

REFQUEST: A MULTIPLAYER ON-LINE GAME TO SUPPORT IDEA CREATION IN INNOVATION PROCESSES

An Ideation Game from the Laboranova Project

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Abstract: Innovation has become the main source for competitive advantage for European industry in the globalised economy. Most innovation processes implemented in companies are based on a stage-gate model starting with an ideation phase. This fuzzy front-end of the innovation process is mostly supported by traditional methods like co-located brainstorming. This paper presents a new approach for idea generation based on a multiplayer on-line computer game. The traditional application area of serious gaming – the field of education and training – is extended by another application: innovation gaming.

1 INTRODUCTION

Innovation is considered as the key for competitive advantage of European industry. Companies are aware of this issue and have implemented innovation processes which are often based on the stage-gate model. A common weakness of these models is the black box of idea generation – sometimes also called the “fuzzy front-end to innovation”. As the output of an innovation process depends highly on the input generated in the early stage of innovation, it is worth to look at concepts and methods to generate high quality ideas as input.

Idea generation is often considered as the result of imagination or inspiration of a single person (Weisberg, 1993), but, idea generation can also be seen as an outcome of a work process not necessarily related to an individual but to a group of persons working together in a network. Very often these teams are distributed so that there is a need to be supported by ICT.

Brainstorming is the most commonly known tool for idea generation, even when other methods like nominal groups have shown a better performance considering the number of generated ideas. But, the number of generated ideas is not the only measure for success. Other measures are currently under research and might concern novelty, variety, feasibility, strategic fit to company, and the capability of company to implement the idea.

Games – especially computer or video games – have been identified as “serious games” when they address beside entertainment another, serious objective. Most serious games address the education. Known examples are from education in military, medicine and business management (Stone, 2005). The application field of serious games are not restricted to these areas. This paper presents a serious game which is designed to support the idea generation in the early stage of innovation projects. It is based on the game concept presented by Baalsrud Hauge et al (2007).

2 IDEA GENERATION AND GAMING

The ideation process, also called the “fuzzy front of innovation” is described to be the process of discovering what to make, for whom, understand why to make it and define the success criteria including the development of insights for answering these strategic questions (Rhea, 2005).

Analysing most used methods supporting ideation as well as the processes carried out and looking at paradigms used for education, it seems to be obvious that constructivism (learning through experiencing) has a lot of similarities with the ideation process. One method used for education based upon

this paradigm and showing a positive learning impact is serious gaming.

In a computer game, players are confronted with information that they have to interpret and interact with. Games can easily contain multiple and contradictory knowledge structures. They can be used to promote discussion and re-framing of the knowledge gathered in the ideation process. Games built around a constructivist view of knowledge and learning can for example have competing, parallel views of incidents. Games focus players' attention and good games tend to strengthen concentration and agency. Often games are hard work but offer engagement by providing challenge and struggle. At the same time, games provide incentives to change existing culture, practices and routines. This is also what is needed for supporting ideation.

3 STATE-OF-THE-ART

There are only a few innovation games available on the market. According to Hohmann (2006) innovation games can be fun ways to collaborate with customers and to better understand their needs. However, the games presented so far are not computerised games and they need to be played co-located.

Møller et al (2007) presented a framework for ideation games which distinguishes between two levels:

- Game Frames are an overall process with general phases.
- Game Modules are shorter routines utilising specific methods or sub-games.

The general idea behind this approach is the composition of game modules into game frames. Modules may be re-used in different frames. In total, four different game frames are discussed:

- **The Takeover:** The general objective of this frame is a temporary change of perspective. This can be achieved by assuming that the company has been taken over by another one which wants to innovate the products from a different perspective.
- **Idea Swarm:** In this frame many people are involved in creating, assessing and further development of ideas. Players are rewarded, when their own ideas are carried forward by others.
- **Idea Evolution:** An idea is running through several steps of mutation following an evolution process. The result is a refined idea.
- **Reframing the Question:** The general objective of this frame is to provide a structure for the

ideation process. This frame is the basis for the *refQuest* game.

