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Acceleration of Innovative Ideas to Market

Work Performed in WP4, AIM System Implementation

Consortium Partners:

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MB Air Systems	UK
ATOS Origin	E
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DOCUMENT CHANGE LOG

Change Control Procedures

Each change or set of changes made to this document will result in an increment to the version number of the document. Minor changes will increment the decimal point of the version number. The change log will record this process and will identify for each version number of the document any modification(s), which caused the version number to be raised.

Version	Date	Reason for Change
0.1	06.10.2005	Document creation
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1.0	05.12.2005	Final Version

Use incremental, sequential version numbers (e.g. 0.1, 0.2,..). Final versions should be 1.0 for first versions, and 1.1, 1.2 for further updates if required.

CONTENTS

1 Introduction

AIM results come from **two different outcomes: the AIM Innovation Toolkit and the AIM Value Added services**. The former one is the SW component-based tool originated from the project and able to cover all functionalities needed by Industrial companies to foster incremental innovation in the extended company. This technical outcome is an open and modular architecture based on state of the art technologies and available in two different types of clients: a java client and a web browser client.

A**dded-value services** base on the specific needs of industrial companies willing to use the system. Real life shows that industrial environments might be very different: legacy systems relying on heterogeneous technologies, business processes that obviously vary from one company to another and mainly, methodologies and philosophies that govern the way of doing things and that need to be adapted to new paradigms. These are only some reasons justifying the need for customization and installation of the AIM system as part of the added-value services.

Additionally, commissioning, training and consulting services are complementary sets customers are willing to pay for. Consulting services might vary from setting up the product information system to integrating AIM with the existing technical infrastructure in the company.

The **main functionalities of the AIM system** are:

- AIM supports the **collection of useful knowledge** and ideas throughout the extended enterprise for new and existing process and product developments.
- AIM enables the complete **modelling of the extended enterprise** (i.e. departments, staff, processes, products, customers, innovations, etc), in order to support an appropriate and efficient structure for ideas and problems.
- AIM supports users in **solving problems** by providing in-depth analysis and methods to identify probable causes of failure situation and determine actions to eliminate the problem.
- AIM supports users in the **technical development of ideas** by following a guided process for in-depth analysis and solving of technical contradictions.
- AIM includes a common **knowledge base** (i.e. database) to store all the information inserted in the system, enabling to reuse knowledge, and avoiding the lost of ideas.
- AIM supports the **complete assessment** of the concepts generated in terms of viability, resources, costs, benefits…
- AIM comprehends **Innovation Management functionality**, to determine the process of innovation, to deliver information between participating actors and monitor the advance of ideas in the innovation life cycle.

AIM copes with all phases needed to perform Innovation management within the extended company, but thanks to some additional advantages, AIM becomes a **competitive solution also from the technical point of view**:

- AIM supports and uses the state of the art standards and technologies, including XML, J2EE1.4, EJB2.0, Web services and most importantly, it provides **several APIs aiming at providing the possibility of further developments.**
- AIM uses **open source/ freeware libraries** and technologies such as JBoss, JDom/Xerces- XML parser, etc.
- AIM supports **several database management systems**, such as Oracle, MySQL and Informix, giving the customer different options according to their own preferences and company policies.
- AIM strongly uses **component-based development** enabling an easy **extensibility, robustness and customization.**
- AIM is Java-2 compliant as based on 3-tier architecture.

- Since companies have different needs and infrastructures, different requirements in that respect have also been considered; this will also make possible a further commercialization of the product, being possible **complementary business models and extended targets**. So far, AIM is **available in two client versions**: a **fat one, which is a java application** to be installed in a PC with access to the AIM main server, and secondly, a **thin client, which is web browser client**. The last one does not require any installation and accesses the server by means of a web browser, as you can imagine from the previous name. This way of accessing and using the system allows this consortium to think about an ASP-based business model.

2 Development of Early prototypes

Based on the end-users' requirements analysis and specifications defined for the innovation components in WP1, WP2 and WP3, early prototypes were developed, in the form of detailed specification and design of the tools including detailed definition of interfaces and the data required, in order to test their approaches at the end-users in the early stages of the AIM system development. Figure 1 presents the AIM System modules, emphasising the ones implemented in the scope of the early prototype.

