Virtual Team Environment for Collaborative Innovation

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Abstract One of the main limiting factors that reduce the potential output the innovation projects, involving different organisations and individuals from different geographical areas, is the poor communication and knowledge sharing between members of the virtual team. In this context collaboration and virtual team management are key issues that need to be addressed by today's innovation projects. This paper presents a literature review developed on the concept of collaboration between project team members and the advantages and requirements of virtual teams. A possible solution for the development of a virtual team environment that fosters innovation and ensures a good collaboration between individuals working in an innovation project is also presented. This solution was build using the Microsoft Sharepoint Services Beta 2 collaborative platform.

1. Introduction

Globalisation coupled with the instability that characterises the markets today and the technological explosion in the last few years that accelerated the rate of knowledge and information flow has put many organisations in difficulty to keep up to the extraordinary level and diversity of knowledge, experience and skills required to develop and successfully bring to market new services, products or processes. More and more companies are faced with the necessity to get the knowledge and expertise they require in different projects from different domains and areas. In many cases the knowledge necessary in development of these new products, services or processes do not fully reside inside the organisational boundaries. Consequently the 50-70's competition, become the 70-90's cooperation and evolved in the 21'st century collaboration. This transition from competition to collaboration in the development of new products raises one main problem: collaboration (Amidon, D., M., 2003). This problem comes from the fact that in order for the collaboration to be fructuous the people involved in the process, product or service development have to be open to share and acquire knowledge, skills, experience and expertise with other individuals. They have to be able to communicate at a high level with all the team members and use their knowledge and the knowledge acquired from others to come up with new ideas that can be put in practice or can become the germinating seed for other ideas.

Research has shown that 50-70 % of innovation project fail (Strebel, P., 1999). The causes for this high rate of failure are numerous and varied and poor collaboration between the team members has been identified as one of the key factors (Dooley, L., Cormican, K., O'Sullivan, D., Wreath, S., 2000). Poor collaboration, or in other words poor communication and knowledge sharing, between members of the project team highly reduces the potential output of the projects resulting in redundant information and knowledge and increased costs and lost of time. These problems are accentuated when the team is a virtual team that consist of individuals that are located in different geographical areas, which come from different backgrounds and domains, different languages and cultures. When these issues are coupled with unstructured collaboration methods such as e-

mails, conference calls and meetings, even if these methods are quick and familiar, new problems arise such as version control, work redundancy and maintenance of up-to-date information for all the members involved in the project. Various authors such as Nonaka and Takeuchi (Nonaka, I, Takeuchi, H, 1995), Davenport (Davenport, T. H., Prusak, L., 2000) and others identified and researched these knowledge management and collaboration problems. Different collaborative platforms have been developed in the last few years that strive to resolve the problem of collaboration between project team members whether they are located in the same or in different geographical areas from the same organisation or different organisations. Lotus Domino, eRoom, WelcomeHome, Microsoft SharePoint are just a few of the collaborative platforms that have developed to help organisations with the collaboration challenges. They answer in one way or another to the problems raised by collaboration and knowledge sharing. The success of these tools depends mainly on the level of involvement of the team members.

This paper presents, in the first part, a literature review that describes the concept and the types of collaboration and the dynamics of virtual team concept, which comprises of the virtual team definition, the advantages and disadvantages that come with the organisation of individuals in this type of team. The second part presents Microsoft Sharepoint Services as a platform for developing a virtual team environment and the virtual team environment developed using this platform for an innovation project.

2. Collaboration

To respond to competitive challenges, the complex customer requirements and the high instability on the market, firms have become more open to collaboration with other parties than in the past. The creation of today's complex new products, processes or services requires a mixture of knowledge from diverse disciplines and professions and it is absolutely necessary to get the expertise from a variety of areas like information technology, technical design, engineering, manufacturing, and marketing etc. The experience, expertise and skills that are needed for an innovation project are usually distributed both within and outside a company. Therefore, people from different companies often need to work together to bring the entire knowledge and experience that are needed for the success of a new product, process or service. An effective knowledge management approach in these conditions can be the difference between success and failure of this type of inter-organisational collaborations. Knowledge sharing and transfer is not possible without willingness of employees to share and without a proper structure of the information to be shared. Tiwana (Tiwana, A., 2000) affirms that "knowledge based activities related to innovation and responsiveness are intensively collaborative", in other words the process of creating, sharing, and applying new knowledge and experience involves collaboration. According to Cormican and O'Sullivan (Cormican, K., O'Sullivan, D., 2001), a great deal of what people learn and implicitly what the organisation ends knowing results from interaction among and between the members of the teams that exist inside and between organisations. This underlines the importance of a good collaboration and communication between the members of projects teams that involve organisations that struggle to manage successfully their knowledge and innovation. The benefits of synchronized and collaborative working project team members are being recognised with team members being actively encouraged to work together more closely and to exchange project information in a more structured way (Anuba, C.J., Ugwu, O., O., Newnham, L., Thorpe, A., 2002).

Based on the type of time and space the collaboration between the team members takes place Anuba et al (Anuba, C.J., Ugwu, O., O., Newnham, L., Thorpe, A., 2001) identified four types of collaboration. Figure 1 depicts the space and time matrix for this collaboration types.

