itself, users involved in the task, contents produced during the task, time to complete the task, tasks rejected, etc. For each of the three types of activities identified, we have designed several procedures which are supported by a workflow tool (WT). The WT allows us to register data from the CI's involved. More detail about the WF tool will be presented in the forth section.

In conclusion, CM of COLS requires completing the following steps for each of the process identified:

1. Planning CM (includes purpose, roles, policies, responsibilities, etc.).
2. Identification of CI's
3. Monitoring CI's Behavior (changes, performance, verification)
4. Building Indicators and Evaluate

III. PROCESS POLICIES, ROLES AND RESPONSABILITIES IN COLS

Process policies, roles and responsibilities are also very important aspects to drive the CM process design. The policies represent agreements for an organization and thus foster quality in the e-services provided.

Some examples of policies are:

1. The CM process will manage CI's required in order to improve quality in the organization and increase the satisfaction of clients.
2. Databases in COLS represent the source for CM and thus they represent the current state of the platform.
3. There are different CM processes in COLS: infrastructure, environment and progress. Each of them has an owner who is responsible for keeping information update.
4. All changes in the CM processes must be authorized by assigned personal.
5. All kind of activities within environments must be traceable and monitored.
6. Procedures for publishing, learning and project management activities must be written and approved by assigned personnel.
7. A procedure is composed of tasks.
8. Implementing procedures helps to assess performance and to measure quality.

For each of the three configurations processes proposed in COLS (infrastructure, environment and progress) there are roles and responsibilities for deploying different kind of activities. These must be designed.

Nowadays, we have already designed roles and responsibilities to cover the progress configuration [learning (L_t), publishing (P_t) and project management (PM_t)]. Besides, a conceptual workflow to manage tasks has been created. See Table 1.

During the creation of an eService prototype, we have several users participating in design and development activities. There is a design manager (D_m) which request to a graphic designer (D_g) to develop a graphic interface. This interface must be validated a first time by the D_m. Then, the technology manager (T_m) reviews it with the aim to evaluate the proposal since a technical point of view and to be aware of next orders to implement it. Later, the proposed interface is approved by the project leader (P_l) and finally it is published by the D_m. If any step between validation and accountable is rejected then it begins in the writing step. An order can be also canceled and modified by the D_m.

Because of research (learning and publishing) activities are part of our R&D organization, users also can play different profiles (U_i, U_j, U_k, U_l, U_m) from those defined in project management activities.

TABLE I. WORKFLOW CONFIGURATION

Pro-cedure	***Request***	***Writting***	***Validation***	***Review***	***Accept***	***Publish***
L_t	U_k	U_j	U_k	--	--	U_k
P_t	U_i	U_j	U_i	U_l	U_k	U_i
PM_t	D_m	D_g	D_m	T_m	P_l	D_m

On the basis of this workflow configuration, a first tool to systemize the process has been implemented. The next section presents a brief resume of it.

IV. WORKFLOW TOOL

The workflow (Wf) concept has to do with the computerized and modeled management of procedures that should be done with the participation of different participants. It embraces tasks and interactions under the form of information exchanging and supports collaborative process [6]. Wf modeling implies describing accurately those procedures. In COLS we have modeled a general process which can support fifteen different procedures. See Fig. 3. Fig. 4 symbolizes the different profiles a user can have and the possible actions to be developed during a flow. The use of workflows also provides information to configuration management. In our case, Wf's are implemented for gathering data linked to progress configuration until now.

Once defined the Wf's models, we have developed several interfaces to implement them. The idea is to promote awareness in relation to project development, learning progress and publishing management. A first group of five indicators has been designed under the name of task progress:

1. My tasks to be solved
2. Tasks to be solved by others and not yet complete
3. All tasks not yet completed
4. All tasks completed
5. Overdue Tasks

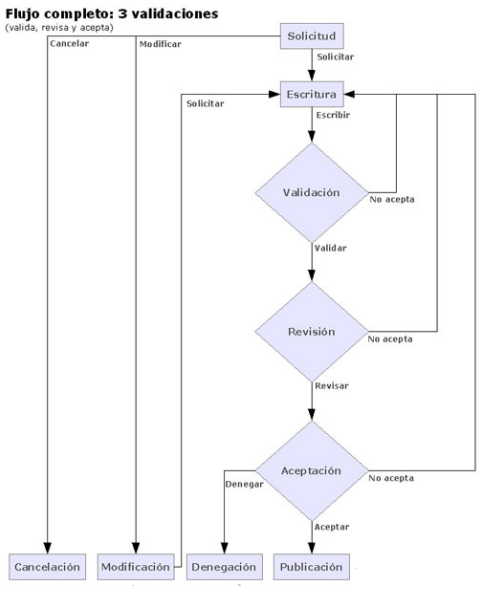

Figure 3. Workflow-based General Process.

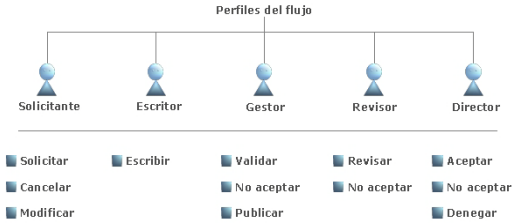

Figure 4. User'profiles during a workflow.