All frames together are concepts for disruptive idea generation. The creativity of the players (idea generators and transformers) should be stimulated by disruptive elements.

These disruptive elements are used e.g. by the Synectics method. Synectics (Gordon, 1961) provides an approach to creative thinking that depends on looking at, what appears on the surface as, unrelated phenomenon. Its main tools are analogies or metaphors. The approach, often used in groupwork, can help innovation workers develop creative responses to problem solving. It helps users break existing minds sets and internalize abstract concepts.

4 CONCEPTS OF REFQUEST

One of the identified game frames is the explorative frame called "reframing the question" (Møller et al., 2007, p. 208). The central objective behind this frame is to use games to structure the otherwise unclear open-ended early exploration and idea generation phase of an innovation project. In this game frame, a number of ideation groups, representing different innovation perspectives, work together to develop and reformulate the central innovation topic. The outcome can be a product idea, a value proposition, a user need or an area of strategic interest.

Summarising, the *refQuest* game is designed to support the following requirements:

- **Structuring of the ideation process.** *refQuest* should provide a structured process for idea generation, documentation and selection.
- **Iteration:** Several iterations of the idea generation process should be possible.
- **Interruptiveness:** The idea generation of the innovation works might be interrupted by a facilitator, who brings in new information such as facts or observed trends. This should be in line with a synectics like style.

5 THE REFQUEST GAME

The *refQuest* game is an extended version of the game *share* (e.g. Schwesig et al., 2005). It is composed as a gaming engine executing a game model consisting of objects of different gaming classes. The content of the game can be considered as a set of objects instantiated from the gaming classes. This approach ensures the separation of algorithmic proc-

essing and game content which allows the change of the content without changing the game itself.

The architecture of the simulation game consists of three layers: the underlying game model, a simulation engine and a user interface, which allows to examine the model elements and to apply game specific actions. These parts are described below:

- **Game Model:** The underlying game model provides all modelled entities as a formal basis for the implementation of the simulation game.
- **Simulation Engine:** The engine works on the underlying model and simulates time and costs, which are the main variables influenced by the players in taking specific actions. The simulation engine can be seen as the central control unit of the game.
- **User Interface:** The user interface allows to browse the overall and personal information in the game and to apply game specific actions.

The business model enables the definition of the simulation engine. The user interface allows data input from players as well as displaying game relevant information as illustrated in Figure 1.

5.1 The *refQuest* Gameplay Concept

The objective of the game is the generation of ideas embedded in the very beginning of an innovation process. As an example a fictive telecommunications products manufacturer is considered. The innovation topic of this example is to develop a new kind of mobile phone for a specific target group: disabled and elderly persons.

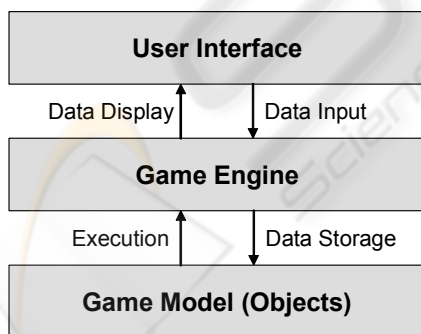


Figure 1: Relation between User Interface, Game Engine and underlying Game Model.

Six persons from the manufacturer are divided into two groups to generate ideas on the innovation topic. The process each of the groups has to follow is shown in Figure 2.

In the first step each group decides the perspective on the topic. Examples for different perspectives

are: production centric, end-user driven or technology oriented. In the second step, each player generates individual ideas and stores them in an idea documentation template. During the third step the players exchange on their individual ideas and define some in the group commonly agreed ideas. In the fourth step the three groups present their ideas to each other in order to be ready to assess the generated ideas in step five. The sixth step is finally to complete the idea generation process and to save the results for further processing. While the players are running through the process steps, some performance indicators concerning time costs and quality are updated accordingly.