The four types of collaboration classified by Anuba (Anuba, C.J., Ugwu, O., O., Newnham, L., Thorpe, A., 2001), based on the space and time the collaboration takes place, are Face-to-Face Collaboration, Asynchronous Collaboration, Distributed Synchronous Collaboration and Distributed Asynchronous Collaboration. The four types of collaboration will be presented in more detail next:
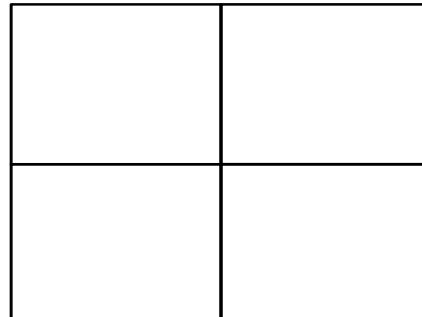

Figure 1: Collaboration types – Adapted from (Anuba, C.J., Ugwu, O., O., Newnham, L., Thorpe, A., 2001)

2.1.   Face-to Face Collaboration

The face-to-face collaboration involves meetings in a common venue such as a meeting room, of the team members that are engaged in face-to-face discussions (Anuba, C.J., Ugwu, O., O., Newnham, L., Thorpe, A., 2001). An example could be a "kick-off" meeting at the beginning of a project between all the partners, and the discussions between the team members and the end customers for requirement gathering etc. This type of collaboration is the most common and requires good communication skills.

2.2.   Asynchronous Collaboration

Asynchronous collaboration it is another type of collaboration between team members that has been identified by Anuba (Anuba, C.J., Ugwu, O., O., Newnham, L., Thorpe, A., 2001). The asynchronous collaboration process can be conducted using different mediums like notice/bulletin boards within an organisation or in a virtual environment that involves the same space/ environment but different times. In other words the information, knowledge displayed at certain time can be viewed by people at different times.

2.3.   Distributed Synchronous Collaboration

The third type of collaboration identified by Anuba (Anuba, C.J., Ugwu, O., O., Newnham, L., Thorpe, A., 2001) as distributed synchronous collaboration involves communication between team members using the current technologies and techniques that imply the real-time exchange of information and knowledge between parties that are located in different geographical areas. There are various techniques available today such as telephony, video-telephony, computer-mediated conferencing, video conferencing, electronic group discussions/editing facilities or on-line chats, etc. This type of collaboration has become more and more used lately due to the extraordinary technological advancements and globalisation.

2.4.   Distributed Asynchronous Collaboration

Finally, distributed asynchronous collaboration, the fourth type of collaboration involves collaboration between people that are located in different areas or places, which access the

knowledge and information at different times. This mode of communication involves communication via the post, fax machines, telephone messages, voice mail, pagers, email, etc. The knowledge transmitted during this type of collaboration is an explicit knowledge that can be expressed in words, numbers and sentences.

A team, by its very nature, involves collaboration. In an organisation that facilitates collaboration the boundaries of the teams are usually flexible and unconstrained by the organization chart, department or even the company. In other words the team becomes an entity that is able to accommodate change without feeling any significant impact on its functionality, or that is able to quickly absorb the eventual impact. In a highly collaborative team the tasks are distributed to the team members based on their expertise, skills, and experience (Duffy, J, 1996). The refined blending of knowledge from different areas and domains required for the development of today's complex new products, processes or services required has changed the notion of the team involved in a project. In many cases, the participants in a project are geographically distributed, and need effective information and communication technologies in order to be always up to date with the information and knowledge in the project. In the last decade, a new term emerged, virtual team.

3. Virtual Team

Virtual teams bring up a different picture from the one of people in the same organization working together in the same place. Unlike traditional teams were all the members are located in the same organisation, department or building, and have the same working hours, share the same language and culture, the members of the virtual team work across space, time and organisational boundaries. They form webs of communication and can be from different geographic locations, different languages, cultures, time zones and even different organisations (Johnson, P., Heimann, V., O'Neill, K., 2001). Different cultures, background domains, and research areas lead to issues that even an effective knowledge-sharing strategy might not resolve entirely. The virtual team members come from different disciplines and often "lack understanding of the critical process factors for areas other than their own" (Davenport, T. H., Prusak, L., 2000). Contrasting with the traditional workspace, which is an office, department etc., the workplace of the virtual team is a "virtual workplace where productivity, flexibility and collaboration reach new levels" (Chase, N., 1999). With all these differences from the traditional teams, new problem rise and old ones become critical. If the environment and collaboration were a problem in the traditional teams in the virtual team the need for a good collaboration and a proper environment for this collaboration are critical. To these problems are new ones are added such as contradictory physical space, geography, time, language, culture and knowledge sharing. For the virtual teams to be successful and have high performance results and a different kind of management of the team approach, an appropriate technological infrastructure and a well-developed environment are required.

