A Tool for Innovation Management

within

Small-Medium Enterprises

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Abstract

Several systems exist to support innovation management within large organisations, however these systems are frequently overly complex and restrictive, limiting their suitability for use within small-medium enterprises. Due to the overheads required and the rigid structure of existing tools this area is frequently neglected by small-medium enterprises.

Existing solutions for innovation management based on the iTeams system developed by CIMRU were reviewed and found to have solid methodology. The implementations are overly structured and for this reason small-medium enterprises are reluctant to use them. The requirements for innovation management within small-medium enterprises are defined as clear goal definition, clear action definition, alignment between goals and actions, communication, knowledge storage, accessibility, and document management.

In order to develop a new system the processes needed are as follows:

Requirements are gathered in order to clearly define what has to be done. Document management functionality is important to ensure changes can be tracked and the most relevant files are readily available. Issue tracking is important to maintain quality control within the development of a system. A content management system provides a historical view of changes to files so that they can be reviewed. Mapping of requirements to functionality ensure proper implementation off all features required. An effective normalised database design ensures that there is no redundancy in information. Good user interface design enables straightforward management and use of the system as it has been implemented.

Several SMEs have shown interest in using this solution, however the system should continue to be developed to ensure that the information contained is up to date and will be used in future.
Declaration

I declare that this thesis was composed by myself, that the work contained herein is my own except where explicitly stated otherwise in the text, and that this work has not been submitted for any other degree or professional qualification except as specified.
Sections of this thesis or work from which it was derived were presented at the following:

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Chapter 1  Introduction

1.1 Introduction

“It is not the strongest of the species that survive, nor the most intelligent, but the ones most responsive to change.”

- Charles Darwin

Darwin’s statement is just as applicable to organisations as it is to organisms. Innovation is defined as the process of change, and as such if an organisation does not innovate, a competitor may gain an advantage and customers might go elsewhere. For this reason it is important for organisations to have a means to manage innovation. This thesis examines the requirements for an innovation management system for small-medium enterprises and discusses how such a system was designed and implemented.

The aim of this chapter is to introduce this thesis and provide an overview of the work undertaken. Firstly, the motivation for the work is described. Next, the objectives are laid out, and finally a proposed outline of the remaining chapters is described.

1.2 Motivation

The motivation for this thesis came from the eNable SME project within the CIMRU research group. This research group is based in the Industrial Engineering department of National University of Ireland, Galway. The purpose of this project is to improve communication and management of processes within small-medium enterprises (SMEs). The requirements of SMEs were examined, processes were decided upon, and a system was implemented facilitating innovation management within SMEs.
1.3 Objectives

The primary objective of this research is to create an innovation management and, to a lesser extent, knowledge management system for small-medium enterprises. It has been observed while there are several systems available for innovation management, these systems seem to be tailored towards the requirements of large enterprises. This is discussed further in Chapter 2. Because of this, the take-up of these systems within small-medium enterprises is low. This thesis focuses on defining the requirements of small-medium enterprises for innovation management and designing a system based on these requirements.

1.4 Thesis Outline

The remainder of this thesis is structured as follows:

Chapter 2 introduces small-medium enterprises and describes the requirements of innovation management and knowledge management. Several innovation management processes are described, and the requirements for effective innovation management are documented.

Existing tools for innovation management are reviewed and compared in Chapter 3. The suitability of such systems for use within small-medium enterprises is discussed.

Chapter 4 documents the process of creating a tool for innovation management. The systems required for managing development of a new system are described, and the process and design behind creating a suitable system for innovation management is discussed.
Chapter 5 describes the system as it has been implemented. All aspects of using the system, both from an end-user and from an administrator point of view are discussed.

The final chapter reviews the work done, documents the conclusions, and suggests proposals for future work. Future areas of interest for investigation and further research are also identified.
Chapter 2  Innovation and Knowledge Management

2.1 Introduction

Small and Medium Enterprises (SMEs) often have problems defining their requirements and goals, and aligning their requirements to their goals, specifically in relation to innovation management and knowledge management. However, a typical SME will not have a person assigned specifically to the task of innovation management and the resources are not available to develop or implement an innovation management or knowledge management system. As such a solution is sought which involves minimal setup and maintenance for the users while providing the functionality required.

We need to define how best to organise knowledge to manage innovation. This becomes a bigger problem when applied to the extended enterprise where companies need to share their information to better integrate with each other.

Firstly, this chapter introduces small-medium enterprises and then the concepts of innovation management and knowledge management describing several innovation management processes. Next, we analyse the problems that SMEs have with innovation management. Finally, we document requirements of SMEs for effective innovation management within organisations.

2.2 Small and Medium Sized Enterprises

According to European research SMEs account for two-thirds of employment within the European economic area. [1] Vendors tend to overlook this fact, however, and focus their sales on large enterprises. [2] The result of this is that innovation management and
knowledge management tools are not normally designed with the requirements of small-medium enterprises in mind, and are too complicated or too rigid for use by them.

A Small and Medium sized Enterprise (SME) is an organisation with fewer than 250 employees and an annual turnover not exceeding 40 million Euros. In addition, an enterprise of this size will typically have experienced/trained managers, own their own product, and service a large number of customers. [3]

<table>
<thead>
<tr>
<th></th>
<th>Medium</th>
<th>Small</th>
<th>Micro</th>
</tr>
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<tbody>
<tr>
<td>Max. Number of Employees</td>
<td>Max 250</td>
<td>Max 50</td>
<td>Max 10</td>
</tr>
<tr>
<td>Max. Turnover (€million)</td>
<td>40</td>
<td>7</td>
<td>-</td>
</tr>
<tr>
<td>Max. Balance-sheet total (€million)</td>
<td>27</td>
<td>5</td>
<td>-</td>
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Table 1 - Classification of Enterprise Size (Europa 2003)

### 2.3 Innovation Management

Innovation is defined as alteration of what is established by the introduction of new elements or forms[4]. In the context of small-medium enterprises we define innovation as any change that adds value to an organisation. This value may not necessarily be financial but might also represent product quality, employee satisfaction, customer satisfaction, or other less tangible metrics.
Change is inevitable in life and this is nowhere more evident than in business. In recent years, thanks to advances in technology and the rise of globalisation, the pace of change has accelerated greatly. Innovation and flexibility have evolved as a new set of key metrics for a business, perhaps more so than traditional cost and structure-based metrics. Globalisation has raised the stakes in the SME sector as competition can now occur in what would have formerly been perceived as safe markets.

Organisational change is an undertaking that involves the organisation as a whole. A coherent and understandable system is required to manage the change process. The innovation process as a requirement has risen to the level where large global companies expect innovation all the time and in all areas.

### 2.3.1 What is innovation Management

Innovation management is management of the innovation process. By this we mean the analysis, documentation, and control of change within an organisation. Innovation management is typically performed at the management level of an organisation and deals with generalities that affect the entire organisation, rather than specifics, which affect only a small part of the organisation. This direction might take form of changes in corporate policy, lines of business to follow, or employee policy.

### 2.3.2 Key/Current problems of Innovation

The most common barrier to innovation is resource limitations, primarily due to lack of available finances, secondly due to lack of manpower, and thirdly due to lack of time. This barrier can only be broken when an organisation decides to innovate and makes the resources available. After resource issues the next barriers are largely perceptual, namely too high risk and a belief than innovation is not necessary. These perceptual barriers are
disappearing rapidly due to education and the need to compete in a global environment. Finally, a lack of technology and a lack of qualified personnel provide the final obstacles to innovation within SMEs. [6]

Even though innovation is important to companies Cottam et al [8] show that 71% of UK companies did not have personnel resources assigned to innovation but that the responsibility for innovation was distributed between various departments. Innovation is important as a means of achieving growth and enhancing organisational performance. Many organisations, however, have difficulty integrating innovation with their business strategy and day-to-day workings.

### 2.3.3 How does an organisation innovate?

Large organisations will typically have a dedicated research and development department with formalised procedures. Smaller organisations frequently do not have a designated department, however, due to their flexible nature the entire organisation can be treated as a productive research and development department. The entire organisation implements change and business processes quickly without all of the formal need for procedures required by large organisations. This has the obvious advantage of creating an agile organisation with the ability to deploy of changes rapidly. However, the major disadvantage of an organisation working in this manner is that a commercially high-risk environment is created. For this reason innovation should be carefully managed so as to keep the organisational risk at a minimum.
2.3.4 Models for innovation management

There are several established models for innovation management within an organisation. In this section a sample of methodologies are discussed. Majaro’s innovation funnel is discussed first. This is a screening and refining system for ideas beginning with a large number of options and working towards a practical solution. Boehm’s “waterfall” system development life cycle model is considered next. The waterfall model works like a production line where one stage is finished in its entirety before proceeding to the next. Following on from this, Boehm developed a spiral model. This model improved on his waterfall model by allowing for continuous improvement. Finally, Dooley and O’Sullivan’s innovation funnel is discussed.

2.3.4.1 Majaro - Innovation Funnel

In his book, Managing ideas for profit, Majaro [9] defines innovation as the practical application of ideas towards meeting an organisation’s objectives in an effective manner. He goes on to describe a four-stage process involving idea generation, idea screening, feasibility study, and commercialisation as shown in Figure 1. This funnel model is used quite widely for product innovation.

![Figure 1 - The Idea Funnelling Process (Majaro, 1992)](image-url)
Firstly, ideas are generated and recorded. After the initial idea generation each of the ideas are considered. If the idea is not worth proceeding with at this point, it is “recycled” into the pool. While it may not be immediately feasible this is no indication that it will not be feasible at some point in the future. After screening the ideas the feasibility of the passing ideas is considered and, ideally, the ideas are implemented. The implementation, or practical application of ideas, results in the actual innovation. It should be noted that at every point in this process ideas are refined and considered and possibly recycled if they are not immediately viable.

2.3.4.2 System Development Life Cycle Model (SDLC)

One of the oldest and best-known systems for developing software systems is known as the waterfall model[10] and is illustrated in Figure 2. It is defined by a sequence of stages where the output of each stage becomes the input of the next.

Figure 2 - Waterfall Model, Boehm (1976)
The stages are defined as follows:

1) Project planning, feasibility study. At this stage a high-level view of the intended tasks are defined and goals are determined

2) Analysis. At this stage the project goals and end-user requirement are refined.

3) Design. At this stage the desired features and tasks are defined in detail.

4) Implement. The actual work is done

5) Integration. At this stage the work packages are brought together and checked for errors and interoperability

6) Maintain. This is the last stage, which includes changes, corrections, and additions to the defined plan.

The model requires that complete assessment for each stage is complete before the phase can commence, resulting in linear systems development.

In “The Mythical Man Month”, Brooks [11] points out two fundamental problems with the waterfall model, the first being that a project goes through the process once only, and the assumption is made that all mistakes are found in the execution and subsequently fixed. The second problem with this model is that it assumes all change processes occur at once, combining different sections only at the implementation stage.