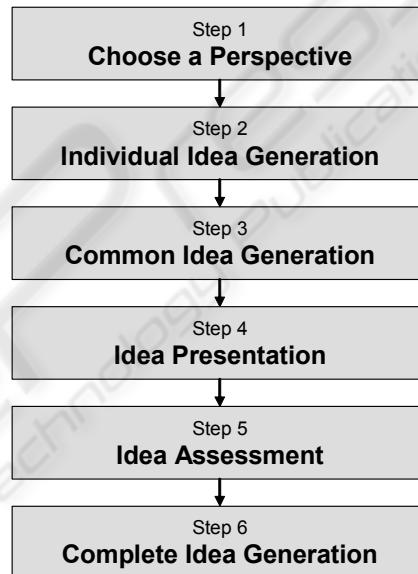


Figure 2: The Idea Generation Process in *refQuest*.

A facilitator is watching and supervising the groups of players. The facilitator can observe the results of the players (the content of documents and actions applied by players) and intervene by setting some disruptive events, which should influence the direction of thinking of some of the group members.

The following sub-chapters describe the formalised gaming objects and classes of the game model to implement the *refQuest* game. All classes and their inter-relations are shown in Figure 3.

5.2 The *refQuest* Gaming Engine

Game and Scenarios

A *refQuest* game is spread over one or more scenarios, which are played in a sequential order. These scenarios represent the levels of the game. Associ-

ated to each scenario is a topic, which is essentially a description of the subject under consideration.

In the example, there is only one scenario with the topic given above.

Players, Groups, Sub-Groups and Roles

In each scenario the players are grouped into groups and sub-groups, which might represent companies and departments in real life. Groups and sub-groups have their own descriptions.

Each player can have a different role in each sub group, e.g. innovation worker or group leader. Beside name, user identifier, password, etc. a characteristic role description is stored with the player. Such a description could be: Mrs Kandar is much cost and result oriented; she knows exactly what she wants for the company, but do understand the user focus and partly the interest of the engineers.

In the example there are three groups each having one sub-group. The groups represent three different locations (offices) of the company. One location is located in Budapest, one in Brussels and one in Bratislava.

Process Steps

A business process is associated to each group which is followed by the players to play the game. The process is further divided into process steps which need to be completed in a sequential order. Each of these steps needs to be completed in order to complete the whole process.

A process step can be either completed by performing some action or by completing a set of documents.

An exemplary process divided into six steps is shown in Figure 2. During the first step, one of the players has to set an action: the decision which view the whole group wants to follow. During the second step each player of the group fills out their own idea generation form (see Figure 4 which shows the document editing view).

Actions

Some process steps may be completed by applying an action of a set of actions. Actions are always under control of a specific player. The setting of an action reveals further information for the player. Actions can only be set by players – not by the facilitator.