In order to successfully and efficiently get all the experience needed in developing new products and services more and more organisations are forced to move from traditional face-to-face teams to virtual teams or adopt a combination between the two types of teams, lately. This shift of team management has its causes, mainly because of the advantages that come with the new team structure and the pressure place on the companies by the markets with the variety and increasing change rate of information and knowledge and the high competitiveness, by the customers that are becoming more and more demanding, and by the employees. Some of the basis for adopting virtual team approach researched by Johnson et al (Johnson, P., Heimann, V., O'Neill, K., 2001) are:

- Flexible hours for the employees – a high flexibility is given to the employees. The working hours are not strict and they are the one that are planning their working hours, as long as the team members do a good job and finish their work on time. Through this

pressure and stress that is put on the employees working at a fix location following a strict timetable is reduced.

- Creates and disperses improved business processes across organisations – using the virtual team the best practices can be much easier presented and are quicker absorbed as the resistance to change is more diminished.
- Supports cross-divisional interaction – the virtual team structure of the team gives the companies the possibility to hire people that are from different domains and areas encouraging the team member in changing knowledge and information and creating the sense of a community crossing over the department, company or team boundaries
- Changes the direction of the company from a production-oriented company to a service/information-oriented company, as the focus is not as much on the product as on the team members' knowledge and ways to capture it to result in new, original ideas that will in the end bring profit. The new asset becomes the company's knowledge.
- Reduces costs for commutation between places by allowing the team members to interact regardless of their location.
- Allow organisations to hire and retain people, regardless of location
- Increased communication between team members, which leads to network building.
- Collaboration across organisational boundaries that facilitates the flow of information and knowledge between team members and constantly provides new ideas and new knowledge that can result in new products.
- Focus on measuring contributions and outcomes rather than on number of hours worked, as the knowledge and the original offspring generated by this knowledge are what is considered the asset in the new team structure.
- Faster response times to tasks as the result of each team member's work can be seen and evaluated by all the team members and because of that the sense of responsibility is more developed.

As the virtual team allows members to work together without requiring their physical presence in the same location, outside consultancy from anywhere in the world can be used, but without expenses for travel, lodging, and down time, partnerships between companies around the world can be realised to work on different projects without the relocation of the team members. This way knowledge from many disciplines can be brought together along with the experience of the team members. While there are great advantages that come from the adoption of the virtual teams, new challenges rise with them. The main one involves satisfying the need for sharing, collaborating and exchanging information. There are some main requirements that have to be fulfilled so that the successful implementation of the virtual team can be realised. Some of these requirements researched by Lipnack and Stamps (Lipnack, J., Stamps, J., 1997) are:

- Collaborative efforts, e.g. co-authoring, document version controlling, applications development, group editing and reviewing, annotating, sharing information and ideas.
- Communication for e.g. sending notes, announces, talking, faxing, having meetings, providing commentary, and having interactive discussions.
- Co-ordination applications that keep track of communications and activities of workers in a group, preparation of group documents, and responses to questions received regardless of geography.
- Information sharing that helps users navigate the information rather than monitoring and controlling the communications patterns of the group.
- Managing and tracking, e.g. project management, corporate calendar, scheduler, version tracking.
- Analysis and decision making tools to support collaborative examination of information, consideration of possible decisions, and development of best decision.

- Developing collaboration between people who work at a distance from each other and who might not be from the same culture is a new organisation challenge (Pellecchia, M., 1998).

As discussed previously there are many advantages that come with the adoption of the virtual teams. The challenge is to provide an environment for the team were the team members can communicate and efficiently manage the knowledge existing in the team and share it between the members of the team so that it will result in new ideas leading to new products, processes or services.

Due to the increased demand for a virtual team environment that will facilitate the collaboration between the members of the virtual team and will ensure the efficient exchange and management of knowledge in a project involving parties from different geographic areas, different domains and cultures a number of collaborative platforms and tools such as Microsoft Sharepoint, Lotus Domino, WelcomeHome emerged in the last few years. These tools have more or less common features such as discussion forums, instant messaging and chats, document storage, sharing and versioning, notice boards for announcements and notices and user administration features. This paper focuses on the Microsoft SharePoint Services as a collaborative platform for building a structured environment for a virtual team working in an innovation research and development project.

4. Building A Virtual Team Environment with Microsoft Sharepoint Services Beta 2

Microsoft Sharepoint Services Beta 2, due for release in Autumn/Fall of 2003, is a virtual team website solution developed by Microsoft Corporation. It allows the development of a virtual team environment where the team members can store, share, and collaborate on-line on documents, contacts, tasks and knowledge necessary in the virtual team's efficient functioning. Different collaborative tools such as on-line discussions, announcements, notices and document sharing are available. These collaboration features can be extended as integration with Microsoft Outlook, MSN messenger and Net Meeting are available.

The platform allows the user to create a fully-featured website with build in functionalities such as announcements, meetings, discussion management, email notification and address book, survey, tasks and hyperlinks and also permits the development and creation of user-defined functionalities. Other very important features, which address the interest of this research, include automatic hyperlink management, team management, and high team interaction. The website built using Microsoft SharePoint can be easily customized to meet the specific project demands using any web page editor such as Macromedia Dreamweaver MX, Microsoft Visual Studio Net or Microsoft FrontPage, which is fully integrated with Microsoft SharePoint, or other editors (Microsoft, 2002).

A virtual team environment was generated for a development and research innovation project using the Microsoft Sharepoint Services Beta 2 platform. The team members were distributed in different locations and they needed a working environment that would allow communicating and collaborating on different problems, ideas and documents regarding the project over the Internet.