### 2.3.4.3 Spiral Model

It is generally accepted that the waterfall model is not acceptable as a method for systems design and implementation, as it does not allow scope for continuous improvement. In most situations it has been replaced with a progressive refinement methodology.
As an alternative, Boehm [12] proposed a spiral model to replace his waterfall model as an approach to the change process within the software development area. The development is organised in several cycles, each devoted to progress in the development. There are four steps used in this process:

1) Define objectives, alternatives and constraints. During this stage, the objectives of the product are evaluated (performance, functionality, etc.), alternative means of implementation are identified, and organisational constraints (cost, schedule, interface, etc.) are defined.

2) Evaluate alternatives, identify and resolve problems. At this stage areas of uncertainty within projects are identified and strategies for resolving these sources of risk are found. A development proposal may be documented at this point.

3) Develop and verify product. At this stage, a prototype may initially be developed, changes are implemented in a controlled and low-risk manner, and the results of these activities are validated against the original objectives.

4) Review results and plan next phases. Each cycle finishes with a stage of review and analysis, involving the primary people or organisations concerned with the changes involved. This review incorporates plans for the next cycle and resources required to carry them out. Component tasks may be separated out to sub-divisions at this stage.
Figure 3 - Spiral Model for software development [12]

After the review stage the process returns to the start of the cycle with increasingly more specific requirements and the process is repeated until the review returns a satisfactory result.

Although the model as described by Boehm was originally designed for software development it can be applied to any task involving significant change as the processes are applicable in many areas of innovation.

2.3.4.4 Innovation Funnel

All organisations have their own unique processes for innovating their systems, however there are several common characteristics that are generic across organisations. A high
level framework has been proposed by Dooley and O’Sullivan, [13] designed to support the management of systems innovation.

Goals are identified at an organisational level, and are the general objectives of the organisation. Actions are identified as any creativity or projects within the organisation.

Using a funnel as a metaphor, as seen in Figure 4, actions are forced to align themselves with the goals of an organisation. Projects are supported by resources such as teams and are fed back into the system refining the goals and increasing the knowledge of the organisation for future work.

It has been found that there are six main areas of innovation management. These are goals, actions, teams, results, collaboration and technology. [14]

Developing goals and measures involves developing strategies and performance targets towards which the organisation strives.

The actions element represents the path through which an innovation develops from an idea into a physical innovation in an organisation’s systems. By aligning actions with
goals, it is ensured that all ideas generated correspond to a part of the organisation’s innovation plan. [13]

### 2.3.5 Comparison of different innovation management frameworks

A common trend runs between these different innovation management systems, and each of these models come to similar conclusions. In order to manage change effectively the following four steps must take place:

1. Goal definition/determination
2. Idea screening/Goal alignment/evaluation
3. Development/Projects/Actions
4. Results/review/plan next phase

How these steps take place in each of the above innovation management systems is illustrated in Table 2.

<table>
<thead>
<tr>
<th>Majoro - Funnel</th>
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<th>Boehm - Spiral</th>
<th>Dooley and O’Sullivan - Funnel</th>
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<td>Planning and Feasibility</td>
<td>Review and Planning</td>
<td>Goal and Action definition</td>
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<td>Idea Screening</td>
<td>Analysis</td>
<td>Define Objectives</td>
<td>Goal and Action Alignment</td>
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<tr>
<td>Feasibility</td>
<td>Design</td>
<td>Evaluation</td>
<td>Projects</td>
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<tr>
<td>Implementation (Innovation)</td>
<td>Implement, Integrate and Maintain</td>
<td>Development</td>
<td>Interpret Results</td>
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**Table 2 - Comparison of Innovation Management Methodologies**

### 2.3.6 Critical Success Factors for Innovation for SMEs

Small-medium enterprises often have large volumes of information, however it may be stored in different places. Members of the organisation may not be aware of where this information may be found; i.e. the organisation may not know what it knows. Because
of this collaboration within the organisation is essential for innovation management within SMEs. This brings us to the need for knowledge management.

In the modern business world, an organisation is dependent on its suppliers and on its customers. Collaboration with customers ensures that the organisation is fulfilling a need well and supplying what the customer actually wants as opposed to what the enterprise believes the customer wants. Collaboration with suppliers ensures that supplies required are available as they are needed, that the supplies are well suited for their intended purpose, and that there is not an oversupply of materials.

2.4 Knowledge Management

Knowledge is defined as information within a context, whether that context is related to human action or to business practices [15]. Knowledge management deals with the understanding of information and knowledge within an organisation. A knowledge management system maximises efficient information finding, handling and organisation, and enables access to information previously available to a limited group of people, making the organisation as a whole more efficient. [16]

[17] Berdrow and Lane define knowledge management as the conscious and active management of creating disseminating, evolving and applying knowledge to strategic ends.

Knowledge differentiates from information through the fact that information can be described as raw facts, however information on its own doesn’t actually mean anything. For example, “Last years sales for this company totalled €2 million” is a piece of information without any meaning. Information becomes knowledge when placed into a
context, for example, “Last years sales totalled €2 million, up 10% from the previous year, while associated costs actually fell” would be an example of an item of knowledge.

Knowledge management is the art of ensuring that the right information is made available to the right personnel, at the right time, and in the right context, ensuring that it is known within the organisation where such knowledge is available. Knowledge management must be grounded firmly in the business strategy in order to be of any use.\[18\]

O’Leary defines knowledge management as those efforts designed to (1) capture knowledge; (2) convert personal knowledge into group-available knowledge; (3) connect people to people, people to knowledge, knowledge to people, and knowledge to knowledge; and (4) measure that knowledge to facilitate management of resources and help understand its evolution. [19]

Knowledge management within an organisation is important to reduce the dependency on individual knowledge and transform it into organisational knowledge. This is normally achieved through documentation and cataloguing of standards, procedures, and methods of organisational procedures and ensuring that the documentation is made available to all that need it within the organisation.

Knowledge management is important within SMEs as it facilitates innovation management. It does this by ensuring that an organisation’s performance indicators are up to date, widely available, and accurate. A knowledge management system provides a means for collaboration, reduces dependence on individuals who may be otherwise occupied, and allows team members to view the management goals and ambitions.
Knowledge management is different from innovation management in that it is a facilitator rather than an executor of innovation. Knowledge management may be applied in wider areas than in the more limited scope of innovation management. Knowledge management can provide the framework and systems by which innovation management can best take place.

### 2.5 Problems for innovation management within SMEs

One of the key characteristics of an SME is lack of internal structures, hence their agility. Employees tend to be multi-skilled but not specialised in any particular area. In order to meet the requirements of any customers that are large enterprises, innovation is required in an evolving market. This innovation requires collaborative efforts to align the efforts with the overall innovation efforts of the large organisation. For most product innovation within supplier SMEs alignment with the overall goal of the large enterprise customer is important.

A number of SMEs were interviewed to document which system features would best help for effective management of innovations and the change process. It was found that most SMEs were reactive based on their customer requirements, rather than proactive in their need to innovate. A number of key requirements were found to encourage proactive innovation within SMEs. These requirements are as follows:

1) Problem Solving and Tracking
2) Goal Visibility
3) Action Visibility
4) Alignment of Goals and Actions
5) Accountability and Ownership
2.5.1 Problem Solving and Tracking

Problem solving capabilities are extremely important for SMEs in order to maintain and upgrade their processes, methods, and products. These problems can be brought to attention by customer feedback, workshops, internal testing, review meetings, and other processes. A means of capturing problems should be made available to the organisation. In addition to recording which problems exist, and the status of these problems, it is important to log how problems were solved, so if an issue re-occurs the previous solution can easily be found. A problem tracking system can dramatically increase the productivity and accountability of individual employees by providing a documented workflow and positive feedback for good performance. [20]

2.5.2 Goal Visibility

The effective formulation of goals needs to be at the heart of the innovation management system for SMEs. It is especially important to have a clear set of performance metrics in place by which SMEs can monitor their performance and progress towards goals. It is equally important to make sure that the goals are known throughout the organisation, and that a resource exists so that goals can be referenced. Poor goal formulation can result in unsuitable targets being set. Examples of good goals include “increase market
share”, “reduce product defects”, “reduce employee turnover”, or “reduce time to market”.

2.5.3 Action Visibility

Tasks need to be tracked within an organisation to ensure that management are aware of what processes are happening within an organisation. We refer to any such projects as Actions. Examples of actions include “implement flexitime system”, “reduce systems down-time”, “cross-train employees”, “answer all customer queries within 2 hours”, or “improve quality control methods”. By tracking actions, personnel are made aware of what progress is being made towards goals.

2.5.4 Alignment of Goals and Actions

It is important to ensure that it is known what effects all the actions within an organisation will have on the various organisational goals. In order to do this, the actions should be aligned to the goals. If an alignment cannot be found for an action its value should be questioned and the decision to go ahead with it should be re-evaluated. If there are many actions that cannot be aligned with goals the organisational goals should be considered and perhaps modified. By aligning actions with goals, it is ensured that all activities within an organisation are having a positive effect on the organisation.

2.5.5 Accountability and Ownership

Each project should have somebody clearly taking ownership of the project and held accountable for the progress of each project. This helps to encourage good working practices and reduces the likelihood of personnel cutting corners or taking shortcuts. In addition, it can help to provide some responsibility and accountability at all levels so that if faults occur they can be traced back to the point of failure. This works both ways and projects that are successful reflect well on project owners.
People are encouraged to take pride in their work and this improves the overall quality of the entire organisation.

### 2.5.6 Traceability

There should be clear traceability from projects and actions to the overall strategic goals of the organisation in a concrete and clear manner. By linking all stages of a process with the individuals responsible for each stage, responsibility is encouraged. If errors are made, the point at which the error occurred can be found and corrected facilitating recovery and correction of this error, and preventing it from recurring in the future.

### 2.5.7 Knowledge storage

Ideally, knowledge generated through problem solving and brainstorming should be stored in a central depository. A clear documentation of all procedures is required in order to streamline the processes within an organisation. The knowledge storage system should be indexed and catalogued and there should be means to browse and search the storage system. This increases the availability of knowledge and decreases the dependency on individuals, resulting in changes that are more efficient.

### 2.5.8 Change control

A mechanism should be provided to keep track of all the change initiatives that are taken place in the organisation, to keep track of the resources that are consumed by each, and to keep track of the personnel responsible for each project. Once changes are completed, the information about why the change happened, how the change was performed, and what changes happened should be logged in the system. In addition to providing an accountable path for any changes that occurred, if a similar change needs to be performed in the future, a record exists as to how it was previously executed so that the new work can be done more efficiently.
2.5.9 Communication

A mechanism to communicate effectively so that there is no confusion between any messages being sent and that everybody is using the latest version of any change initiative. A communication of goals to all relevant staff, especially managers and personnel involved in the implementation, is necessary. Examples of online communication mechanisms include online discussion boards, e-mail lists, and online chat systems. Discussion boards and email lists are examples of more permanent communications systems. Longer messages and replies can be formulated using discussion boards or email lists, however replies through these systems can take longer. On a discussion board all messages are listed and comments can be added. The messages can be managed in a hierarchical manner making the structure of the discussion easy to follow [21].

In addition to discussion boards and email lists, online chat or messaging systems can be helpful as they allow personnel to reply instantaneously to a query. The advantage is that replies are very rapid and informal. Additionally, it can be instantly seen if the person being contacted is available. However, instant messaging systems can seem intrusive or distracting as a response is sought immediately.