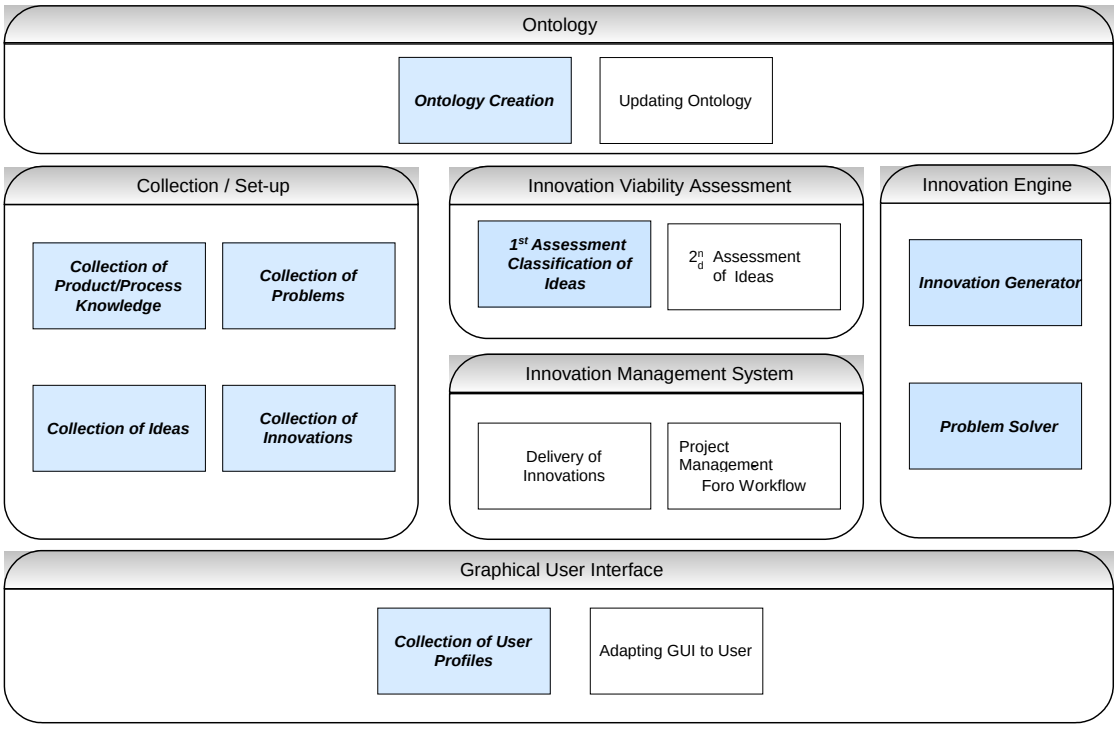


Figure 1: AIM modules

3 Implementation of Components

Implementation of components was therefore solidly based. Its aim was to develop the Early Prototypes into Final Prototype solutions and during this task, refine the specifications themselves:

- Specifications for the components had been created and refined in tasks 2.1, 2.2, 2.3, 3.1 and 3.2, lasting till end 2003.
- Early prototype had been developed under ATB's coordination during task 4.1, and it was delivered on October 2003. It is not strange that early prototype is "older" than specifications, as it was used to refine the specifications: it served as a communication tool between developers and industrial users to reach a common understanding.
- Early prototype had been assessed from the beginning of the development till October 2004 when Early Prototypes Validation Report was delivered.

The corresponding development was spitted in two parallel ways:

- According to the modules that build the system, that is, according to functionalities.
- According to the user interfaces, published to the users.

From the first point of view, the System was divided into:

- Innovation Repository led by ATB
- Collection System led by ATB
- Set-up module developed by ATB
- Innovation Engine led by LABEIN
- Innovation Viability Assessment by LABEIN
- Innovation Management System by ATOS

From the second point of view, the System was divided into:

- Thin client (browser and applet) led by ATOS.
- Fat client (Java application) led by ATB.

User interfaces (presentation layer components) are components themselves and they had to be developed for this task. User applications (thin and fat client) are the result of the integration of presentation, business and data layer components. Work done to make everything work together is explained in the analogue report for Task 4.4, System Integration.