By providing a user friendly interface and easy to use functionalities Sharepoint allowed the creation of the on line virtual team environment in a few easy to follow steps: fill in the name of the website, choose and website address, choose the website's type (virtual team environment, blank site, meeting workspace, document workspace, etc.), and finally chose a template. Figure 2 displays a screen shot of the Sharepoint web page for the creation of a new module/ page in the team website.

4.1. Sharepoint Build-In Features

A number of built-in features are implicitly generated when the SharePoint team site is created, such as Libraries, Lists, Discussion Boards, Surveys and Web Pages and will be presented in more detail next.

4.1.1 Libraries

A library is a collection of files that are shared between team members. There are tree types of libraries that can be created in SharePoint. These are document, picture, and form libraries. A built-in library named Shared Documents for storing, sharing and version tracking of the project's documents is implicitly created when the team environment is first generated (Microsoft, 2002).
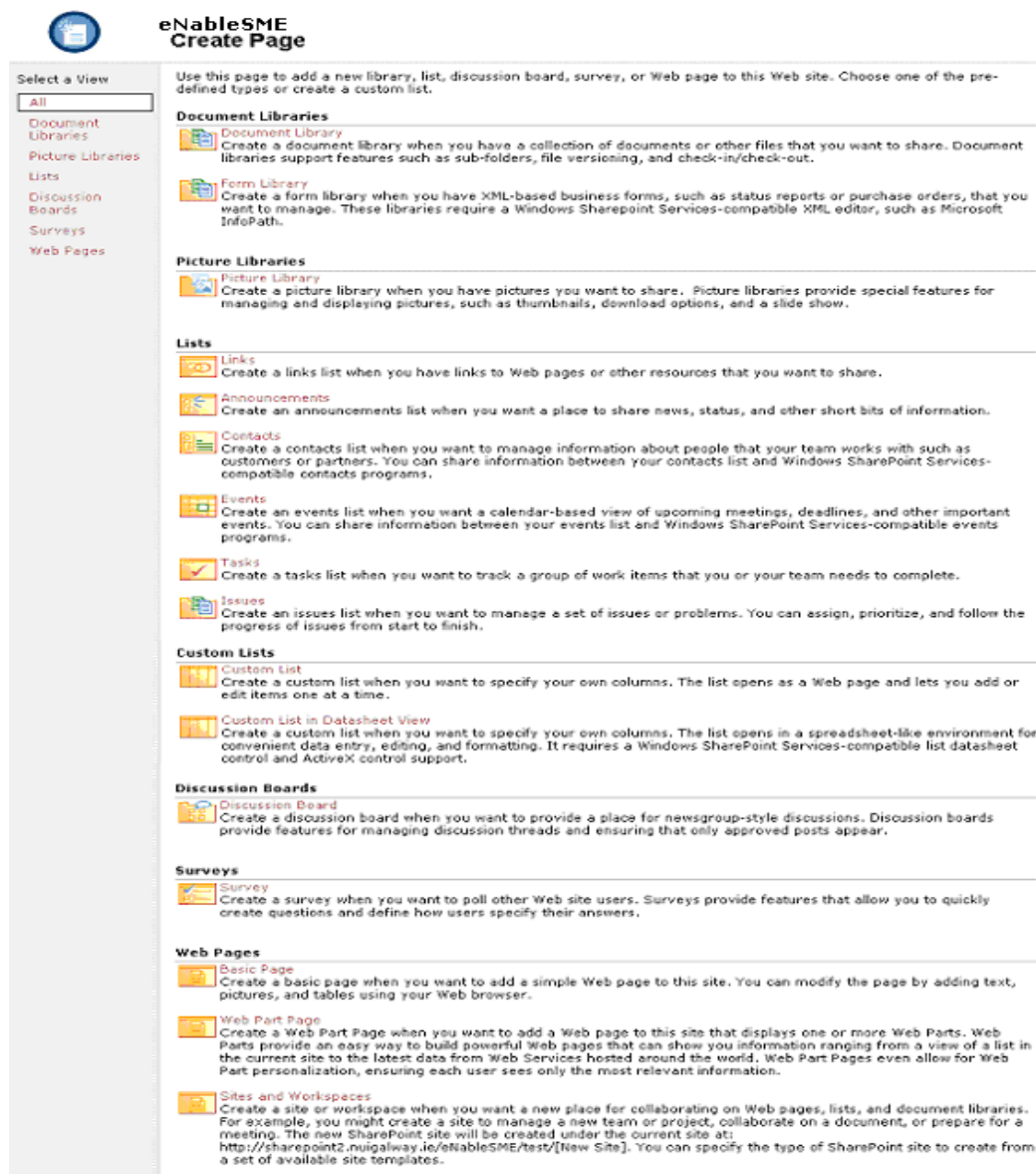

Figure 2: Create Page – Screen Shot

4.1.2 Lists

A list is a collection of three preformatted forms module that allow the users to create, view, edit and delete different elements (entities) for storing and structuring project data information and knowledge.