2.5.10 Portfolio Resource Allocation

There should be a clear plan in terms of projects and the resources of the company. Management should not look at individual projects but at the portfolio of projects, so that resources are allocated appropriately to different projects and so that redundant systems and procedures are minimised.
2.5.11 Document Sharing

Originally the world wide web was designed at CERN to enable the sharing of documents and information across multiple platforms and sites amongst researchers [22]. As a document sharing system the success of the WWW has been unequalled. It has made collaboration and innovation amongst geographically separated organisations vastly easier. The support for sharing of document files is a feature of many web based collaboration systems [23].

Organisations should have a central document repository so that the most up to date version is always available. This is important to ensure that decisions are correctly followed. As documentation is superseded the new version is accessible to all. In addition, if documents are contained in a central repository, they are always available, rather than being available only at the discretion of an individual or department. However, it is important to ensure that if multiple copies of a document are being worked on, that all the changes are reflected in the central copy. This brings about the requirement for some sort of locking system or a document sharing system. A version control system, such as Microsoft\textsuperscript{1} Visual SourceSafe, or the open source Concurrent Versioning System tool, can prove useful in this context. By providing a locking mechanism, it prevents one person from modifying a document while another is working on it, but allows access to the most recently published version to all users of the system.

\textsuperscript{1} Microsoft, SourceSafe, Internet Explorer, and Windows are registered trademarks or trademarks of Microsoft Corporation
2.5.12 Historical Information Archival

As documents are modified over time, information is updated and modified. Occasionally, a user may wish to refer to an older version of a document which may now be out of date. If versions are periodically saved and may be returned to at any point, the evolution of the document over time may be observed. [24]

2.5.13 Accessibility

It is important to make sure that the information required by individuals within an organisation is easily available to the personnel who need it, as they need it. Providing accessibility may mean something as simple as making sure that access to the knowledge base is made available to all relevant staff and is not unreasonably restricted, or ensuring that a server which is running an knowledge management system is consistently available during working hours.

2.6 Conclusions and Recommendations

2.6.1 Limitations/Problem areas of innovation management in SMEs

Small-medium enterprises frequently lack a structured format for innovation management, however, there are structures and methods that exist and can be applied to innovation management easily. The primary limitations within SMEs are resource limitations. This may refer to financial resources, personnel resources, or equipment resources.

2.6.2 Reasons for Chapter 3

This chapter has shown the reasons for innovation management and knowledge management within SMEs, and the methods available to such organisations. We have also reviewed the functionality required for successful innovation. For the next chapter,
we shall investigate what tools already exist which attempt to solve these problems, how they integrate with existing systems, and what problems exist with these tools.
Chapter 3  Existing solutions

3.1 **Introduction**

In the previous chapter we reviewed the features required for an innovation management and knowledge management system within small-medium enterprises.

Firstly, in this chapter examples of available tools for innovation management and knowledge management are reviewed and their features are compared. Next, several existing implementations of innovation management systems which use the Innovation Funnel framework as proposed by Dooley and O'Sullivan[13] are reviewed. Finally, we discuss the suitability of such systems for small-medium enterprises as compared with the requirements discussed in the previous chapter.

3.2 **Tools for Knowledge Management**

A wide variety of tools are available which broadly fall under the definition of knowledge management and the choices available are many and varied. The costs and complexities of these tools vary from minimal to excessive.

3.2.1 **Features Required**

The primary features required by a knowledge management tool are a subset of the key requirements for innovation management as discussed in the previous chapter. The required features are as follows:

1) Accountability and Ownership
2) Knowledge Storage
3) Change Control
4) Communication
3.2.2 Existing tools for knowledge management

In this section we will discuss several tools which are available for knowledge management. Firstly three open source options are discussed, PostNuke, Bugzilla and the Concurrent Versioning System. Next we discuss a commercial knowledge management system, Microsoft SharePoint. Finally we compare these systems and their suitability as knowledge management systems.

3.2.2.1 PostNuke - a collaboration environment

PostNuke is a free, community developed tool designed for community, content and collaboration management. It provides a set of tools allowing a dynamically generated web site to be rapidly developed with a minimum amount of technical knowledge. A website developed using this tool can be configured in several ways. Firstly the appearance can be modified through the use of templates. Different levels of users can be created and allowed access to different areas of the website. Files can be stored in a central location using document management tools. Announcements and content are customisable and can be dynamically generated through user interaction. A discussion forum feature is provided by default, as is a system for managing mailing lists.
PostNuke is a freely distributable tool with the source code is included, allowing
customisation to suit whatever task is necessary. In addition, licensing costs can be kept
down by installing PostNuke on a free operating system such as FreeBSD or Linux.
Client access is through any standard web browser. Back-end support is provided
through MySQL, a freely available database system, and PHP, a free, server-based
scripting language.[25]

3.2.2.2 Bugzilla

Bugzilla is a defect tracking system developed by the Mozilla Corporation to manage
bugs in its web browser, on which Netscape is based. The system has been freely
released as a contribution to the programming world. It has become the de-facto
standard defect tracking system by which all others are measured. [26]
It has been included here as an example of a specialised knowledge management system,
collecting knowledge in a specialised area. The knowledge stored is highly structured,
and is optimised for problem tracking only, so while this tool is useful for one particular
aspect of project management, it is limited in use in other areas. Communication
systems within Bugzilla are highly developed. A comment can be made on any item in
the database and email updates can be configured for a variety of actions. Documents
may be attached to items, providing a means to add additional information such as
images of examples of issues or log files. An owner is attached to all items, providing
traceability and accountability.

Back-end support is provided through the Apache Group’s open source web server, the
MySQL database server, and the Perl scripting language. Bugzilla runs on any UNIX
based operating system. The appearance can be customised through templates.
A Strict framework for reporting and managing bugs has been developed, and entries
into the knowledge base must follow certain formats. This framework is required to
reduce the number of duplications, ensure correct assignment of defects to the
appropriate personnel, and therefore rapid resolution and testing of defects once they are
identified. For example, it is required to search against existing reported, defects before
it is permitted to report a new defect. Because of this complexity, it can appear daunting
as a system for less structured projects.

Interoperability with external tools is provided through interfaces with email, XML, and
http APIs, and integration with CVS. [26]

3.2.2.3 Concurrent Versions System

The Concurrent Version System (CVS) is a tool used for file version control system. It
records a history of changes to files, so that all changes made can be tracked and
recorded. It can provide a means to lock files so that only one person can modify a file at
a time, ensuring integrity. It has been included here as an example of a document
management system.

As a knowledge storage system, it can provide a means to store documents in a way that
preserves their history, and can keep them in a hierarchical manner. A means is provided
to merge changes if two versions of the same file are modified at the same time by
different users, resolving conflicts and resulting in a complete document. However, the
CVS tool is not a useful tool for communication as it is solely a file depository. There is
no means to communicate. Having said this, it has been widely integrated into more
complex knowledge management systems which include more complete communication
systems. Accountability and ownership is well managed through use of user and group
accounts. It is still, however, important to ensure that all parties involved in an
organisation are communicating and aware of tools, schedules, and business processes.
Another perceived drawback of the CVS system is that it is a low-level, command line tool. This is in fact a strength as well as a weakness, as while it makes the tool itself difficult to use. It also makes integration into alternative systems straightforward. As a result of this a wide variety of visual clients are available for various platforms, including Windows and Java. The tool itself has been integrated into several other systems, including Microsoft Visual Studio[27], Bugzilla[28], Apple XCode[29], Sun Java NetBeans[30]. [31]

3.2.2.4 **SharePoint**

SharePoint Services is a product produced by Microsoft and included with Windows Server 2003. It provides a means for workgroup collaboration through lists, documents, and discussion groups, through a web-based interface. [32] Lists can be customised by users, as can document libraries, to store and provide whatever information is required. In addition, security can be implemented on a group or user level as required to reflect an organisation’s policies and requirements. There is a document storage system provided which integrates with the Microsoft Office range of applications, so that changes made to documentation are automatically stored on the central repository instead of on user’s hard drives. A discussion area is provided and integration with Windows Messenger can be provided. This integration allows workgroup members to see when each other are on-line. Customisability is through templates that can be modified by the administrator. However, the technical expertise required to modify the templates can cause frustration. In addition, if a browser other than a recent version of Internet Explorer for Windows is used by the client, some of the integration functionality is lost. This may cause problems with organisation members who are using non-Microsoft operating systems or older versions of Windows on their desktop. Back-end support is provided through Microsoft’s IIS Web server, the .NET framework, and
Microsoft’s SQL Database Server. A version of this database server is included with Windows 2003. The costs of this system should be taken into consideration when deciding whether to use this system. [33]

3.2.3 Comparison of existing tools

All of these tools fulfil certain criteria, however no tool provides a complete feature set. In addition, other criteria such as an organisation’s preferred platform, budgetary constraints and requirements to share hardware with existing systems can limit the suitability of any particular tool for the task of innovation management and knowledge management. A comparison of the features of the reviewed systems can be seen in Table 3.

<table>
<thead>
<tr>
<th>Tool</th>
<th>PostNuke</th>
<th>Bugzilla</th>
<th>CVS</th>
<th>SharePoint</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge Storage</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Change Control</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Communication</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Document Sharing</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Historical Information Archival</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Traceability</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Requires customisation</td>
</tr>
<tr>
<td>Accountability/Ownership</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Accessibility</td>
<td>Web Browser</td>
<td>Web Browser</td>
<td>Custom Program(^2)</td>
<td>Web Browser(^3)</td>
</tr>
</tbody>
</table>

Table 3 - Comparison of Knowledge Management Systems

It should be noted at this point that these tools are all designed with different purposes in mind and as such all are excellently suited towards specific tasks. Any one of these tools might provide an ideal solution for knowledge management within an organisation depending on what the technical requirements of that organisation are in terms of knowledge storage.

\(^2\) CVS requires a command-line client to manage files within the system. However, a wide variety of graphical interfaces are available for most operating systems, and the client has been integrated into several development environments.

\(^3\) SharePoint provides some features that are not available or work in a restricted manner if a browser other than Microsoft Internet Explorer is used on a platform other than Windows by the client.
3.3 Tools for Innovation Management

We have looked at different knowledge management solutions and found them suitable for the task as described. However, all of these systems are either too rigid or too flexible to be immediately useable as innovation management system.

3.3.1 iTeams tools and previous implementations

In the previous chapter, we discussed the innovation funnel as framework for innovation management. [13] Dooley and O’Sullivan’s “The iTeams methodology” which we mentioned in section 2.3.4.4 has been implemented on several different platforms and in different environments. This section reviews various implementations of the iTeams methodology using different development tools, and the customisability of these tools. All of the current implementations of these tools require only a standards-compliant web browser such as Internet Explorer or Firefox to be installed on the client, which reduces the requirements of an organisation using the tool to that of merely requiring an internet connected computer with a standard web browser.

3.3.1.1 Lotus Domino® Implementation

The Lotus Domino implementation of iTeams was developed by CIMRU and was applied to many multinationals to help manage systems and product innovations. This is a collaborative software application that allows multiple users to manage the goals, actions, teams, and results of an organisation.