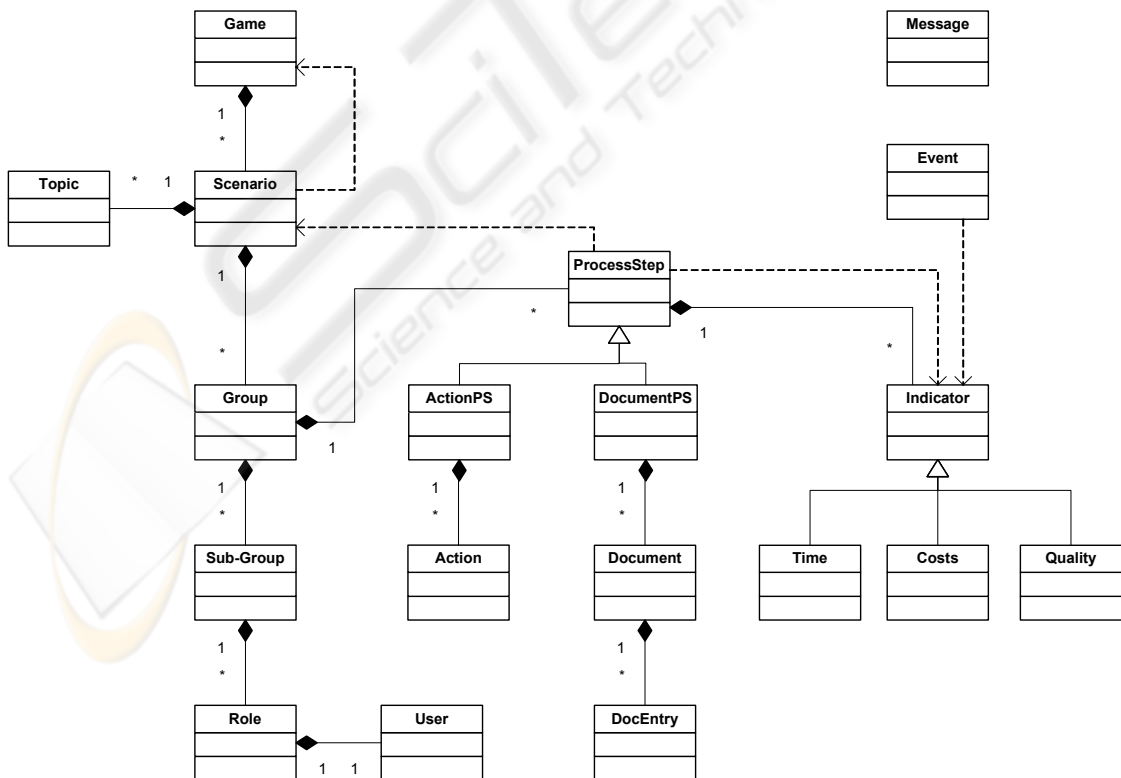


Figure 3: Conceptual Class Diagram of *refQuest* Game Classes.

The actions defined for the first step of the process of Figure 2 are:

- Choose User Centric View
- Choose Production Centric View
- Choose View of Public Authorities
- Choose Economic View
- Choose View of In-house Competencies
- Choose After Sales View
- Etc.

Events

Events can only be set by the facilitator. The facilitator may choose an event from a predefined list of events and applies it to a specific group of players. The players are informed about the occurrence of the event and get further information about it. Events can be set in any of the process steps.

Some examples for events in the *refQuest* game are:

- New Technology Occurred
- EU or National Directives have Changed
- Production Processes are Updated

- Etc.

Documents

Documents are associated to process steps and players. A document is a collection of document entries. Each document entry can be edited by the player who owns the document. Each document entry has a type and may have a preset value and a target value. If there is a target value defined, the objective for the player is to get as near to the target as possible because this is affecting the quality performance indicator.

Documents might be visible from the beginning or they are created when specific process steps are completed. Players can work on documents when they are visible until they are frozen (completed). The associated process step is completed when all documents associated to this process step are completed. The owner of a document can manage the access rights of the document by providing view and edit rights to other players. The facilitator can view all documents, but cannot change them.