A number of built-in lists are automatically generated when the virtual team environment which can be easily populated with project information and, if needed easily customisable the lists if desired. These lists are announcements (for sharing small amounts of information), links (for sharing of resources outside the team environment), events (for generating calendar-based view of meetings, deadlines, and other important events), contacts (for creating, sharing and managing information about the people that in a way or other interact with the team), issues (for creating lists of problems that appear), and tasks (for tracking the team members work progress). Additional lists can be created based on the built-in lists or based on the custom-designed lists. Once a list is created it can be saved as a custom-designed list and later be used as a base for generating new lists. Lists can also be created from spreadsheets from a compatible spreadsheet program such as Microsoft Excel 2002, and Microsoft Internet Explorer 5 or later browser. The hyperlink to a list in the website can be set to appear in the home page in the Quick Launch bar (Microsoft, 2002).

4.1.3 Discussion boards

Discussion boards offer the team members a forum where they can discuss or chat about topics of interest for the team. Comments and reply to others' comments can be posted eliminating the need for the e-mails and offering a knowledge centre for the other team members. A default discussion board named General Discussion is implicitly generated when the team environment is created (Microsoft, 2002).

4.1.4 Surveys

Surveys provide a method of finding team members opinion about different things of interest for the successful implementation of the project. To generate a survey, the survey's questions have to be defined together with the specifications on how the team members should enter their answers (Microsoft, 2002).

4.1.5 Web Pages

The Web Pages are used to add a new basic page, a web part page or a site under the team's website. A basic page can contain text, images and tables. A web part page provides a method for creating pages where web parts containing listings information from the website. Additional sites and wok spaces can be created under the team's web site such as document or discussions sites (Microsoft, 2002).

4.2. Implicit Home Page Structure

A default home page for the virtual team is also generated when the new on line evironment is created. The page is structured in four main areas:

- At the top of the home page a main toolbar - depicted in Figure 3 - with hyperlinks to the home page of the new virtual environment, the documents and lists/ modules in the environment, to the web page where new components can be added to the web site, to the site settings web page and to the parent website (if there is one) are displayed. Extra hyperlinks can be added edited or deleted from the toolbar using Microsoft FrontPage. This toolbar is implicitly displayed on all the pages in the website and can be removed using Microsoft FrontPage.

Figure 3: Main Toolbar – Screen Shot

- Under the main toolbar an area with the website's name and brief description are displayed. The information displayed here is the one filled in when the new web site was created and it can be changed from the Site Settings web page

- A Quick Launch toolbar on the left hand side of the home page containing hyperlinks to the main modules in the website. The Quick Launch toolbar can be modified directly from the browser or from the web page editor. It implicitly displays the implicit modules
- A content area on the right hand side of the home page. This content area can be customised directly from the browser by dragging and dropping previously created web parts or from a web page editor such as Microsoft FrontPage.

4.3. Site Settings

The Site Settings web page depicted in Figure 4 is generated when the website is created and provides the authenticated team members with administrator rights to manage customise and change profile information and modify the structure of the site.

The administrators of the site can manage the users and the sites and workplaces that have been created on the website. The users can modify the title and the description of the site that appear on the first page under the main toolbar, to customise the home page and to modify the site content by adding new modules or modifying the created once. The user's profile can be modified from this page as well as depicted in Figure 4.
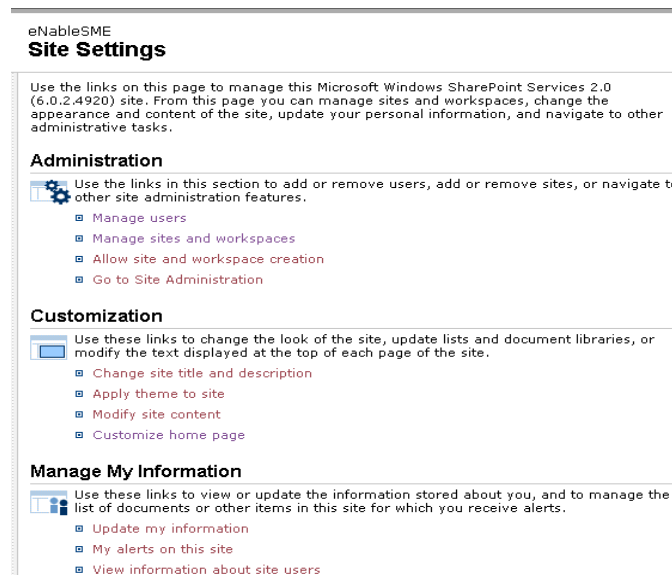