As you can see in Figure 5, a central portal that provides access to many of the modules that are required for effective innovation management is provided. The central dashboard is split up into four key modules of goals, actions, teams, and results. Each of

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4 Domino and Lotus Notes are registered trade marks of International Business Machines Corporation
these modules contains links that are central to the description and execution of these modules.

Figure 5 - iTeams portal implemented in Lotus Domino

Within the goals module, an indicator view exists which is useful in monitoring performance. The indicators section, seen in Figure 6, allows users to quantitatively assess where they are and where they aim to be in the future in definite terms.

Figure 6 - Indicators view

Actions need to be carried out in order to fulfil these high level goals so as to reach target goals. iTeams provide a number of links under the actions heading to allow organisations to identify and categorise their actions. These areas are broken down into problems, projects (as shown in Figure 7) and ideas. Each of these areas of actions
contains a text description, the responsible team member, a proposed team and a ranking.

![Figure 7 - Projects view](image)

iTeams help managers to manage the results of actions by using the traffic light system. It manages exceptions by identifying all the underperforming project strategies, indicators etc. that are in the portfolio.

![Figure 8 - Results view](image)

iTeams provides a good implementation of the type of innovation management system that is required by SMEs. It reflects the architecture of best practice and has been widely
implemented in a number of areas. However a simplified version of this will be required in order to help the innovation management process of SMEs.

### 3.3.1.2 SharePoint implementation

A version of iTeams based on MS SharePoint was developed and implemented as a research project to investigate the possibilities and limitations of SharePoint as a development system. Initially, the system was designed to replicate the functionality of the Domino implementation. Again, lists were set up representing the modules required for effective innovation management under the four key modules of goals, actions, teams, and results.

While SharePoint proved useful for rapid development of a prototype, due to limitations in its capabilities, numerous desirable features could not be easily developed in a way that would provide a consistent interface. For example, cross-referencing views with one another proved quite difficult due to the way data is stored dynamically on the server. The work required to integrate SharePoint features with unsupported outside systems would be greater than the work required to create a customised system from scratch.
3.3.1.3 iTeams Light

iTeams Light was developed as a proof of concept for the enable SME Project. It supplies a reduced set of functionality of the previous implementations of iTeams, written completely from scratch, designed for use by small-medium enterprises. It was designed as a single-operator system, meaning that all users could see all information contained within the system. As such it could be installed in an organisation for use by personnel within that organisation. An object-oriented methodology was used in the design of the tool, to make rapid development of robust tools possible.

A simplified view of the iTeams system is presented, showing only Actions and Indicators. The fields required within these two views are less restricted than in the other implementations making the system more flexible and suitable for the less structured data a smaller enterprise will use.

Figure 10 - Indicators view under iTeams Sharepoint
Due to the requirement that a .net capable web server is required by an organisation using this system, iTeams light is not suitable for small-medium enterprises, as other iTeams based solutions are available with lower systems requirements. In addition, some architecture decisions were revised after the development of this system, requiring re-design and fresh consideration of ideas. However, as a prototype system, it proved very useful as a starting point to develop the final system on which this thesis is based.

### 3.3.2 Comparison of existing iTeams solutions for innovation management

Initial iTeams based systems are varied in how they operate and suit different purposes. The Lotus Domino implementation is highly structured and serves large enterprises with rigid structures well. However, this structured system does not suit a SME where data and requirements are much more loosely defined and where the structure of information may not match that required. The SharePoint based system, while more suitable, lacks certain desired features and while it may meet the requirements of some small-medium enterprises, it is still not generalised enough for our purposes. While iTeams Light is a good start, providing much of the flexibility that would suit small-medium enterprises. Improvements could be made to its usability. It might, however, provide an ideal
solution for a more IT oriented small-medium enterprise, where it could be hosted alongside other existing systems and customised for their purposes.

### 3.4 Conclusions and Recommendations

There is no tool that includes all the functionality desired. A combination of tools that have little feature overlap (or integration capabilities where features do overlap) would provide the ideal system for online collaboration. Microsoft's SharePoint Team Services seems to provide the most flexibility for general knowledge management within different environments. However there is significant overhead required in customisation of a SharePoint based system so as to facilitate innovation management in addition to knowledge management. iTeams would appear to provide a well-structured system for innovation management, however the current implementations do not appear to meet the requirements of small-medium enterprises. As such, it is proposed that a new system be developed using best practices of software design, so as to provide a user friendly and flexible solution for innovation management within small-medium enterprises.

#### 3.4.1 Reasons for Chapter 4

Based on the functionality of existing implementations of iTeams, and the feature set required for innovation management within SMEs, it has been decided to develop a new system for innovation management within SMEs. It was decided that the feature-set of existing solutions was too constricted and that customisability of commercial systems was too limited for our purposes, so a new solution was to be developed. In the next chapter we shall look at the design and planning required for such a system.
Chapter 4  Designing a new system

4.1  Introduction

In the previous chapter, several different existing solutions for innovation management were reviewed. After reviewing the existing solutions, it was decided that a new system was to be developed for innovation management in small-medium enterprises.

In this chapter, first the process of gathering requirements is described. Next, the systems that were put in place to manage the development of a new system are described. Finally, the design of the system itself is described, including system architecture, database design, and web site layout.

4.2  Requirements Gathering

In this section the processes used in gathering the requirements for an innovation management tool is used. Firstly, the common features of small-medium enterprises are reviewed. Next, we discuss how small-medium enterprises innovate. Finally, we define the requirements for innovation management.

4.2.1  Common Features of Small and Medium Sized Enterprises

SMEs in Ireland are often the suppliers of large enterprises. Large enterprises frequently have specific requirements that must be fulfilled before selecting suppliers. This was discovered during interviews conducted by researchers working on the eNableSME project. One of the key requirements identified is ability to change and upgrade, and to problem solve issues, in other words innovation management.
4.2.2 Specification

In addition to interviews with small-medium enterprises, a survey was conducted by researchers working on the eNableSME project amongst several small-medium enterprises to establish a list of requirements for an innovation management tool. The survey itself is shown in appendix A, and the results of this survey can be seen in appendix B.

4.2.3 Requirements

As a result of the survey, and following on from requirements discussed in section 2.5, it was decided through workgroup discussions to implement the following features for the initial release of the system:

1) Goal Visibility
2) Action Visibility
3) Alignment of goals and actions
4) Communication
5) Knowledge storage
6) Accessibility
7) Document management.

Content relating to innovation management is to be created, covering several different systems for managing ideas.

Existing documentation discussing various methods of innovation management, project management, and performance measurement will be made available as reference sources. For this release, the system will only include documents provided by the administrator, however as future work, the ability of users to publish their own documents is a desired feature.
A discussion forum will be provided to encourage communication between users of the system.

A means for new users to view and respond to the survey is to be provided.

A system will be provided allowing an administrator of the system to manage users, create and delete content, and review survey results.

Users will be able to navigate content, create goals and actions, align these goals with actions, and add entries to the discussion forum.

### 4.3 Systems used to manage development

In this section, the tools and systems used to manage development of a new system are described. First the tools used to describe systems and store documents are discussed. Next, knowledge management systems used as a part of the development process are described, including a system which was put in place to track bugs or issues within the system are discussed. Finally, the system to track file content is described.

#### 4.3.1 Tools used in planning

A SharePoint website was created to help with project management. Minimal setup was required to create a document depository, discussion groups and task list. This project management website was to be a central portal for development of the solution. As this portal can be accessed simultaneously by several different users, it proved useful as a hosting space for prototypes, concepts, and evolving documentation for the system.
Microsoft Visio was used for database layout design, site design and workflow planning. This tool was used as it creates UML diagrams, providing simple visualisation of relatively complicated systems. In addition, Visio provided a database creation tool which proved useful for converting the visualised database layout into SQL statements which could be used to create the database.

4.3.2 Document Management

In section 2.5.11 we discussed the requirement for a document management system. As SharePoint provides a shared document system, this was used to store design documents relating to the project as it was developed. A view on this document tracking system can be seen in Figure 13.
4.3.3 Issue Tracking

As mentioned in section 2.5.1, it is important to be able to track issues within a project. A means to track issues is required for the development of our solution. In section 3.2.2.2 we discussed Bugzilla, an open source issue tracking system. Bugzilla was considered as an option for issue tracking, however it was found to be overly complex for this project as it captures far more data than is required. It was decided that for the purpose of issue tracking within this project the data required was limited to the following information:

- Title
- Description
- Reported by
- Assigned to
- Status
- Notes

A list representing this reduced set of data was created in the SharePoint project tracking website. The status field was defined as having several options. These options were: Open, Ready for Testing, Validated, Closed. The “Assigned to” field is restricted to a list of allowed users of the system. Several views were created on this data, one of which can be seen in Figure 14. The created views include filters on the following:
• Only display outstanding issues

• Display all issues assigned to the current user

• Display work completed

In addition, through the filter screen, any user of the system could create other views on this list, for example to show a list of all tasks completed within a certain time span.

In section 2.5.8 we discussed the requirement for managing changes within a project.

The Microsoft Visual Source Safe tool was used for content management as it integrated with the Microsoft Visual Studio development environment which was used for the development of this system. Development and changes were firstly made on a development machine. When the development of a section of code was complete, the source code files and the resulting compiled binaries were “checked in”, or copied into, the SourceSafe database. From the SourceSafe system these files were then deployed, or

**Figure 14 - Issue tracking**
copied across, to a test machine. Once the changes had been tested, and had reached a satisfactory standard, the binary files were deployed to a production machine. The source files were not required on the production machine, and it is safer not to include them from a security point of view, as if there is a compromise on the production machine it increases the difficulty of reverse engineering the system. If errors were discovered, the history of the files could be reviewed to establish what point they were introduced at, helping to provide a means to correct them.

As the tool was being developed, sections might be unavailable while they are being worked on. By providing a test machine, it was ensured that all sections were consistently available. This method of development also ensured that as developmental changes were being made, a stable version of the tool was always available for review or to facilitate content changes.

4.4 System Design

In this section the system design work undertaken is described. The system architecture is described. Visual design is decided on, page layout is described, and proposed navigation of the site is described. Finally a database schema is decided upon and documented.

As this is to be designed as a system for innovation, the name InnovationChannel was chosen. The internet domain innovationchannel.net was registered by CIMRU and the production machine used to host the system was made available at this address, making it publicly accessible.

4.4.1 Mapping of methodology to tool

We have already discussed the use of the innovation funnel as a tool for managing innovation. This funnel is implemented in a section of the system that was originally to be called My Planner. A typing error was made referring to it as “My iPlanner” and it
was decided to keep this term as a way to uniquely identify this section of the
innovationchannel.net tool.

Figure 15 - Innovation Funnel

Within the My iPlanner section, a means is to be provided for goal tracking, action
tracking, and alignment of goals to actions.

4.4.2 Three Tier Architecture

A three-tier client/server architecture includes a user interface system as a top tier, a
process management component as a middle tier, and a database management
component as a bottom tier.[34] For this solution, the entire system is hosted on a server
running Windows 2000 Server. For the top tier, an end user accesses
innovationchannel.net using a standards compliant web browser, from any platform. The
browser generates a request which is received by the server. This request is handled by
Microsoft Internet Information Server (IIS), which returns display code to the browser
providing the user interface.