Components developed followed the sequence derived from Idea to Innovation Life Cycle. For example, it had no sense to develop Innovation Viability Assessment and not be able to test it because Collection System is not ready and we cannot put ideas in the system to assess. Therefore, the sequence was like this:

- Presentation layer components were started from the beginning, based on that from early prototypes, but with substantial changes coming from their validation. Idea and problem information model had been enriched, so the presentation layers had to be extended.
- Innovation Management System is the module who deals with the life cycle of the idea, its steps and the information that has to be stored and spread as the idea covers it. It was started from the beginning using a commercial workflow engine, coming from ATOS and called FORO-WF. Idea lifecycle was modelled as a workflow process. Innovation Management System interfaces FORO–WF to create new cases of the process and later to perform tasks that make the process continue.
- Innovation Repository was started from the beginning, that is, database structure, ontology…
- Collection System was started from the beginning and very soon it was capable to put an idea in the repository (in its most simple way, that is, with the Basic Collector). Later, it was necessary to create complex ideas, related to the elements of the Extended Enterprise (production units, business units…).

- Set-up module development started to be able to populate all this information about the enterprise in the database, to be able to link it later to ideas and problems.
- Collection System was completed for Expert and Advanced collector, the two other levels of complexity when creating new ideas in the system.
- First Assessment is the first step an idea must pass to remain in the system as worthy of consideration; therefore, Innovation Viability Assessment started at this moment.
- Innovation Engine (Innovation Generator and Problem Solver) was developed later as a structured means for the development of ideas into innovation concepts. The ideas collected within previous module and stored in the repository can be that way further developed.
- Second Assessment was developed at the same time, and with that, the work for Innovation Viability Assessment was completed.
- Coming from industrial partners feedback and also from mid-term review, it was detected the need to support the motivation of final users working in this new procedure of the company. To cover that requirement but also to enrich the information that the innovation managers can obtain from the system, the consortium decided to extend the functionality of Innovation Management System. ATOS was responsible to improve it in two ways:
    - Increase the number and types of automatic email notifications that are sent as users work in AIM (providing, assessing, approving or denying ideas)
    - Provided some predefined charts about the innovation tasks:
        - Top lists with the most prolific users (ideas providers), with the most successful innovators, with the most active users (performing any task)
        - Evolution of the innovation tasks through time periods.

As new versions of the components were developed, and after succeeding in the unitary tests, they were circulated to all partners. They were integrated by ATB at the fat client and by ATOS at the thin client to be published and tested by industrial users. Integration issues (problems, requirements, solving process, publishing...) are further explained in the analogue report for Task 4.4, System Integration.

Even after the end of the scheduled time to develop the components, new feedback kept coming from industrial users. This feedback can be used for a commercial version of AIM services. All of this can be seen in detail in deliverable D5.3, System Validation.

4 WEB Infrastructure Implementation

The WEB Infrastructure Implementation, developed by iCIMSI, aimed, on one hand, at developing a new presentation layer that allows interaction with the AIM System through the Web and, on the other hand, at opening the system to future integration, in particular within existing legacy systems, and extensions.

The main goal consisted of developing a standard interface for the modules of the AIM system, in order to provide a standardised way to access the AIM Application Service

The solution chosen, based on D3.3 Web Infrastructure Specification, intended to reduce any possible impact on the existing system and to minimise any interdependency among the existing development teams and the various software components that have to be integrated. This approach guaranteed the maximum flexibility concerning possible requirement changes during project development, and the greatest independence of the various teams responsible for development within the whole project.

Figure 2. System Completed.

Figure 3 and 4. Contents and menu from the server.

5 AIM System Integration

Integration that had to be carried out in this task was a complex work, due to several reasons. Those reasons and also the solving factors and processes chosen by the consortium. They are presented next:

- three different development teams situated in three different locations took part on it (ATB in Bremen, LABEIN in Bilbao and ATOS in Madrid). Processes and communications we had are further described in last part of this summary.
- two different integration results had to be produced indeed:
    - Fat client, integrated under the coordination of ATB and validated by all industrial users, but mainly Ball Packaging.
    - Thin client, integrated under the coordination of ATOS and validated by all industrial users, but mainly Cutting Tools and MBAS.
- two different pre-production environments had to be deployed to publish and validate the results:
    - Fat client needs to be tested directly at the place where it is installed, so it was integrated at ATB facilities and later installed at Ball Packaging Europe. ATB visited Ball Packaging facilities the first time to prepare the software environment (operative system, database management system and application server) and installed the first version of AIM system that was delivered there. Later, updating the system is much easier and it could be done by simply sending patches by email and with the support of a small group of trained people of Ball Packaging.
    - Thin client needed to be published on internet to be validated by industrial users. At the final stage of the project, thin client was installed in Cutting Tools and MBAS facilities, but in previous stages the prototype should be nearer to developers: ATOS prepared an environment at Madrid to host the prototype and publish it on Internet. This solution allowed developers update it very fast when any new feature was finished or an improvement was done as a result of feedback.

AIM thin client was published at http://forosrv2.atosorigin.es:9001/aim/aim.html running on a server with the following environment:

- Microsoft Windows 2000 Advanced Server
- Oracle 9i
- FORO-WF
- JBoss 3.22

Not only new modules, developed for the project, integrate the system. Some other software components, coming from outside the project were incorporated. They could not be adapted to us, so we adapted to them. On the other hand, when this resulted to be needed, we kept interoperability as a goal. We had in mind that in the future some N other application could be used in the place of that used during the project, and we do not want to implement N different ad hoc integrations. Instead of that, we encapsulated the functionality inside Java Interfaces and that way, future changes are minimized and nothing has to be changed in AIM components themselves, only at interfaces to other modules.

- For example, for the creation of the Innovation Management System, we decided to base on a commercial workflow engine, FORO-WF. AIM system is developed in Java and FORO-WF is developed using CORBA. ATOS developed a two-level interface to link AIM and FORO-WF.

AIM Components (Java)
Innovation Management interface to FORO-WF (Java) → idea life cycle, new idea, pass a step
General purpose interface to FORO-WF (Java) → process, new case, perform a task

FORO-WF (CORBA)

One general layer was created to be put over FORO-WF. It is a collection of Java classes allowing instantiate workflow processes, create new cases of them and later perform the necessary tasks. This layer allows any general purpose application interface FORO-WF. This is an interoperable result, that is, it is not only valid for AIM.

Another specific layer was created to be put over the first one. It has classes and methods specifically related to Innovation Management. In the concrete implementation done this time, this component links to FORO Java Interface, but other possible implementations could interface any other workflow product or even other type of solution. And no changes would be required at AIM Components, only at the layer. This is interoperability, not only integration.

Mapping between Innovation Management and workflow is the following: idea life cycle is a process, each new idea is a case of idea life cycle process, each step of the cycle where the idea is cancelled or approved is a task performed in the process...

During integration, a process was established to deal with incidences (integration problems or emerging requirements). This process was designed following Problem Life Cycle that is managed in AIM application:

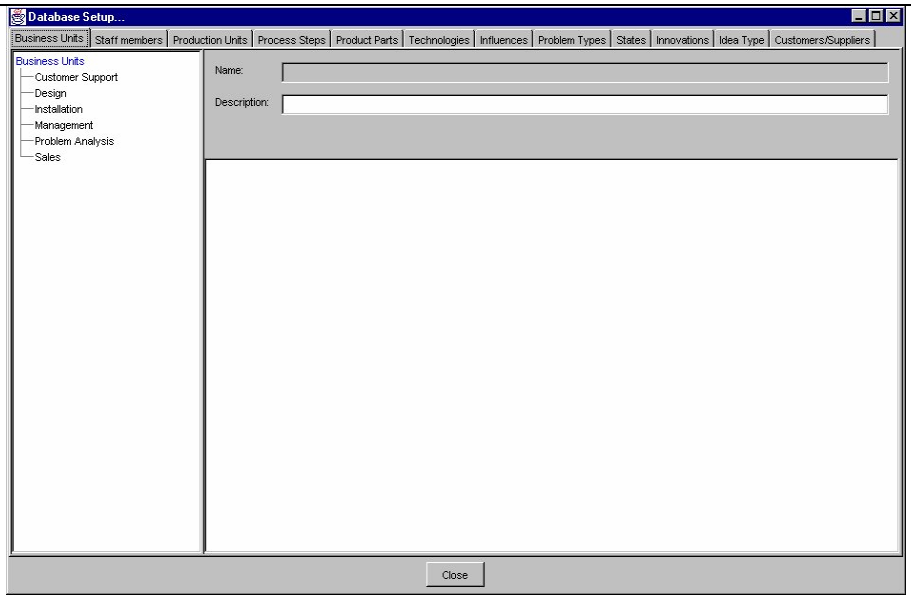
1. Communication to the other involved development team(s) → New Problem
2. Acknowledge → Open problem
3. Short-term solution agreement
4. Short-term solution execution
5. Short-term solution testing
6. Short-term solution validation
7. → Solved Problem
8. Long-term solution agreement
9. Long -term solution execution
10. Long -term solution testing
11. Long -term solution validation
12. → Closed Problem