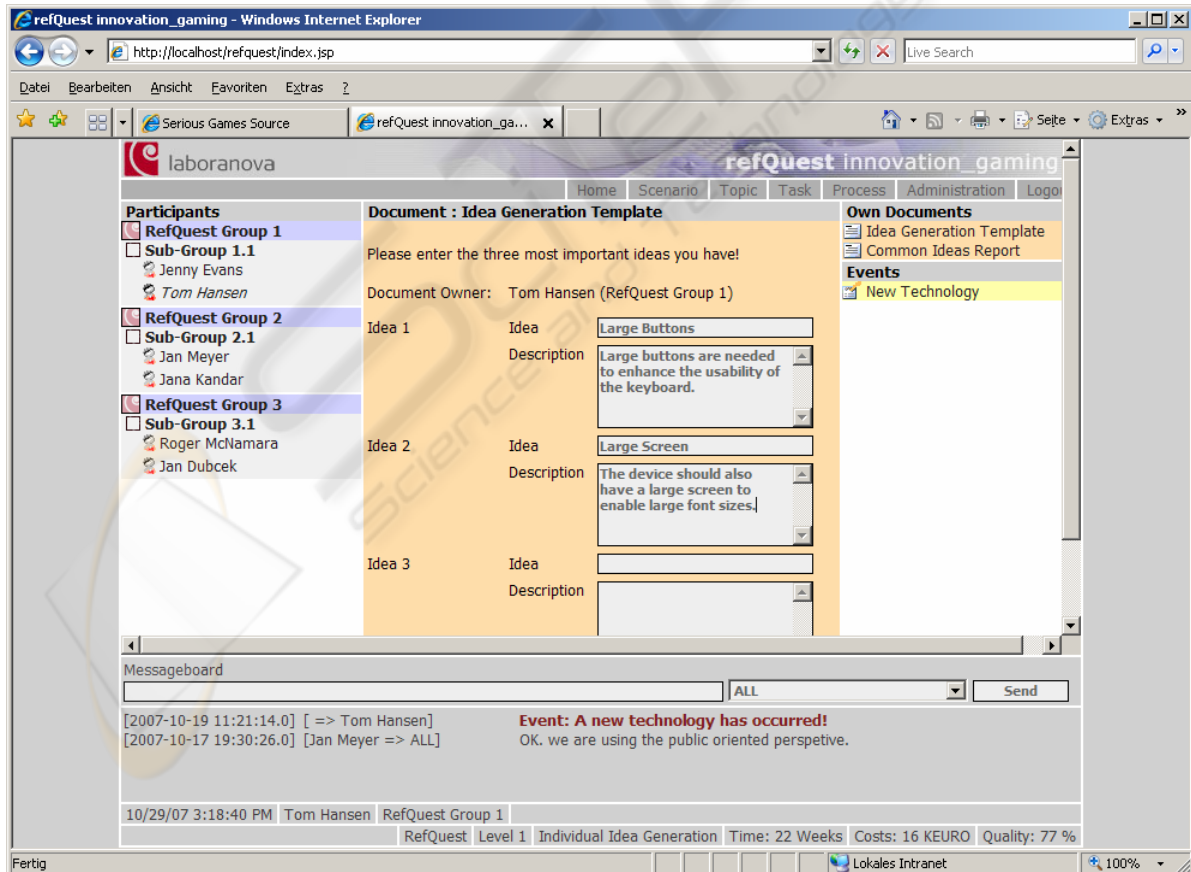


Figure 4: Player Screen of *refQuest*.

Performance Indicators

There are three different indicators updated while the players are progressing through their process steps:

- **Time** is measured in weeks. The time of an application of an action is directly stored with the respective action. It is up to the game designer to decide, how much time is spent by applying a specific action. The completion of documents is measured directly by storing timestamps from starting and ending a process step. The duration is calculated from the difference where each 10 minutes represent a week in the game time.
- **Costs** are measured in Kilo-€. The costs for applying a specific action are stored with the respective action. The costs for completing a document are calculated based on the duration for document completion.
- **Quality** is measured in per cent. At the beginning, quality is at 100%. It may reduce during the game down to 0%. Again, the actions

store a value which is subtracted from the current quality, when the action is applied. The reduction of the quality by completing a document is calculated depending on the goal values of the document entries.

The completion of a process step, i.e. the application of an action or the completion of all documents belonging to a process step, will update the indicators as described above. Also the occurrence of events can influence the values of the performance indicators.

The performance indicators might be used to play against a given goal of the game, e.g. fastest time, least cost or highest quality.

Message Board

The *refQuest* game also supports the exchange of short messages between players via a message board. Also the facilitator can observe the message board and place messages into it.