The middle tier containing the process management is written in C# and compiled using
the Microsoft .NET framework. This middle tier communicates with a Microsoft SQL
database server, which provides the bottom tier of data management. A simplified
conceptualisation of this three tier architecture can be seen in Figure 16.
4.4.3 Site Map

It was decided to develop a rich variety of content for the website, as a result of this an apparently complicated site was envisioned, containing many static web pages and including a lot of textual information, and providing additional interactive functionality around the My iPlanner area. From an end-user point of view, the site should be easily navigated but content rich. A visual representation of the site as an end user would perceive it is shown in Figure 17.

As it can be seen from this diagram, there are many content pages, indeed more than can be clearly displayed in this diagram. There is significant redundancy and duplication within these pages. From an end-user point of view, the site is content rich, but still easily navigated through a hierarchal system. Everything should be easily found through use of a navigation area, which provides links to the main page of each sub-category.
Figure 17 - Site Map
4.4.4 Look and Feel

A graphical designer was consulted and five different logos and two layout prototypes were created. The requirements given to the designer for the layout were as follows:

- InnovationChannel logo
- Username/password login form
- Navigation area with text links
- Configurable content area
- Space for graphical ad-style links

The prototypes were hosted on the SharePoint project management site. An announcement was placed on the front page of this site containing links to the hosted prototypes for review. From these prototypes feedback was gathered within CIMRU.

![Sample logos](image)

**Figure 18 - Sample logos as returned by designer**
Through discussions amongst researchers within CIMRU, one of the logos was chosen along with elements from both prototypes. For example, the graphics and content areas from the second concept were preferable, while the login and navigation areas from the first concept seemed more efficient. This feedback was returned to the designer who then revised the prototype and created a template for the tool. This final template can be seen in Figure 20.
4.4.5 Database Layout

A normalised database layout was devised to remove any possibility of data duplication within the database while providing maximum flexibility for capturing data.

Database design is traditionally done by firstly creating an entity relationship diagram (ERD). For this project, Microsoft Visio was used to create the ERD diagram. Using Visio had the added advantage that once the diagram was complete structured query language (SQL) scripts to create the database can be automatically created.

The areas of the database required were broken down into areas broadly corresponding with areas of the site. The resulting database diagram is shown in Figure 21.

4.4.5.1 User section

Each user is linked to a company. The decision to separate users and companies was made so that it would be possible to have several users within a company, with separate usernames, referencing the same goals and actions within the iPlanner section.
4.4.5.2 iPlanner section

Tables are created to track Goals and Actions. As there are to be many users of the system, goals and actions are linked to the company table mentioned above so that each user can be limited to their own goals and actions.

A table GoalAction is created, to provide for alignment of goals and actions. This table will contain a reference to an item in the goal table, a reference to an item in the action table, and a status, so that the alignment can be a weak link, a strong link, or no link between the two items.

4.4.5.3 Survey section

To provide for the many questions within the survey, a question table was created. As there are several different types of possible answers to any one question, for example textual answers, multiple choice, or numeric, a QuestionType table was created containing these definitions. Each question contains a reference to a value in this QuestionType table.

In the future, other surveys may be created. As a provision for this, a Survey table was created, containing a title field, and each question is linked to this, so that additional surveys can be created, and only the questions relating to that survey will be created. A table to track responses to the survey is also created. This table is linked to each question. In order to track respondents to the survey, a Respondent table is also created. This table contains a unique ID for each user of the system. If the user has registered a logon id, the respondent table contains a link to their userid, however this is not a requirement, as the respondent ID will also be tracked anonymously for non-registered users through the use of browser cookies.
4.4.5.4 Discussion section

A system for registered users to add to a discussion forum is to be created. The discussion form has a subject table, which references itself, so that hierarchal discussions can be had. Each subject can have several messages, which are linked to the user that created the message.

4.4.5.5 Content section

The content area is broken down into areas. Similarly to discussion subjects, the areas are hierarchal so that sub-headings can be created. Each area contains static content, links, and files, so tables are created for each of these areas containing a reference to the relevant area.
4.4.6 Page Layout

This section is different from section 4.4.3 in that the earlier section describes how a user perceives the site, while here we are defining the actual dynamic pages created. It was decided that to maintain the same look and feel across all pages on the site, a database driven content management system would be designed for the content pages.
Because of this, there are far fewer pages actually used than it would appear from the apparent site map. In fact, all the pages can be broken down into six sections:

1) Content
2) Registration
3) Survey
4) My iPlanner
5) Discussions
6) Administration

A visual representation of the site layout can be seen in Figure 22. The main page provides a link to the other areas. Each area has a link to it in the side navigation bar. Selecting an area of content to view shows all files, links and content associated with that area. Selecting the My iPlanner area allows the user to manage a list of actions, manage a list of goals, and align actions with goals within the system. Selecting the discussions area brings the user to a section where discussions may be browsed or added to. In addition an administration section is provided, which is password protected, where the system administrator can manage users, modify any of the content within areas, and view survey results.
4.5 Conclusions

In this chapter the processes used in creating a new system were described, focusing on requirements gathering, planning, document management, and issue tracking. The requirements for an innovation management system have been defined, core functionality has been identified and documented. The design of the new system been described, including database layout and proposed site navigation. In the next chapter the process of using the innovationchannel.net system is described.
Chapter 5  Implementation

5.1 Introduction

In the previous chapter the process of creating a new system was discussed and defined. In this chapter, we describe the use of this system as it is implemented. Firstly, the areas of the system that a user will encounter are described. Individuals within small-medium enterprises who are looking to improve their innovation management methods will access these areas regularly. Later in this chapter, the administration areas of the system are described. An administrator of the innovationchannel.net system will use these areas to update content, view survey results, and review user activity within the system.

5.2 Initial View

As previously mentioned, a user connects to the innovationchannel.net tool by using a standards based web browser. In order to start using InnovationChannel, the user opens the address http://www.innovationchannel.net with their web browser. When a user first connects to innovationchannel.net, they are presented with the main screen which can be seen in Figure 23.
This screen is broken down into sections as follows:

- A navigation bar is presented, allowing quick access to other sections of the tool.
- A login form is also shown, so that returning users can quickly access their personalised content.
- A content section is provided, containing descriptive text.
- Links are provided, to the survey, the tools section, and content from the clusters section.

Included in the login form is a link to the registration screen, to allow new users to register and personalise the information that they will see. Most of the screen is taken up with the content welcoming the user and describing the functions defined in...
innovationchannel.net. Links to the survey, the tools section, and content from the clusters section are shown on the right hand side, providing quick access to popular areas within the tool.

### 5.2.1 Navigation Bar

The navigation bar, as shown in Figure 24, is displayed on the left hand side of every view throughout the tool. This bar is provided so as to provide easy access ability to every available area. The currently active section is always highlighted in the navigation bar using different colour text and a chevron-styled arrow. The links within the navigation bar are consistent throughout the site and are as follows: At the top of the navigation bar, there is a link to the initial view. Next is a link to the survey. If the user is registered and has already completed the survey, they can update the answers that they have provided by selecting this link. This is followed by a link to the iPlanner tool. If the user has not logged in, selecting this link brings them to a page providing information on this tool. The rest of the navigation links are dynamically generated based on what content has been entered into the database. There is a link for every area that has visible content within the system. In the sample shown, these dynamically generated links are to the Case Studies, Links, Tools, News and About sections.

![Figure 24 - Navigation Bar](image)

---

Page 58
5.2.2 Login Form

A login form is provided at the top of every page. If a user has not registered it appears as shown in Figure 25.

![Figure 25 - Login form](image)

Once the user has entered their email address and password, and clicked on the “Login” button, the content on this page changes. The login form is replaced with a status bar displaying the currently logged in user and an option to log out of the system, as seen in Figure 26. After the user has logged in, the content of the main view changes, and links to the iPlanner section, the discussions section, and any other sections that only had content visible to registered users become active.

![Figure 26 - Status bar showing logged in user](image)

If the user enters an incorrect combination of email address and password they are brought to the registration page and an error is displayed at the top of this page.

5.3 Registration

If the user fails to log on for some reason, or if they select the “register now” button, they are brought to the registration page. This page can be seen in Figure 27. It contains the navigation and logon bar, both of which are displayed throughout the tool and have been described above. In addition, it contains the registration form. The registration form prompts the user for their email address, password, name, telephone number, and company name.
Figure 27 - Registration

All of these fields are optional except for the email address and password fields. A new visitor to the site populates these fields with their information, and then clicks on the “Register Now” button. The entries on this form are checked to ensure that they contain proper values. If the email address that has been entered on this form already has an entry associated with it in the logon table, or if any of the information contains invalid information, the user is returned to the registration page and an error is displayed informing them of this fact. If all of the information entered is valid, new entries are added to the “logon” and “company” tables of the database, reflecting the values entered on this form, and the user is brought back to the initial view as described in section 5.2. However, the content of this view changes to inform the user of the additional functionality which they now have access to. Currently, logged on users have access to additional content, the iPlanner section, the discussions forum, and a list of other registered users of the system which can be uses for social networking purposes.
Chapter 5 - The innovationchannel.net tool

5.4 My iPlanner

As mentioned in section 4.4.1, iPlanner is the name given to the iTeams functionality as it is implemented in this tool. This section provides core functionality for innovation management by supplying a means of managing lists of goals, lists of actions, and aligning them against each other. Each user of the system has their own set of goals and actions within the system, providing them with their own individual iPlanner. This is referred through as “My iPlanner” throughout the site.

My iPlanner is accessed by selecting the “My iPlanner” link from the navigation bar. If the user has not yet registered for the system, they are brought to a content page containing information about the features and advantages of iPlanner and directing them to the registration page. If the user has registered but has not yet added any goals to their iPlanner, they are brought to the goal entry screen. This screen is described in section 5.4.1. Similarly, if they have entered goals but have not yet added any actions to their iPlanner, they are brought to the action entry screen described in section 5.4.2. If they have both goals and actions, they are brought to the main iPlanner view described in section 5.4.3.

5.4.1 Goal data entry screen

In section 2.5.2, the importance of goal visibility within an innovation management system was discussed. Goals are managed within iPlanner through the goal entry screen. The goal data entry screen is displayed in Figure 28. The same screen is used both to add new goals and to edit existing goals. On this screen the user is prompted to enter a title for this goal, current and target values, current status, and a description. If the user is modifying an existing goal, these fields are already populated with the current values as they exists within the database.
In previous iTeams systems, such as those discussed in section 3.3, the current and target values may have been restricted to particular data types, depending on the application or organisation which they were designed for. However in this implementation it was decided to use free form text fields. This gives the advantage that because the values are not limited in scope, textual entries such as “pending” are allowed and organisations can use the terms that already exist in their internal systems.

The “Status” field allows three options, “Green”, “Amber” and “Red”. These can be updated to reflect the current health of the goal. A value must be provided for status, however if the user does not select one the selection defaults to “Green”.