As resulting from the System Integration, components interact to provide the full functionality of AIM. Modules are presented below by means of their main and representative functionalities.

Common Knowledge Base

Main functionalities and examples of screenshots:

- Common Knowledge Base implemented as a relational database, using Oracle;
- Set-up module as a stand-alone java application;
- definition, modification and deletion of all the information that constitutes the static data of the Common Knowledge Base;
- required functionality to administrate the users of the AIM system, including the definition of users and user groups, and the definition of rights for each user group, regarding what could be accessed, modified and/or delete in the system.

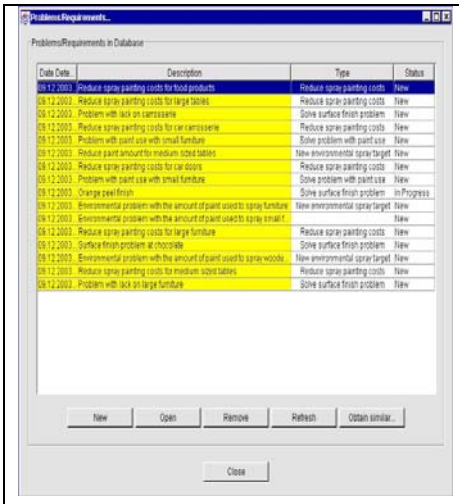
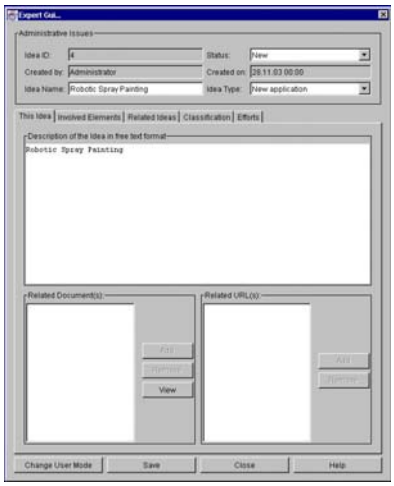


Set-up Module

COLLECTION SYSTEM

Main functionalities and examples of screenshots:

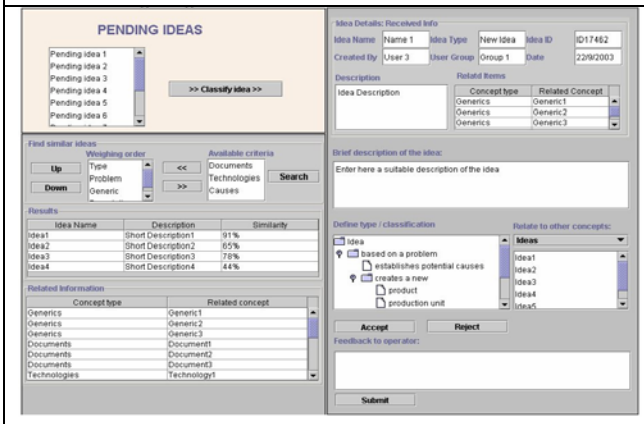
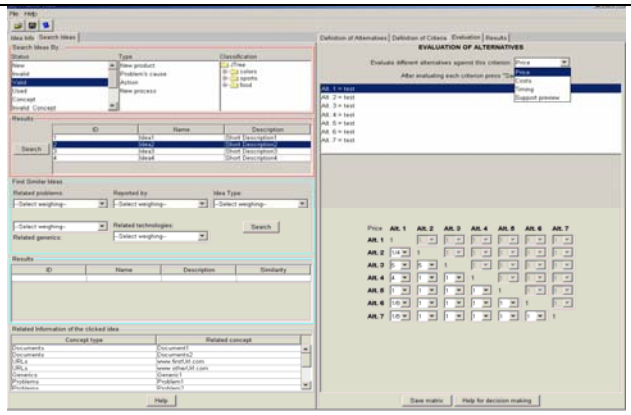
- to insert new ideas, problems/requirements in the CKB;
- to modify ideas, problems/requirements already stored in the CKB;
- to delete ideas, problems/requirements stored in the CKB;
- to search ideas, problems/requirements stored in the CKB, using basic criteria (responsible user, date, generic involved, problem related);
- to obtain ideas similar to a selected one, using CBR.