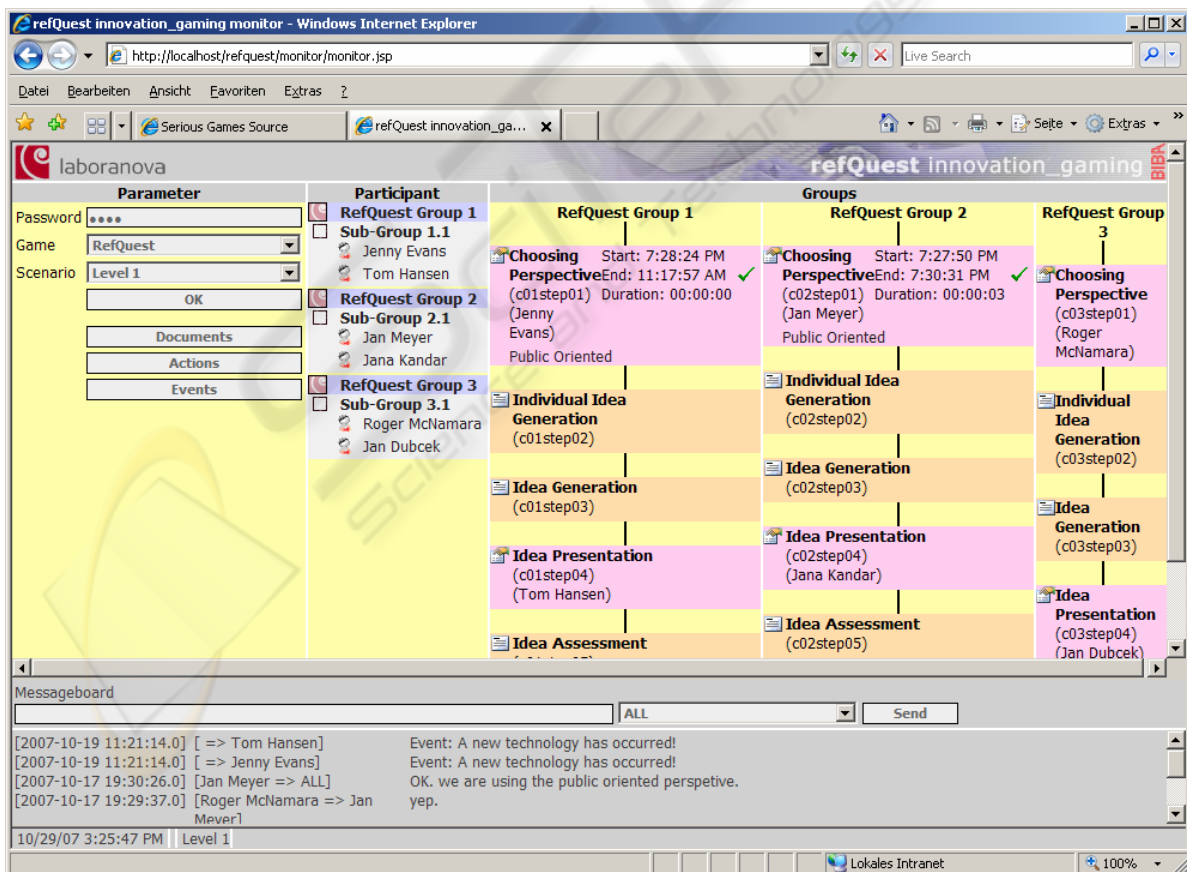


Figure 5: Facilitator Screen of *refQuest*.

5.3 The *refQuest* Implementation

The *refQuest* game is implemented as a browser game. Players and the facilitator just need an up-to-date web browser to play the game.

The server software is implemented using JSP (Java Server Pages) and JSTL (Java Server Pages Standard Tag Library). The servlets are running under TomCat. The game objects are stored in a relational database, i.e. MySQL.

Scalability and performance considerations have currently not been taken into account. It is expected, that only a few users (less than 100) are active at the same time. Under these circumstances performance is not really an issue when the deployment uses sufficient hardware. Currently the web application is running on a two processor system under Windows 2000 Server.