When the user selects “Save”, the information as it has been entered in these fields is written to the database. If there are any actions defined for the users company, then the user is brought to the main iPlanner screen described in section 5.4.3. If actions have not been defined, then the user is brought to the action data entry screen as described in section 5.4.2.
If the user selects the “Delete” button, they are prompted with a dialog box asking them to confirm that they want to delete this record. The dialog box contains an “OK” and a “Cancel” button. Selecting OK results in the currently visible goal being deleted from the database, while selecting “Cancel” returns the user to the goal edit screen.

### 5.4.2 Actions data entry screen

In section 2.5.3, the importance of action visibility within an innovation management system was discussed. iPlanner provides a means to manage actions through the “action” data entry screen.

The “Action” data entry screen is displayed in Figure 29. The same screen is used both to add new actions and to edit existing actions. On this screen the user is prompted to enter a title for this action, its due date, priority, current status, and a description. If the user is modifying an existing action, these fields are already populated with the current values as they exist in the database.

---

**ACTION**

An Action is the "expenditure of effort". Actions are like projects or tasks that when completed help you to achieve your Goals. Please input the Title of your action in as few words as possible (e.g. New Web Site). The Due Date field should contain the expected completion date of your action (e.g. end of March). The Priority field is used to rank the importance of the action. Finally, you can classify the Status of the action where for example Green means that the action requires no attention, Amber may mean it requires attention or Red may mean the action requires urgent attention.

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action Title</td>
<td></td>
</tr>
<tr>
<td>Due Date</td>
<td></td>
</tr>
<tr>
<td>Priority</td>
<td>None</td>
</tr>
<tr>
<td>Status</td>
<td>Green</td>
</tr>
<tr>
<td>Description</td>
<td></td>
</tr>
</tbody>
</table>

![Figure 29 - Actions Add/Edit](image)
The content of the “Due Date” field is not limited in format. This allows due dates such as “third quarter” to be entered as well as actual date values. The “Priority” field allows the values “High”, “Medium”, “Low”, and “None”, with the value “None” selected as default. The “Status” field allows three options, “Green”, “Amber” and “Red”, defaulting to “Green”.

When the user selects “Save”, the information as it has been entered in these fields is written to the database. If there are any goals defined for the users company, then the user is brought to the main iPlanner screen, however if goals have not been defined, then the user is brought to the goal data entry screen.

If the user selects the “Delete” button, they are prompted with a dialog bog asking them to confirm that they want to delete this record. The dialog box contains an “OK” and a “Cancel” button. Selecting OK results in the deletion of the action which is being edited from the database, while selecting “Cancel” returns the user to the action edit screen.

5.4.3 Main iPlanner tool

Once the user has added at least one goal and at least one action to the database, they can view the main screen of the iPlanner tool. This tool can be seen in Figure 30. The standard navigation bar and logon bar are visible, allowing quick access to other sections of the site. An explanatory paragraph is supplied describing the tool and how to use it.

The goals that have been defined are listed horizontally across the screen, while the actions are listed vertically down the screen. There are links allowing the user to create a new goal or a new action provided. Selecting these links brings the user to the add goal screen described in section 5.4.1 or add action screen as described in section 5.4.2 as
appropriate. Selecting any of the titles of the goals or actions brings the user to the edit screen for the relevant item. The priorities of each action are also displayed, and the status of each goal and action is displayed graphically. Finally, where each goal and action intersect, a box is shown defining whether the relevant goal and action are not linked, are linked weakly, or are linked strongly. Clicking on this box cycles through these three options, allowing the user to easily define the links between goals and actions.

Figure 30 - My iPlanner Tool

5.5 Survey

Clicking on the “Survey” link from the navigation bar brings the user to the survey form. From this form, a user may enter their answers to the survey or, if they have already registered and responded to the survey, update or add to their existing responses. The survey form can be seen in Figure 31. The questions displayed on this screen are based
on the entries of the “question” and “questiontype” tables of the database. The user can answer questions of the following types:

- Textual
- Yes/No
- Score 1-5
- Score 1-5 and relevance 1-5
- Multiple choices.

**Figure 31 – Survey**

In addition, provision has been added to the system so that if desired, users can include registration details of company name, password, and email. When the user has completed the survey, a unique entry is created for them in the respondent table and their responses are recorded in the database in the “responses” tables of the database. If the user is logged in, the entry in the respondent table is linked to their logon id. If the user was not logged in, and has completed the email address and password fields of the survey, an entry is created for them in the “logon” table containing these values, and the
user is logged on. If the user has previously completed any of the questions on this survey, their answers will already be populated in this survey form. The questions asked in this survey are shown in Appendix A

5.6 Discussions

In addition to the iPlanner and survey sections of the innovationchannel.net tool, registered users also get access to the “Discussions” section of this tool. This section allows a community to evolve around the innovationchannel.net tool. Selecting the “Discussions” link from the navigation bar brings the user to the top-level discussions screen, as seen in Figure 32. An overview of topics is displayed, along with the creator of each topic, and time of the last entry in this topic. Links are provided which allow a user to add a new topic or add a new post under the current topic. This functionality is described in sections 5.6.1 and 5.6.2.

<table>
<thead>
<tr>
<th>Discussion</th>
<th>Owner</th>
<th>Created</th>
<th>Last post</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Discussion</td>
<td>Owen O'Leary</td>
<td>22 April 2004</td>
<td>No Messages</td>
</tr>
<tr>
<td>Project Planning</td>
<td>Owen O'Leary</td>
<td>22 April 2004</td>
<td>No Messages</td>
</tr>
</tbody>
</table>

Figure 32 - Discussion Area

5.6.1 Add Topic

The ability to add a discussion topic is available to any registered user of the system.

When the user selects the “New Topic” option, the form seen in Figure 33 is shown. By entering the name of the new topic and selecting the “Save” button from this form, an entry is created in the “discussion_subject” table. This new entry has the currently
displayed discussion topic as a parent, providing a hierarchal discussion group format.

The logged in user is registered as the owner of the discussion topic.

![Figure 33 - Add Topic](image)

### 5.6.2 Add Post

By selecting the “New Post” option, the screen shown in Figure 34 is shown, allowing the user to add a new contribution to the discussion under the current topic. After the user saves their entry, it is added to the “discussion_message” table in the database and is made visible to all registered users of the system.

![Figure 34 - Add post to discussion](image)

### 5.7 The rest of the navigation bar

The remainder of the links in the navigation bar bring the user to various sections of non-interactive content. While the content may not be interactive, it is dynamically generated so as to maintain a consistent look and feel across the site, and to make it straightforward to maintain the content. Each area as defined in the “Areas” table of the database that has entries related to it in either the “content” table, the “links” table, or the “files” table is displayed in the navigation bar. Selecting any one of these areas displays a summary of these related entries. An example of a view of the “Case Studies” area,
Chapter 5 - The innovationchannel.net tool

containing two entries in the “Content” table, can be seen in Figure 35. As each area has a description field, this description field is displayed above all of the content for this area. An example of a view of the “Links” area, containing one entry in the content table and ten entries in the “links” table, is displayed in Figure 36. Selecting the “Further Information” link beside any of the content brings the user to a page containing all the detail from the relevant record within the “content” table. Selecting any link to another site opens this page in another window.

---

<table>
<thead>
<tr>
<th>Home</th>
<th>Reviewing best practice and monitoring current practice in industry is critical for any organisation. InnovationChannel.net provides you with a number of case studies from practice in industry on various stages of the innovation process.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survey</td>
<td></td>
</tr>
<tr>
<td>My Planner</td>
<td></td>
</tr>
<tr>
<td>Learning</td>
<td></td>
</tr>
<tr>
<td>&gt; Case Studies</td>
<td>This is a case study regarding the creativity process of a large multinational in an R&amp;D department</td>
</tr>
<tr>
<td>Links</td>
<td></td>
</tr>
<tr>
<td>Tools</td>
<td></td>
</tr>
<tr>
<td>News</td>
<td></td>
</tr>
<tr>
<td>About</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 35 - Case Studies content page**
We have now reviewed all of the sections of the innovationchannel.net tool that a normal user of the system will come across and so will proceed to the administration section.

5.8 Administration

While it would be possible to maintain the entire website by entering data directly into the database, in reality this allows too much scope for error and limits administration of the tool to individuals with an understanding of the underlying database layout. In order to make administration straightforward, an administration section has been created for the site managers. Within this section areas, static content, links, and uploaded documents can be edited. Current users of the system can be viewed, edited, and deleted, and their individual iPlanner goals and actions can be viewed. A summary of the survey results can also be viewed. An administrator can access this area by opening the address http://www.innovationchannel.net/admin in their internet browser. The administrator will be prompted for a username and password. After
entering their username and password, they are brought to the main administration screen as shown in Figure 37.

Figure 37 - Administration Main page

Along the top of this screen, there are links to add new content, new links, new areas, upload a file, view users, and view survey results. Below this list of options, is a list of all the content entries within the database, a list of links within the database, and a list of areas. Selecting any of the displayed entries allows the administrator to edit the relevant value.

5.8.1 Areas

By selecting the “Add New Area” link from the main administration screen, or by selecting the name of an existing area, the administrator is brought to the “area” content editing screen. From this screen the administrator can change the name of the area, and manage the description which is visible in the area page itself, as described in section 5.7. Only the appropriate text as filled in on the “Anonymous User visible Description”
and “Logged in user Visible Description” form is displayed to users of the system, depending on their context.

![Table of Area Information]

**Figure 38 - Add/Edit/Delete Area**

### 5.8.2 Static Content

By selecting the “Add New Content” link, or by selecting the title of a section of content, the administrator is brought to the content edit screen shown in Figure 39. On this screen, the administrator can select the area under which this content will be displayed, a title for the content, a short description summary, and the content itself. The short description summary is shown under the title of the content on the list of items. Checkboxes are provided to control whether the content is visible to anonymous users, logged in users, or both. Finally, a numeric “sort order” field is provided, giving the administrator control over the order in which content appears on the areas page. A “delete” button is provided so that the administrator can remove content. In future
revisions to the innovationchannel.net tool, the “sort order” may be managed through a more intuitive system.

Figure 39 - Add/Edit/Delete Static Content

5.8.3 Links

By selecting “Add New Link”, or by selecting a “link” entry from the main administration screen, the administrator is brought to the link edit screen shown in Figure 40. The appearance of these links as an end user would see them is described in section 5.7. On this screen, the user can select what area the link will appear under, a short title, the URL the link will point to, and a long description for the link. Selecting the “Save” button updates the database with the values entered. Selecting the “Delete” button removes the entry from the database.
5.8.4 File Management

By selecting the “Upload File” option on the main administration screen the administrator is brought to the file upload screen shown in Figure 41. On this screen, it is possible to select which area this file will be listed under, the name of the file as it is displayed to users, and upload files to the system. By selecting the “Choose File” button, the administrator is prompted to select a file from their operating system. When they then select the “Save” button, the file is copied to a “documents” folder on the innovationchannel.net server and an entry is created in the database referencing this file.

Figure 40 - Add/Edit Link entry

Figure 41 - File Upload
5.8.5 User List

Clicking on the “View Users” link brings an administrator to a page listing all the current users of the system, as visible in Figure 42. The list is displayed in the order in which users joined the system, with the first users to register shown at the top of the list.