		
Problem list	*Problem description*	*Ideas expert GUI*

INNOVATION VIABILITY ASSESSMENT

Main functionalities and examples of screenshots:

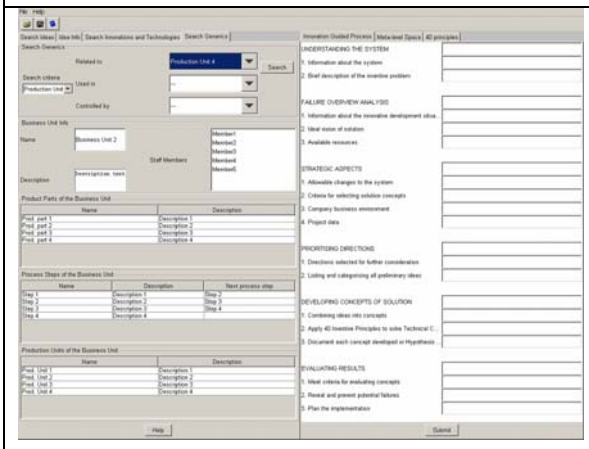
- checking the idea/problems pending of validation,
- storing/deleting Ideas/problems depending on their technical viability, interest for the company, innovation associated,
- searching related Ideas, problems,
- relating the Idea/problem to specific products, generics, users, ideas, problems.

	
Innovation Viability assessment	*Innovation Viability assessment: evaluation of criteria*

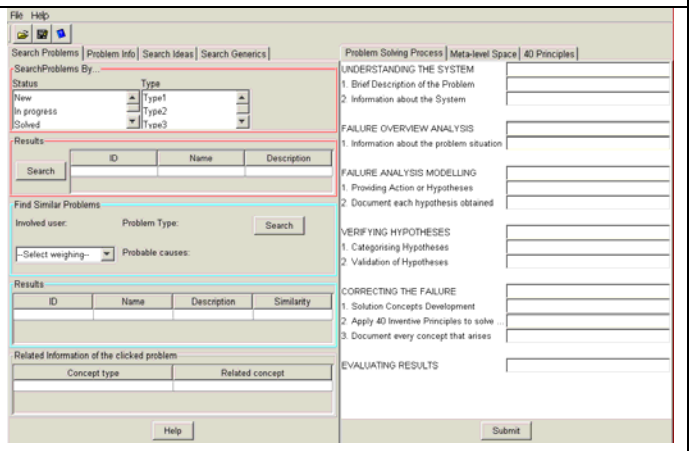
INNOVATION ENGINE

Main functionalities:

- Easy and friendly access to information/knowledge from the Innovation Repository, making re-use of functionalities, as search problems/requirements stored in the CKB, using basic criteria (responsible user, date, generic involved), developed for Collection System.
- Guided Methodologies, specifically oriented for enabling depth-analysis of the System when this situation arises, and guiding in the process of either developing Ideas or solving Problems:
  - The Innovation Generator to foster products/processes improvements,
  - In order to support the solution of problems detected in the manufacturing processes or regarding products, the Problem Solving was developed.
- A graphical space for representation and combination of Concepts, Ideas or Information.



Innovation Generator



Problem Solver

INNOVATION MANAGEMENT SYSTEM

Innovation Management System manages the life cycle of ideas and problems. Both ideas and problems undergo complete cycles with different phases, changing their status as phases are passed.

For that purpose, other modules interface it. Mainly, Collection System will interface IMS when collecting a new idea, to start the life cycle. However, this module will also be able to deliver information to the final users: in the way of feedback to those who participated in the life cycle and in the way of statistics.