As the current version of *refQuest* is based on an engine developed in another project (see Baalsrud Hauge et al., 2007), we have not considered changing the technology when adding new features. But using JSP results in loading always a whole page which sometimes results in some flickering of the screen. A more adequate solution would be the application of AJAX (Asynchronous JavaScript and XML) which is taken into account for upcoming releases.

Figure 4 shows a players screen of the current *refQuest* game. One of the players is entering *ideas* in the step of individual idea generation. Figure 5 shows the facilitator's screen to the game.

6 CRITICAL DISCUSSION

A main difference of using games in the support of ideation instead of more traditional methods like brainstorming etc. is that games should be motivating and to some extent make fun. Another difference is that games always have a competing element, which mostly makes it interesting to play.

Up to now, the *refQuest* game has only been played by students at the University of Bremen as well as by research scientists from the Bremer Institut für Produktion und Logistik (BIBA). This early stage validation of the game has shown that the game seems to support the idea generation, but that the competing elements needs to be taken more into account (to make it more a *game*).

The use of events, momentarily set by the facilitator had a positive and motivating aspect at the game, since it could be applied if the motivation seemed to decrease as well as in order to help find-

ing a solution. Furthermore, this first step in validation showed that more work is needed to be carried out in order to improve the game. Also further evaluation is necessary.

7 FUTURE PLANS

The *refQuest* game aims at supporting ideation (idea generation) at an early stage in the innovation phase. The current version of the game include an user scenario which is understandable for almost everyone and is therefore suitable for using the game for prototype discussions as well as for a pre-evaluation of the game. An implementation in different business environment requires an adaptable game framework – as presented in this paper – so that the game reflects the running processes in each company. This will improve the “productivity” of the game as well as improve the efficiency because the players will know the environment. At the moment the game may only be changed by first carrying out a business process analysis and then change the scripts. This is very time consuming both for the potential company as well as for the game designer and the programmers. For the future it is intended to build an authoring tool which allows an author to manage the game objects without assistance from the programmer. It will still require a deep analysis of running processes.

The game is designed to be used in a workshop setting, i.e. the players are available at the same time. This works in quite many companies quite well, but analysing the process of idea generation shows that the processes itself is discrete. Future versions provide the option to play the game either in a workshop setting in a given timeframe, and then with time limitation in each step or as a more integrated version which allows each player to carry out the steps when he has time and he only organises small discussions when he needs to carry out a task with someone else. The limitation will then be that the facilitator is available. The first step in order to integrate the game into the working environment will be to connect the DB of the game with the ones of the companies.

Further more, the experience in using the demonstration game and other games based upon the same game engine has shown a need for non-linear processes, as well as to have more generalised, tasked design process steps. But this is a quite essential change of the concepts behind the gaming engine. Therefore, when this is realised, it will result in a major new release and other issues – e.g. the appli-

cation of AJAX technology – will also be taken into account.

8 CONCLUSIONS

The *refQuest* game allows the implementation of different ideation processes due to the separation of gaming engine and game contents.

The requirements for the game mentioned in Chapter 4 of this paper are fulfilled. The definition of a process with its single process steps allows the structuring of the ideation process. The possibility of defining several sub-sequent scenarios allows the iteration of ideation processes. Finally, the implementation of events realises the required interruptive element of the game.

The current set-up of *refQuest* is available as a prototype implementation. A proof of concept is still to be done. It is planned to test the prototype within innovation management courses at the University of Bremen.

Further applications of *refQuest* will be performed in the context of the Laboranova project. The industrial end-users of Laboranova, who are interested in using this game within their own innovation projects are the German software company SAP and the Danish heating manufacturer Danfoss. For these end-users, the content needs to be adapted to their specific innovation topics.

The performance indicators time, costs and quality might not be adequate for the ideation process. Other indicators need to be investigated and included into the game.

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