![User List](image)

By selecting any user within the user list, an administrator is brought to the screen shown in Figure 43 showing the details of that user, including the goals and actions which have been set up by that user in their iPlanner tool. In addition to the details entered by the user, the date on which they were added to the database is also displayed.

The administrator has an option to delete the user if necessary by clicking the delete button. It is necessary to be able to delete users so that test data from development or abusers of the system can be removed.
Deleting a user results in all the data related to this user being removed from the database, including all of their entries or topics in any of the discussion forums and their goals and actions within iPlanner. Users should not be deleted without taking this into consideration, so as to ensure that important discussions or other content is not lost.

5.8.6 Survey Results

By clicking on the “View Survey” link, the administrator is brought to a screen containing a summary of responses to the survey. All the questions are listed and, where possible within the space limitations of this screen, a summary of responses to the survey questions is provided. This screen can be seen in Figure 44.
Results of survey - Innovation Survey  [Return to Admin screen](http://www.thesisproject.net)

Registered: **37**  |  Unregistered: **7**  |  Total: **44**

<table>
<thead>
<tr>
<th>Question</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Is your organisation achieving its full potential?</strong></td>
<td></td>
</tr>
<tr>
<td><strong>General</strong></td>
<td></td>
</tr>
<tr>
<td>Vat-No</td>
<td><img src="#" alt="view results..." /></td>
</tr>
<tr>
<td>Product/Service Description</td>
<td><img src="#" alt="view results..." /></td>
</tr>
<tr>
<td>NACE-Code</td>
<td><img src="#" alt="view results..." /></td>
</tr>
<tr>
<td>Turnover (2003)</td>
<td><img src="#" alt="view results..." /></td>
</tr>
<tr>
<td>No. of Employees</td>
<td><img src="#" alt="view results..." /></td>
</tr>
<tr>
<td>Region</td>
<td></td>
</tr>
<tr>
<td><strong>Market Strategy</strong></td>
<td></td>
</tr>
<tr>
<td>Price</td>
<td><img src="#" alt="1; 8; 2; 5; 3; 14; 4; 0; 5; 0;" /></td>
</tr>
<tr>
<td>Quality</td>
<td><img src="#" alt="1; 7; 2; 1; 3; 2; 4; 7; 5; 27;" /></td>
</tr>
<tr>
<td>Flexibility</td>
<td><img src="#" alt="1; 7; 2; 4; 3; 11; 4; 15; 5; 7;" /></td>
</tr>
</tbody>
</table>

**Figure 44 - Survey Results**

By clicking on the summary of responses, where it is present, or on the “View Results” link, the administrator is brought to a page displaying the responses to this question. For multiple-choice questions, the responses are displayed graphically as well as in a summary of responses, as can be seen in Figure 45. For other types of questions, all of the responses are listed.
Chapter 5 - The innovationchannel.net tool

5.9 Conclusions

In this section we have reviewed the process by which the innovationchannel.net tool is used. We have reviewed every section which was implemented, whether the sections are oriented towards users within SMEs or administrators of the system. By using the tools described in this chapter, an interface to the design described in section 4.4 has been provided.

All aspects of the system have been described and as such hopefully it would be possible to recreate the innovationchannel.net tool using the content of both this and the previous chapter as a reference, if it were so desired.
Chapter 6  Conclusions

6.1 Overview

We have reviewed the requirements for innovation management within small-medium enterprises. The processes required for efficient creation of a new system were described, and a new system has been designed allowing efficient innovation management within small-medium enterprises. In this chapter the work undertaken is reviewed, and suggestions for future work are made.

6.2 Review

In the first chapter we introduced the work to be undertaken and examined the motivation for this thesis, and then provided an outline of the work to be undertaken.

Chapter 2 examined the requirements for innovation and knowledge management in general. We reviewed several systems for managing innovation, and reviewed the specific requirements for effective innovation management.

Chapter 3 reviewed existing tools for innovation management and knowledge management, with a specific view to the suitability of existing implementations of the iTeams methodology for innovation management within small-medium enterprises.

The process of designing a new system was described in chapter 4, including requirements gathering, planning, document management, and issue tracking.
architecture and design of a new system was described, including database layout and site navigation.

Chapter 5 described the innovationchannel.net system as it has been created from both a user and an administrator point of view. All of the functional sections of the system have been described. The functionality provided by these sections provides a suitable interface to the system that was described in chapter 4.

6.3 Recommendations

Innovationchannel.net has evolved into a stable utility, allowing innovation management within small-medium enterprises. However, it is important to update the system in order to ensure that it will keep pace with updating technologies. As such innovation cannot be ignored even within the innovationchannel.net tool itself, or the information and tools contained within will become redundant and outdated. There are several directions that can be followed from here. New directions that may be followed are described in this section.

6.3.1 Low-bandwidth version

An ability to view an organisations goals and actions while visiting a customer might prove valuable. A transportable or downloadable format of the data could be provided, allowing a user to access their goals and actions, discussions, or the content sections of the tool offline from a non-connected PDA. A low-bandwidth format of the site could also be provided, allowing quick and easy access from a wap-enabled mobile phone or wireless enabled PDA.
6.3.2 RSS feed

One technology that has emerged since the original prototyping of this tool is the use of RSS feeds for content aggregation. RSS (Really Simple Syndication) is a format based on XML which was developed to enable distribution from an online publisher to users. The current version of the standard was created by Harvard Law School in 2003[35]. It has become popular as a means of publishing data in a machine-understandable format. Microsoft have announced that RSS technology will be integrated into the next version of Windows[36], and Apple have already released a version of their Safari internet browser which supports RSS[37].

As all of the content within the innovationchannel.net tool is database-driven, it would be straightforward to add RSS content representing of every section of the site. This would give the added benefit of making the data machine-understandable, allowing the information contained within to be incorporated into a news aggregator such as RssReader [38], and paving the way for integration of innovationchannel.net into the semantic web. [39]

6.3.3 Allow users to manage content

Currently only the administrator can add content and documents to the innovationchannel.net tool. However, it might provide value to allow end-users of the system to add their own content or documents, improving the community aspect in a similar way that systems such as Wiki currently allow[40]. This proposal should be examined carefully though, as there may be security or copyright implications involved with allowing users to post files or content without providing a means to review it first.
6.3.4 Clusters

Users of the system might find it desirable to allow other users or companies to view a subset of their iPlanner data. One possible way of implementing this would require one party to create the cluster, and then request a second user to join the cluster. The second party would then accept the request, and be allowed to join the cluster. Once both parties were included in the cluster, a subset of their goals and actions could be shared between them, and a “Cluster iPlanner” could be viewed, showing the shared goals and actions for both parties, and allowing them to view the status of these goals and actions. This would allow SMEs to improve their connections with suppliers, customers, or collaborators and hopefully become more competitive.
Appendix A – Survey Questions

General

Name of the company:

Contact and (Phone/eMail):

VAT-no:

NACE-code (see attached):

Turnover (2002):

No of employees:

Market Strategy

Indicate the emphasis of your company on each of the following points, where 5 is the most important and 1 the least important. Please circle:

Price: 1 2 3 4 5    Quality: 1 2 3 4 5    Flexibility: 1 2 3 4 5    Speed: 1 2 3 4 5

Products, Processes and Services

Does your company manufacture products or deliver services?

Please circle: Products    Services / Both

We have a specific innovation taskforce/workgroup (y/n)

We have a specific R & D department (typically product innovation only) (y/n)

We have an adequate number of qualified engineers and other professionals (typically product innovation only) (y/n)

No of people working for the R & D department (typically product innovation only):
Appendix A – Survey Questions

We innovate our products and/or services (y/n)

We innovate our processes (y/n)

Our products and/or services are innovative in comparison with our competitors

(1 not at all, 5 very innovative) Please circle: 1 2 3 4 5

**Funding**

There is adequate research and development funding from Government and semi state agencies (y/n)

We are eligible for this funding (y/n)

How important is this funding (not 1-5 very): Please circle: 1 2 3 4 5

We need this funding in order to fully execute our innovation program (y/n)

Factors that prevent us from using funding include:

**Collaboration**

The following questions require you to determine the extent to which you agree or disagree with the following statements. Please indicate (a) how your company actually scores with respect to each statement and (b) how relevant you consider each statement to be for your company, where 1 represents that you strongly disagree and 5 represents that you strongly agree.

<table>
<thead>
<tr>
<th>Score (a)</th>
<th>Relevance (b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>We work closely with our customers to understand their requirements</td>
<td>1 2 3 4 5 1 2 3 4 5</td>
</tr>
<tr>
<td>We work closely with other organisations in sharing information and technology</td>
<td>1 2 3 4 5 1 2 3 4 5</td>
</tr>
<tr>
<td>We have good linkages with centres of knowledge</td>
<td></td>
</tr>
</tbody>
</table>
1 2 3 4 5 1 2 3 4 5
We have sufficient information technologies for information exchange
1 2 3 4 5 1 2 3 4 5
We find it difficult to access information from others (e.g. customers, suppliers, …)
1 2 3 4 5 1 2 3 4 5
We find it difficult to share and transfer information with others
1 2 3 4 5 1 2 3 4 5
Our structures and processes make it difficult for us to collaborate with others
1 2 3 4 5 1 2 3 4 5
We have insufficient information technologies for information exchange
1 2 3 4 5 1 2 3 4 5
Management is too busy fire-fighting to network with others
1 2 3 4 5 1 2 3 4 5
Other factors that prevent us from collaborating with other organisations:

Structures for innovation
We have strategies to deploy state of the art technology and automation
1 2 3 4 5 1 2 3 4 5
We have explicit strategies to stimulate internal creativity and risk taking
1 2 3 4 5 1 2 3 4 5
We invest sufficiently in innovation of our products and processes
1 2 3 4 5 1 2 3 4 5

Structures for management
We develop effective strategic plans
We implement these plans in full

We have well defined indicators (measures) of performance

Our managers are equipped with a level of skills appropriate to the business

Our problems are identified and solved systematically

We use project management tools and techniques

Our projects are linked to indicators (measures) of performance

We have an adequate number of engineers and other professionals

Quality

We see quality as a competitive factor

We adopt a quality model (y/n)

If yes, please circle which model: ISO EFQM Other

Current Goals and Current Projects

Innovation is defined as “making changes to something established by introducing something new”. As such, it involves large and small changes to your organisations
products, processes and services. These changes are required to make a positive impact on your performance. Please list the titles of your current top seven performance goals.

**Current Performance Goals**

List the titles of your current and top key performance goals (no more than seven):

(e.g. Increase Sales Revenue by 0.5m, Improve Net Profitability by 2%, Reduce Lead-times by 25%, Develop 0.25m of sales in new markets, Reduce Quality Costs to zero, Halve overhead costs, etc.)