Figure 4: Site Settings web page – Screen Shot

5. Virtual team environment for project innovation management

Using the features provided by Sharepoint Services and the Microsoft FrontPage web page editor a virtual environment has been structured so that it facilitates the exchange of knowledge and the management of the innovation process in an innovation project. Figure 5 depicts the main page of the virtual team environment.
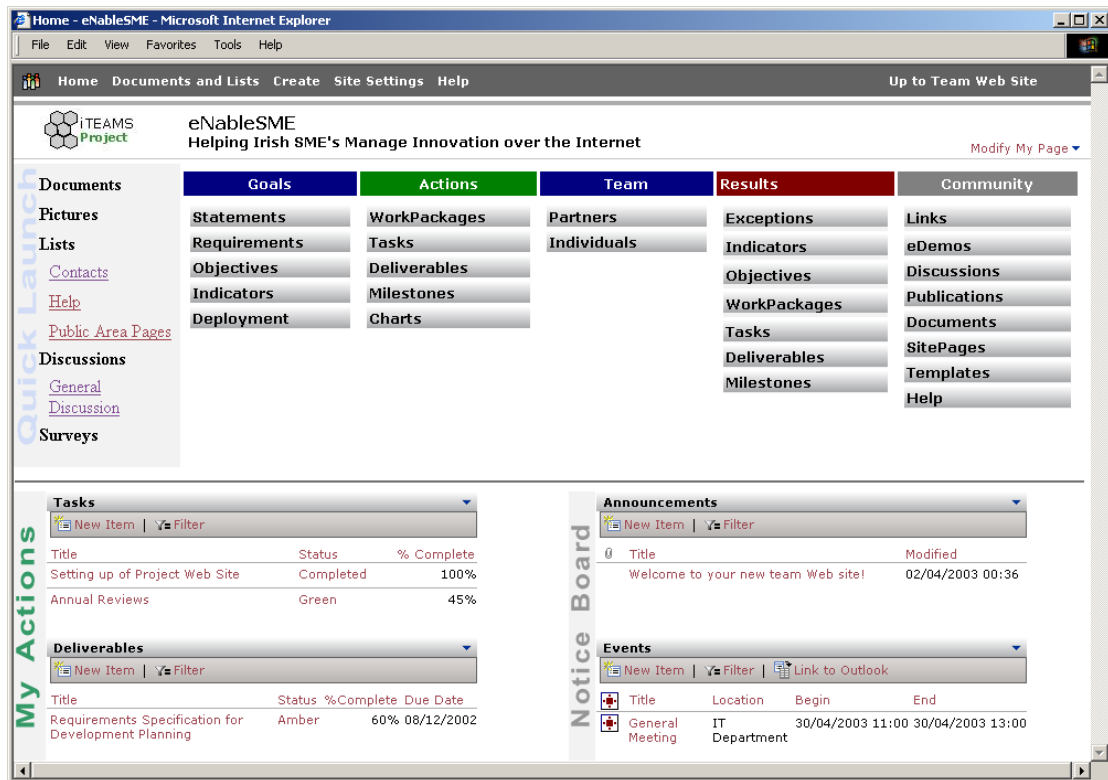
Figure 5: Virtual Team Environment Home Page – Screen Shot

The home page is the main page of the virtual environment and allows the users to access all the modules and sub-modules in the environments. The implicit main page generated when the virtual environment was created has been customised so that it will provide the required environment for the management of project innovation process. The logo of the application, the name of the project and the project mission are displayed at the top of the page. The content of the Quick Launch toolbar was modified so it displays other hyperlinks as shown in Figure 5. The content of the home page has been modified and divided in three sections. On the top, the Main Menu is displayed. This menu is comprised from five main areas: Goals, Actions, Teams, Results, and Community. At the bottom of the page two columns are displayed. The first column contains the 'My Actions' area where the actions that are assigned to the 'logged in' user are displayed. The second column contains the Announcements and the Events sub-modules, with the announcements and notices that have been published in the project.

The main software modules displayed in the Main Menu are divided into five key areas. The Goals area reflects the 'goals' of the innovation project. The Actions area reflects the 'actions' element of the project (tasks, deliverables, milestones). The Teams area on the other hand represents the resources of the innovation project. The Results area corresponds to the 'results' element of the innovation project, while the Community area reflects the 'community' element of the innovation project. These five areas effectively encompass the entire project innovation process and provide the team members and the project managers with tools necessary for its management. Each area has a number of modules that allow the project team members develop competence within specific areas. The software system eliminates the duplication of information as the data may be shared between different modules and sub-modules within the system and provides an environment for the effective collaboration between the virtual team members.

5.1. Goals

The Goals module of the menu corresponds to the Project Goals in the innovation project and allows the generation of four different forms relating to the project goals. These are

Statements, Requirements, Objectives, and Indicators. They provide a structure for formulating the goals element of the project innovation process. Through the software the project management are encouraged to correlate the project's requirements, objectives and indicators and formulate a project's vision statement.

5.1.1 Requirements

The Requirements specification represents the internal and external demands on the project from key stakeholders. It involves identifying the stakeholders, defining the stakeholder requirements and defining all change ideas. Each requirement has an acronym and a title. The title of the requirement has to be short and to summarise in few words the quintessence of the requirement, a more elaborate explanation can be given in the description field. Each requirement corresponds to one of the demands of one of the project stakeholders. The stakeholder can be selected from a drop-down list of stakeholders that includes the project funding agency, the project partners and team members, etc.

5.1.2 Indicators

The performance indicators forms that can be created in the Indicators sub-module in Goals area are metrics used to measure the performances of the project. They permit the continuous evaluation and improvement of the project performance. The Indicators need to be concise, easily measured, time bound and realistic. The Firm Target field indicates a short-term goal for a specific indicator. Stretch Target indicates a goal for up to the end of the project and its value is more a 'best performance' point than real allowing team members to 'stretch' their efforts to achieve them.

