A Web Based Intelligent Training System for SMEs

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Abstract: It is widely accepted that employees in small business suffer from a lack of knowledge and skills. This lack of skills means that small companies will miss out on new business opportunities. This is even more evident with respect to the adoption of Internet marketing in Small and Medium Enterprises (SMEs). This paper reports a pilot research project TRIMAR, which aims to develop a web-based intelligent training system to aid small business employees in their learning and decision-making regarding the use of the Internet as a new marketing medium. TRIMAR attempts to contribute to the wider debate on the content and style of training most suitable to small businesses. It aims to identify the training needs of small businesses for Internet marketing at a pan-European level and to seek the most effective ways to address training and support needs with web-based systems. Based on training needs analysis carried out within five European countries: UK, Germany, Poland, Slovak Republic and Portugal, a web based system for gaining Internet marketing knowledge and skills was constructed. The system consists of three major subsystems: Self Assessment Tool (SAT), Training Modules (TM), and a Case Retrieval System (CRS). Various users through an online questionnaire tested the system. The initial feedback revealed that the case base training approach delivered on the Internet provided a highly appropriate training medium for SMEs.

Keywords: intelligent web-based training, Internet marketing, SMEs, training needs analysis, case based reasoning

1. Introduction

The Internet is described as the SME's gateway to global business and markets (Liikanen, 2001), and e-business technologies are expected to allow SMEs to gain capabilities that were once the preserve of their larger competitors. SMEs are regarded as significantly important on a local, national or even global basis and they play an important part in the national economy. The lack of anticipated engagement in e-business by Small and Medium sized Enterprises (SMEs) is a rising concern to the UK government and service providers alike. Development of information and communications technologies has resulted in the emergence of new directions in marketing policies and activities. The Internet has become an attractive information tool for marketing (Chaffey *et al.,* 2002; Coupey, 2001; Dann, 2001; Reedy, *et al*., 2001). Decision makers from Small and Medium Enterprises (SMEs)[1] based in European countries face difficulties while implementing and utilising the Internet for marketing. The difficulties in question result from – in the majority of cases – a lack of the knowledge and skills that are necessary to introduce and carry out marketing in an enterprise. Therefore it is necessary to provide managers with up to date knowledge on Internet marketing and to develop skills that are indispensable. This situation is reflected in a survey conducted within the EU funded TRIMAR project. To meet the SMEs demands an intelligent Internet training and consulting system that supports an introduction of Internet marketing in SMEs has been created within TRIMAR. This paper describes how the TRIMAR project attempted to improve the skills shortage and knowledge deficiency in SMEs by developing an intelligent web-based training system with a case study based approach.

2. Objectives and rationale for developing the TRIMAR system

The TRIMAR project seeks to contribute to the wider debate on the content and style of training most suited for those running and working in SMEs. It also aimed to identify the Internet

[1] The European Commission coined the term Small and Medium Enterprise in 1995 (Storey, 1995). The SME sector is divided into:
- Micro-enterprises – those with 0 – 9 employees,
- Small enterprises – those with 10 – 99 employees,
- Medium enterprises – those with 100 – 499 employees.

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marketing training needs of small businesses in the five EU countries: UK, Germany, Poland, Slovak Republic and Portugal. The research attempted to achieve the following objectives:

- Assess the current status of SMEs' training needs in Internet marketing in five EU countries;
- Determine specific areas in Internet marketing in which SMEs require training; and analyse similarities and/or differences in SME training needs in the five countries;
- Collect, analyse and report detailed cases from SMEs in participating countries and present as individual SME internet marketing case studies;
- Store the cases in a database and develop a case based approach for searching and matching cases in a web based training system;
- Develop a web based training and support system for Internet marketing by SMEs.

Once an organisation puts itself on the Internet (by creating a website), it becomes instantly 'visible' and accessible to millions of people. It would be unwise to expose the SME through the Internet unless careful measures and strategies are adopted because the increased visibility makes accessing the SME much more immediate and the shop window and back-up support and response structures must be in place before the web site goes 'live'. An unsatisfactory Internet presence may actually prove to be detrimental to the development of a business. If used effectively, for SMEs, the Internet can provide a "gateway" to international markets and overcome many barriers to internationalisation commonly experienced by small businesses. Therefore, the organisation should focus on its needs, strategy and direction before venturing on to the Internet for marketing and publicity purposes.