**Current Actions (or Projects)**

Improving performance goals is brought about by various actions such as new projects and initiatives. List the titles of your current and top improvement projects or initiatives (no more than seven):

(e.g. New PC for Order Entry, Web Site Development and Promotion, Inventory Management Software, Operator Training Program, Safety Drive, Marketing Initiative in East Europe, Source a Strategic Alliance in New Market, etc.)
Appendix B - Survey Results

Turnover (2003) Results varied between €90,000 and €7,000,000
No. of Employees Results varied between 2 and 115

Market Strategy

Price 1: 9; 2: 5; 3: 17; 4: 8; 5: 9;
Quality 1: 8; 2: 1; 3: 2; 4: 7; 5: 30;
Flexibility 1: 8; 2: 4; 3: 11; 4: 17; 5: 8;
Speed 1: 10; 2: 3; 3: 11; 4: 14; 5: 10;
Innovation 1: 10; 2: 2; 3: 11; 4: 5; 5: 20;

Products, Processes and Services

Does your company manufacture products or deliver services?
Products: 15  Services: 17  Both: 10

We actively engage in the innovation of our products, processes and/or services
Yes: 30  No: 6  Undecided: 5

We have a specific innovation taskforce/workgroup
Yes: 13  No: 29  Undecided: 6

We have a specific R & D department (typically product innovation only)
Yes: 8  No: 35  Undecided: 5
No of people working for the R & D department (typically product innovation only)

Results varied between 0 and 34

Our products and/or services are innovative in comparison with our competitors (1 not at all, 5 very innovative)

1: 9; 2: 3; 3: 10; 4: 15; 5: 11;

**Funding**

There is adequate research and development funding from Government and semi state agencies

Yes: 20  No: 21

We are eligible for this funding

Yes: 37 No: 3 Undecided: 8

How important is this funding (not 1-5 very)

1: 10; 2: 0; 3: 2; 4: 10; 5: 26;

We need this funding in order to fully execute our innovation program

Yes: 34 No: 7 Undecided: 7

**Collaboration**

We work closely with our customers to understand their requirements

Score: 1: 8; 2: 2; 3: 3; 4: 12; 5: 19;

Relevance: 1: 9; 2: 0; 3: 1; 4: 7; 5: 27;

We work closely with other organisations in sharing information and technology

Score: 1: 17; 2: 11; 3: 11; 4: 2; 5: 3;

Relevance: 1: 12; 2: 7; 3: 7; 4: 6; 5: 12;
We have good linkages with centres of knowledge
Score: 1: 22; 2: 8; 3: 6; 4: 3; 5: 5;
Relevance: 1: 17; 2: 1; 3: 8; 4: 8; 5: 10;

We have sufficient information technologies for information exchange
Score: 1: 13; 2: 6; 3: 10; 4: 10; 5: 5;
Relevance: 1: 11; 2: 2; 3: 3; 4: 8; 5: 20;

We find it difficult to access information from others (e.g. customers, suppliers, …)
Score: 1: 19; 2: 8; 3: 8; 4: 7; 5: 2;
Relevance: 1: 16; 2: 1; 3: 7; 4: 8; 5: 12;

We find it difficult to share and transfer information with others
Score: 1: 18; 2: 8; 3: 11; 4: 3; 5: 4;
Relevance: 1: 15; 2: 3; 3: 7; 4: 8; 5: 11;

Our structures and processes make it difficult for us to collaborate with others
Score: 1: 22; 2: 7; 3: 10; 4: 4; 5: 1;
Relevance: 1: 19; 2: 5; 3: 9; 4: 2; 5: 9;

Management is too busy fire-fighting to network with others
Score: 1: 17; 2: 6; 3: 9; 4: 8; 5: 4;
Relevance: 1: 15; 2: 3; 3: 4; 4: 9; 5: 13;
Structures for innovation

We have strategies to deploy state of the art technology and automation
Relevance: 1: 11; 2: 3; 3: 6; 4: 7; 5: 17;

We have explicit strategies to stimulate internal creativity and risk taking
Score: 1: 19; 2: 9; 3: 7; 4: 7; 5: 2;
Relevance: 1: 14; 2: 0; 3: 7; 4: 13; 5: 10;

We invest sufficiently in innovation of our products and processes
Score: 1: 12; 2: 11; 3: 10; 4: 5; 5: 6;
Relevance: 1: 10; 2: 1; 3: 8; 4: 9; 5: 16;

Structures for management

We develop effective strategic plans
Score: 1: 10; 2: 5; 3: 14; 4: 11; 5: 4;
Relevance: 1: 9; 2: 1; 3: 7; 4: 6; 5: 21;

We implement these plans in full
Score: 1: 12; 2: 6; 3: 14; 4: 10; 5: 2;
Relevance: 1: 10; 2: 0; 3: 6; 4: 11; 5: 17;

We have well defined Goals of performance
Score: 1: 11; 2: 5; 3: 9; 4: 13; 5: 6;
Relevance: 1: 10; 2: 1; 3: 4; 4: 11; 5: 18;
Our managers are equipped with a level of skills appropriate to the business
Score: 1: 9; 2: 3; 3: 10; 4: 16; 5: 6;
Relevance: 1: 9; 2: 0; 3: 2; 4: 11; 5: 22;

Our problems are identified and solved systematically
Score: 1: 10; 2: 1; 3: 13; 4: 12; 5: 8;
Relevance: 1: 9; 2: 0; 3: 3; 4: 12; 5: 20;

We use project management tools and techniques
Score: 1: 21; 2: 8; 3: 9; 4: 3; 5: 3;
Relevance: 1: 14; 2: 1; 3: 9; 4: 8; 5: 12;

Our projects are linked to indicators (measures) of performance
Score: 1: 16; 2: 2; 3: 6; 4: 10; 5: 10;
Relevance: 1: 11; 2: 0; 3: 4; 4: 14; 5: 15;

We have an adequate number of engineers and other professionals
Score: 1: 21; 2: 5; 3: 10; 4: 5; 5: 3;
Relevance: 1: 13; 2: 0; 3: 11; 4: 9; 5: 11;

Quality

We see quality as a competitive factor
Score: 1: 10; 2: 1; 3: 1; 4: 7; 5: 25;
Relevance: 1: 10; 2: 0; 3: 0; 4: 5; 5: 29;

We adopt a quality model
Yes: 9 No: 23 Undecided: 12

If yes, please select which model:
EFQM: 1 ISO: 3 Other: 7 N/a: 4
# Appendix C – List of companies surveyed

The following companies have completed the survey and registered as users of the innovationchannel.net tool:

<table>
<thead>
<tr>
<th>Name of company</th>
<th>Line of business (if available)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gcom Teoranta</td>
<td></td>
</tr>
<tr>
<td>Oilean Mara Teo</td>
<td>Manufacture of food products and beverages</td>
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<tr>
<td>iTeams</td>
<td></td>
</tr>
<tr>
<td>MusiCan</td>
<td>Computer and related activities</td>
</tr>
<tr>
<td>Carmarthenshire County Council</td>
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</tr>
<tr>
<td>Insilco Technologies</td>
<td>Manufacture of electrical machinery and apparatus n.e.c.</td>
</tr>
<tr>
<td>Carmarthenshire County Council</td>
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<tr>
<td>Dermalogics</td>
<td></td>
</tr>
<tr>
<td>Ostán Thoraigh</td>
<td>Hotels and restaurants</td>
</tr>
<tr>
<td>Iasc Mara</td>
<td>Fishing, operation of fish hatcheries and fish farms</td>
</tr>
<tr>
<td>Ostán Oileán Acla</td>
<td>Hotels and restaurants</td>
</tr>
<tr>
<td>Sidheán Teo.</td>
<td>Manufacture of other transport equipment</td>
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<tr>
<td>Teach na hEigse</td>
<td>Education</td>
</tr>
<tr>
<td>Sliogéisc Phort Duirlinge</td>
<td>Manufacture of food products and beverages</td>
</tr>
<tr>
<td>Galway &amp; Arran Fishermens Co-Op</td>
<td>Fishing, operation of fish hatcheries and fish farms</td>
</tr>
<tr>
<td>Seaview Hotel</td>
<td>Hotels and restaurants</td>
</tr>
<tr>
<td>Halfway Inn Ltd</td>
<td>Hotels and restaurants</td>
</tr>
<tr>
<td>Davies Craddock</td>
<td></td>
</tr>
<tr>
<td>Altron Communications Equipment Ltd</td>
<td>Manufacture of fabricated metal products</td>
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<tr>
<td>CBSI Consulting</td>
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<tr>
<td>WESTBIC</td>
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<tr>
<td>voka-kvkaw</td>
<td>Other business activities</td>
</tr>
<tr>
<td>DERI Galway</td>
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<tr>
<td>Milseoga Ui Mhurchú</td>
<td>Manufacture of food products and beverages</td>
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<tr>
<td>Kik Sports Ltd.</td>
<td>Manufacture of wearing apparel</td>
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<tr>
<td>Eadai Fastnet Teoranta</td>
<td>Manufacture of textiles</td>
</tr>
<tr>
<td>Name of company</td>
<td>Line of business (if available)</td>
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<tr>
<td>Bá Dhún na nGall Teo.</td>
<td>Manufacture of textiles</td>
</tr>
<tr>
<td>Scannáin Dobharchú</td>
<td>Other service activities</td>
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<tr>
<td>ESKAN</td>
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<tr>
<td>RNA PLANT</td>
<td>Construction</td>
</tr>
<tr>
<td>Monowa Manufacturing (Uk) Ltd</td>
<td>Manufacture of fabricated metal products</td>
</tr>
<tr>
<td>Carmarthen Golf Club</td>
<td>Recreational, cultural and sporting activities</td>
</tr>
<tr>
<td>Cloonkeen Candles</td>
<td></td>
</tr>
<tr>
<td>CCCTT Teoranta</td>
<td>Activities of membership organisations n.e.c.</td>
</tr>
<tr>
<td>Connemara Heritage Centre</td>
<td></td>
</tr>
<tr>
<td>Mc Faddens Garage &amp; Tool Hire</td>
<td>Sale, maintenance and repair of motor vehicles</td>
</tr>
<tr>
<td>Eachtrai Uisce Teoranta</td>
<td>Recreational, cultural and sporting activities</td>
</tr>
<tr>
<td>McGeever Services Ltd.</td>
<td>Other service activities</td>
</tr>
<tr>
<td>Digital Filing Ltd.</td>
<td>Publishing, printing and reproduction of recorded media</td>
</tr>
<tr>
<td>Diseart</td>
<td>Education</td>
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<td>ICCT Teo.</td>
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<td>Aras Ghaoth Dobhair</td>
<td>Health and social work</td>
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<td>Oasegroendecorateurs</td>
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<td>CTTC</td>
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<td>Dales</td>
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<td>Les Genereux</td>
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<tr>
<td>Sport &amp; Recreatie Den Bol</td>
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<td>Nienhuis BV</td>
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<td>Mondoor b.v.</td>
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<tr>
<td>Agro IT B.V.</td>
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<tr>
<td>Jos Borst Bedrijfsgroen</td>
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<tr>
<td><a href="mailto:koeverden@planet.nl">koeverden@planet.nl</a></td>
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<tr>
<td>Enterprise Ireland</td>
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</tr>
<tr>
<td>Nienhuis BV</td>
<td></td>
</tr>
<tr>
<td>Barrow Signs &amp; Graphics</td>
<td>Publishing, printing and reproduction of recorded media</td>
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<tr>
<td>Antur Teifi</td>
<td></td>
</tr>
<tr>
<td>The Peter Bradley Foundation</td>
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