The four forms of Statements, Requirements, Objectives and Indicators permit the definition of goals that the project team will pursue, and their communication to the team members through the various views of data. The Goals module provides the team members with various views of data entered through other modules. The Deployment sub-module includes views that identify the relationships that exist between requirements, objectives, indicators and workpackages, and tasks.

5.2. Actions

The Actions module represents the actions in the innovation project. These actions are carried out to successfully achieve the project's goals. The software sub-modules of WorkPackages, Tasks, Deliverables and Milestones are the project's activities.

The Tasks sub-module is designed to structure and capture the minimum information necessary to enable the team members to implement the action and monitor the evolution and the success of the action's implementation. When the user clicks on the Tasks hyperlink in the virtual team environment's home page (see Figure 5) a page with all the tasks is displayed as pictured in Figure 6.

eNableSME
Tasks

Use the Tasks list to keep track of work that you or your team needs to complete.

Select a View
All Tasks
My Tasks
Due Today
Active Tasks
By Assigned To
Results

Actions
⊞ Alert me
⊞ Export to spreadsheet
⊞ Modify settings and columns

New Item | Filter | Edit in Datasheet

0	Acronym	Title	Assigned To	Start Date	Due Date	% Complete	Status	WP
⊟ WP : WP1 (5)								
	T1.1	Requirements Analysis	David Mulligan	01/11/2002 00:00	05/11/2003 00:00	60%	Amber	WP1
	T1.2	eDev Tools	Owen O'Leary	01/11/2002 00:00	01/11/2004 00:00	20%	Amber	WP1
	T1.3	Design of module architecture and data structures	Owen O'Leary	11/03/2003 17:45	11/11/2003 00:00	70%	Green	WP1
	T1.4	Development of Java based modules for domino server	Owen O'Leary	09/01/2003 17:45	08/01/2003 00:00	100%	Completed	WP1
	T1.5	Testing, debugging and proof of concept at selected SMEs	David O'Sullivan	06/01/2003 17:05	12/01/2004 00:00	40%	Green	WP1
⊟ WP : WP2 (5)								
	T2.1	Research into XML-based B2B industry standards.	Owen Molloy	01/11/2003 17:55	01/01/2004 00:00	50%	Green	WP2
	T2.2	Research for supplier B2B integration	Owen Molloy	01/11/2002 17:55	05/01/2004 00:00	70%	Green	WP2
	T2.3	Develop methodology for mapping of current business data	Owen Molloy	01/01/2003 17:55	01/03/2004 00:00	30%	Green	WP2
	T2.4	Analysis, Design and Development of B2C e-business publishing framework	Owen Molloy	01/11/2002 18:00	01/12/2003 00:00	40%	Green	WP2

Figure 6: View page for Tasks module- Screen Shot

In this view all the tasks in the project are listed. The main information about each task is displayed. The information in a list can be grouped, sorted or filtered. New columns can be added to the view and new views can be created. The team members can also subscribe to the page to be alerted every time the information is changed. The team members can drill down into each task record by clicking on the name of the task. A page with the task's details will be displayed. The team members can add, edit, view subscribe and delete one element from the list. The web pages corresponding to these functions are implicitly generated when the module is created. Figure 7 depicts the web pages corresponding to these functions for the Tasks module.

Figure 7: the functions for the Tasks module – Screen Shots

Figure 7 depicts the structure of the tasks forms. The Priority field is used to indicate the importance of the task for the success of the project. The %Complete and Status fields are used to monitor the evolution of the task implementation. The value of the Status field can vary from Red (the task requires immediate attention), to Amber (there are some minor problems in implementing the task), to Green (the task implementation is going well) to Complete (the task has been implemented). The Status Description field gives more details on the status of the task. Each task is part of a WorkPackage and has an acronym, title, a start and an end date, and a responsible that has to ensure that the action is well implemented and it meets the project goals. The tasks can be tracked back to the project goals using the data from the Requirements field. Attachments can appended to each record in the list. The feature allows the team members to attach relevant documents and files to the tasks. For example if there are few individuals that work on the task they can attach the necessary files to the task. This way all the information needed for the correct implementation of the task is up to date and is held in one single place.

5.3. Teams

The project constraints also influence the implementation of innovative actions in the innovation project and are reflected through Teams module in the first page. The Team

module addresses the constraining element of the innovation process. This module allows the identification of the human elements that interact within the innovation process and permits the effective management of their involvement. The Team module manages the human resources of the project through the two sub-modules: Partners and Individual. The Partners sub-module holds all the information about the organisations that are partners in the project. The Individual sub-module allows the capture of information about the project team members, their name, personal details, biography, and role in the project etc. Each Individual in the project has a user name assigned by the administrator of the CPIM, works in an organisation and has a status (role) in the project, which can be Research Engineer or Project Manager, etc. Other information that is captured about the individuals involved in the project is: the email address, phone, extension, web site address, and biography.

The virtual environment developed with Microsoft Sharepoint Services help allows the assignment of human resources to the development and implementations of innovation actions. The software functionality permits each team member to visualise the actions that are assigned to him/her (Figure 5). The Team module acts as a communication tool, providing the project team members with up to date information about the other individuals and organisations involved in the project.