3. The internet marketing training needs of SMEs

The Internet provides exciting new opportunities for SMEs to extend their business to the global market place. However, introducing Internet marketing into SMEs and combining both off-line and on-line marketing campaigns is not an easy process (Chaffey et al., 2002). This process requires that decision-makers and marketing specialists acquire new skills. Surveys and focus groups conducted by the authors with SMEs revealed that:

- SMEs are not equipped with the necessary expertise to deal with culture-based market differences such as consumer and market characteristics.
- They do not have experience of world market characteristics and do not know how to adapt their companies to the converging global market place in terms of products, promotion and distribution.
- They have no knowledge of how other SMEs are operating on the Internet and which Internet marketing models are available and that they may already be unwittingly adopting.
- The managers would like to learn from successful experiences of other SMEs and adopt best practices identified from Internet marketing case studies within their sector.

The project aimed to investigate the training and decision support needs for adopting Internet marketing in SMEs. For the purpose of this research, a FAME database or similar register of companies in the participating countries (UK, Germany, Poland, Slovak Republic and Portugal) was used. The register was filtered for SMEs in the service sector. The TRIMAR team conducted a questionnaire survey in the five EU countries. Telephone and face-to-face interviews were also conducted where questionnaires did not elicit much response from the various companies. The surveys involved 190 enterprises. They revealed that most small businesses were generally not aware of the power of the Internet as a marketing tool. More than half of the respondents evaluated their level of Internet marketing knowledge and skills as low and insufficient. Most respondents believed that lack of knowledge and in-house expertise were the major barriers to effective implementation of Internet marketing strategies and operations, and that training of managers and employees could considerably contribute to their marketing success. Managers expressed their interest in the provision of a web-based training system to aid their learning and knowledge acquisition.

There was a clear and identified need to provide training to SMEs to increase their skills and knowledge base in the area of Internet marketing. In a recent study, Sambrook (2003) focuses on lifelong, electronic and work-related learning and suggests that SMEs and Higher education must strengthen links to increase the skills and knowledge base and suggests that "there is a need for more effective use of ICTs to help overcome the problems of remoteness and to stimulate e-commerce and e-learning, given that around 90 per cent of small firms use computers".

Introducing Internet marketing requires that decision-makers and marketing specialists acquire new skills. While admitting their lack of skills and knowledge in embracing the Internet as a new media for marketing activities, most of the

respondents believed that training of managers and employees in Internet marketing could considerably contribute to their marketing success and they could achieve further benefits. The suggested subjects and the demand for training courses as indicated by SMEs are presented in Table 1.

Table 1: Training needs and training levels for Small and Medium Enterprises in Internet marketing

Training needs	UK	Germany	Poland	Portugal	Slovak Republic
Establishing company on the net	Not required	Intermediate	Beginner Intermediate	Not required	Intermediate
Awareness of opportunities	Beginner	Beginner Intermediate	Beginner Intermediate	Advanced	Intermediate
Website marketing functions	Beginner Intermediate	Beginner	Beginner Intermediate	Intermediate Advanced	Intermediate
Website Performance monitoring	Beginner Intermediate	Beginner Intermediate Advanced	Beginner Intermediate	Intermediate	Intermediate
Testing, evaluation, maintenance	Beginner	Intermediate	Beginner	Advanced	Intermediate
Website Marketing tools/techniques	Beginner	Intermediate	Beginner Intermediate	Intermediate	Intermediate
Building customer relation on net	Beginner Intermediate	Beginner Intermediate	Beginner Intermediate	Beginner Intermediate	Intermediate
Internet marketing models	Beginner	Beginner Advanced	Beginner	Intermediate	Intermediate
Internet marketing mix	Beginner	Beginner	Intermediate	Intermediate Advanced	Intermediate
Internet Marketing strategy	Beginner	Beginner	Beginner Intermediate	Intermediate	Intermediate
Database and direct marketing	Beginner	Not required	Intermediate	Not required	Intermediate

The statistical results are summarised using the labels beginner, intermediate and advanced to focus attention on the patterns that emerged for levels of training and training needs. The majority of training is required at the beginner and intermediate level with few respondents requesting advanced level training in the majority of the training areas listed. The respondents from the Slovak Republic showed a clear need for training at the intermediate level in all the training areas listed, and this illustrated a level of consistency between the requirement to balance technical and business Internet marketing training needs. Overall, UK and Portugal have followed similar trends whereas Germany and Poland have shown similar traits. This is surprising, as one would assume the more parallel economies of UK and Germany on the one hand, and Poland and Portugal on the other, to display similar patterns. The survey evidence of requiring different training levels on Internet marketing training provision among partner countries raised challenges on how to cater the training needs of different user groups. This issue was duly considered in the design of the TRIMAR system.