Fig. 5 represents a quick view of the current state of work a user has. Users can consult their tasks through this interface or through a menu in the main interface menu of COLS.

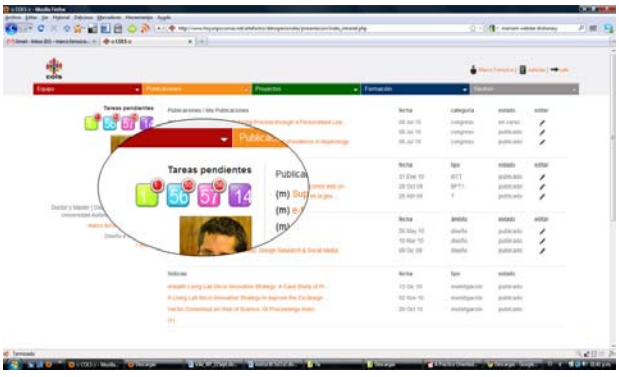

Figure 5. Custom information about current state of work for each user.

Fig. 6 corresponds to an explicit list of pending tasks a user has. The user can consult who are involved in the workflow procedure, the current state of a procedure, attached documents to support a task, comments about a task, etc. A green line has been used in the flow to indicate the exact moment for participation in the procedure. All tasks are saved in a database which can be consulted for tracing and monitoring specific configuration items.

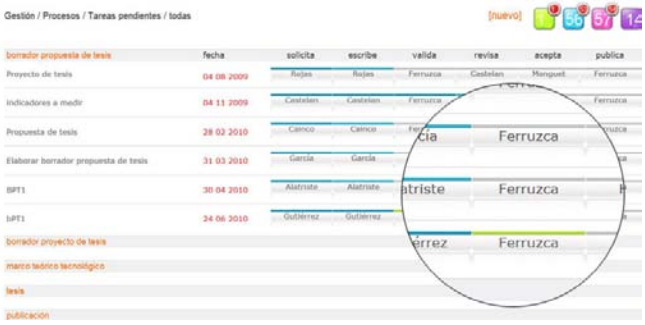

Figure 6. List of procedures and tasks in the workflow.

The workflow tool has been used for a year in order to manage the design and developments of eServices. It has also been applied to support tutoring and coaching in a PhD program, and it has been used to manage papers and lectures publishing.

Until September 2010, more than 400 orders to complete a procedure have been deployed. More than five thousands tasks have been completed. These numbers were extracted directly from the Database. With them we could trace "work traffic" in the last year, identify demanding projects, work overload by persons, etc. All this information should be transformed in CI's. See Fig. 7.

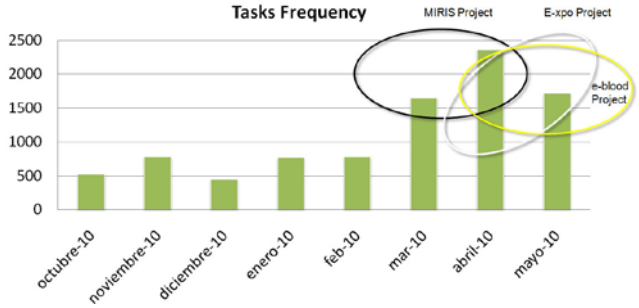

Figure 7. An example of a graphic constructed on the basis obtained through the designed workflo tool.

V. LESSON LEARNED

In our case, the implementation of a workflow tool to support the development of procedures has been very useful because users involved in the creation of prototypes for delivering eServices are more awake. The user is conscious about his role, position and level of responsibility within work procedures (design and development).

In addition, workflows output has facilitated to build a repository of ideas and documents which can be consulted for reviewing past experiences in projects, acquiring knowledge, etc.

The workflow tool provides important data for planning and implementing a part of the configuration management in our platform. In specific we are already working in defining

configuration items which in consequence allow building metrics capable to be evaluated. As well, we are designing new graphic interfaces for presenting behavior metrics.

If we achieve to cover with more accurateness the configuration items in the three processes defined (infrastructure, environment and progress) then we would have a better understanding of how they are interconnected and thus design a better configuration management model for COLS. More process-supporting technology (tools) will also be required since the workflow tool just presents a partial image of current state within the IT environment.

A last reflection, configuration management in organizations offering eServices can be useful for increasing productivity, minimizing errors, improving quality and satisfying users' needs. It implies to begin building a basis with accurate process design and modeling of functional and operative processes. In order to support it, technology is also required, in specific tools which facilitate gathering, analyzing and visualizing the evolution in products and services, but also in the organization behavior.

For R&D centers, the implementation of CM in the research process can also foster quality by warranting results and products of research and by ensuring the traceability of the processes and research activities.

In the future, more research is needed to define ad hoc models in this domain. We will continue this research in this direction while we keep developing other topics tight related to CM. This is the case of content management or knowledge management.

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