5.4. Results

Actions are implemented with the purpose of contributing to the project goals achievement. The Results module allows the project management to evaluate how successful the implementation of the project is. The goal-results relationship allows the project managers to evaluate the performance of the project and take corrective actions so that the project goals are successfully implemented. The results information is available through the WorkPackages, Tasks, Deliverables, Milestones, Indicators, and Objective result views, to all the team members so that they can act in order to correct the problems that appear. This gives them empowerment, helps the knowledge generation of the team members' knowledge, and reduces their resistance to the changes adopted by the project managers.

The Exception sub-module identifies all the actions and goals that require immediate attention due to their red status. A red status signifies that there are problems with implementation of the action or project goal achievement. Action needs to be taken to remedy the evolution of the action implementation so that the status of the actions and/or goals improves.

5.5. Community

The Community module offers the team members tools that facilitate and sustain the collaboration between the team members. There are three types of collaboration that are ensured through this module. These are asynchronous collaboration, distributed synchronous collaboration, and distributed asynchronous collaboration. The fourth type of collaboration, face-to-face collaboration, very important in sharing tacit knowledge is ensured as well trough meetings and workshops. The tools available for sustaining and facilitating the collaboration between team members are: Documents, eDemos, Publications, Meetings, Announcements, Discussions, Templates, and Links.

Documents sub-module allows the users to share documents, edit, discuss over the changes and subscribe to the documents so that they will receive an email when a change appears in the library or document they subscribed to. Versioning control, access control and send it for review is also available.

The Publications, eDemos, Links, and Templates sub-modules allow the dissemination of knowledge between the team members in different forms (documents, links to outside sources of knowledge, presentations, etc.).

6. Conclusions

A good collaboration with suppliers, customers, partners and between employees is how organisations acquire, hold and develop the new knowledge vital for the implementation and development of new, innovative products, process and services. The difficulty in managing and ensuring a good collaboration comes from the human element involved in the process, as it involves the people's willingness to share their knowledge with others. Four types of collaboration between individuals have been identified. These types of collaboration are face-to-face collaboration, asynchronous collaboration, distributed synchronous collaboration, and distributed asynchronous collaboration and have been classified based on the space and time the collaboration takes place.

Microsoft Sharepoint Services supports three of the four types of collaboration which are implemented in the case study virtual environment too. These types are:

- Asynchronous collaboration: that is supported by the Announcements and Notices modules, which display information in the form of notice boards and also by the Documents module that allows versioning and discussion over documents.
- Distributed Synchronous collaboration supported by the Discussions module and by the integration with MSN for on line chats
- Distributed Asynchronous collaboration supported through the integration with Microsoft Outlook which allows the users to subscribe to be alerted whenever the information on the site is modified.

The evolution of technology has made possible the development of a different type of team: the virtual team involving people from different geographical areas and organisations. While this type of team comes with certain advantages, the main problems raised by traditional teams - such as knowledge sharing, and collaboration - become critical. These problems can be resolved by providing a proper environment for the virtual team members. There are few requirements that have to be fulfilled by a virtual team environment in order for the virtual team members to effectively work together and for the difficulties that usually come with this type of team to be overtaken.

Microsoft Sharepoint Services and the virtual team environment build using this platform fulfil the main requirements for of a successful virtual team environment:

- Collaborative efforts are supported by Sharepoint which allows co-authoring, document version controlling, group editing and reviewing, annotating, sharing information and ideas, approval and author tracking for the documents.
- Communication is supported through the three types of collaboration implemented in Sharepoint.
- Co-ordination of the virtual team is also supported as all the teams actions are tracked. The evolution of work in the project is monitored in the case study environment in the modules of the Results area in the first page.
- Information sharing through document sharing and discussion forums, chats, links surveys, notices and announcements.
- Managing and tracking, project management are also supported by the Microsoft Sharepoint.
- Analysis and decision making tools to support collaborative examination of information, consideration of possible decisions, and development of best decision are the surveys and issues modules implicitly provided by Sharepoint and in the case study the Exception module which lists all the project actions that are not meeting their targets, fail to implement the project goals and require immediate attention.
- Microsoft Sharepoint encourages the development of collaboration between people who work at a distance from each other and who might not be from the same culture is a new organisation challenge through its three types of collaboration modules and

through the integration with Microsoft Outlook that allows the translation of documents from one language to others.

Microsoft Sharepoint Services provides a platform that facilitates an easy implementation of a virtual team environment. The platform comes with a friendly user interface and provides features that ensure an effective and successful collaboration and knowledge sharing between the team members. Microsoft Sharepoint Services fulfils the main requirements for the successful implementation of a virtual team environment.

Project innovation cannot be successful unless the knowledge and information in the project are effectively captured, shared and internalised by the project virtual team members. It is important for the success of the project that the new issues that arise from the virtual team management, and collaboration are addressed as the effective management of them will lead to the achievement of the project goals, and formation of knowledge that will not be lost at the end of the project but will be used to successfully implement new projects and continue to innovate. The virtual team environment developed using Microsoft Sharepoint Services effectively addresses these issues and allows for an easy and user friendly management of the innovation project and of the virtual team working on the innovation project.

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