4. E-learning on internet marketing for SMEs

E-learning has various forms, definitions and many classifications (Servage, 2005), including asynchronous, synchronous, instructor led, web based instruction, distance, mentor supported and many other descriptions. Each of these types may use a unique combination of delivery, technological and design issues, leadership, structural and cultural issues, and pedagogic frameworks (Gunasekaran et al., 2002, Trentin, 2002, Russel, et al., 2003, Morrison, 2003, Zhang and Nunamaker, 2003, McPherson and Numes, 2006). However, at the present time there is little reported in the e-learning and management learning literature on the appropriate methodology applied to the combinations of design, content management, interaction styles and implementation of a web based training system for SMEs. Further, there are a number of choices an SME has to make in choosing which e-learning system is most appropriate for their learning needs and Roffe (2004) describes “two important dimensions for small firms” which are “authenticity” and “personalisation”. “Authenticity for clients can extend beyond accuracy,

comprehensiveness, and normal institutional quality assurance methods. The learner needs to have confidence in the program and to perceive relevance in the content. A program on how a company can market over the Internet, for example, may be accurate in describing the necessary steps. It might be comprehensive in coverage by touching on all the current issues and have relevance insofar as it matches content to the knowledge of the group to which it is targeted. The program may offer formal educational credit. Nevertheless, authenticity can still be lacking if the learner does not believe that the situations, steps, solutions, and cases are realistic and true-to-life. Building a level of credibility in the program involves adopting approaches that anchor the learning program in an authentic context; this means content with cases to which a client can relate. The goals need to be personal and meaningful. The subject content needs to engage the learner with tutor support that is stimulating and timely. The approach needs to lead learners logically to work on their own real-life implementation. As the business environment is dynamic, each of these components must be reviewed and revised to maintain authenticity".

Our system exhibits authenticity by exploring the possibility of using case based approaches to enhance training and learning, the survey asked "in what way would you prefer to learn about Internet marketing"? 40% of respondents selected "presentation of case studies". This evidence indicates the willingness of SMEs manager to learn from the previous lessons and experiences of other businesses, and suggested that the system to be adopted should incorporate a case study based approach. The content would have increased value because it would relate directly to the actual experiences of other SMEs and the quality of the cases would be high because the content would be analysed, explored and a conclusion about the success of the SMEs Internet marketing strategies would be formulated before it was reported in the case database.

Further, the survey findings suggested that the system should include the "personalisation" dimension by providing a self assessment tool to aid the SMEs learning by customising their learning pathways. Roffe (2004) suggests that "personalisation can be achieved through diagnosing the needs of an individual or analysing the learner's objectives, existing skill sets, interests, career objectives, job profiles, attainment, and style. Individual tracking with repetition of certain topic areas and assessment can aid personalisation, as an invitation to join specific groups for aspects of collaborative learning. All of this can establish an individual profile for a particular learner to address specific learning needs".

The above preferences undoubtedly result from numerous advantages of e-learning, which are of special importance to SME employees (Lehtonen et al., 2002; Oliver, 2002). E-learning solutions overcome the limitations of traditional teaching processes and reduce costs of knowledge acquisition in enterprises. E-learning systems guarantee learners' controlled access to indispensable knowledge in the most suitable time, either from work or from home. This form of training does not require managers to leave their workplace and thus they are not excluded from everyday duties and decision-making processes. Moreover, e-learning ensures individualisation of teaching processes due to adjustment of the scope, intensity, pace, and level of the programme to the needs of the SME and the decision maker. Furthermore, e-learning allows for repeated usage of the knowledge delivered and individualised access to source material and supplementary support. Additionally, decision-makers may undertake further training to improve their knowledge for given decision making situations. However, in developing an e-learning system in Internet marketing for SMEs a number of challenges arose such as, communicating around certain issues such as pinpointing the (academically) relevant characteristics of particular SMEs, and the time it takes to build a training programme whilst ensuring the materials and content are current and maintain perceived relevance (Bersin and Associates, 2005).

The most important part of the development phase was having regular meetings with the participating SMEs to help inform the design process (Moon et al., 2005), and Johnston and Loader (2003) suggest that "factors such as constant consultation on design and delivery, half-day workshops organised for SMEs in the area of training design, and business focus will encourage SME participation in training and speed the knowledge elicitation process". It was also important to have structured discussions with SMEs using focus groups and interviews because as is described by Taran (2006), "SMEs have a tendency to over-communicate" so it was important to have a moderator present to keep discussions about the proposed training themes and system design focused and objectives on track.

5. Architecture of the TRIMAR system

In responding to SMEs training and decision support needs, one of the major outcomes of the TRIMAR project was the provision of a web-based

intelligent training and support system using a case based approach. The general architecture of the system is shown in Figure 1 and consists of three major modules:

- Training Modules (TM).
- Case Retrieval System (CRS).
- Self Assessment Tool (SAT).

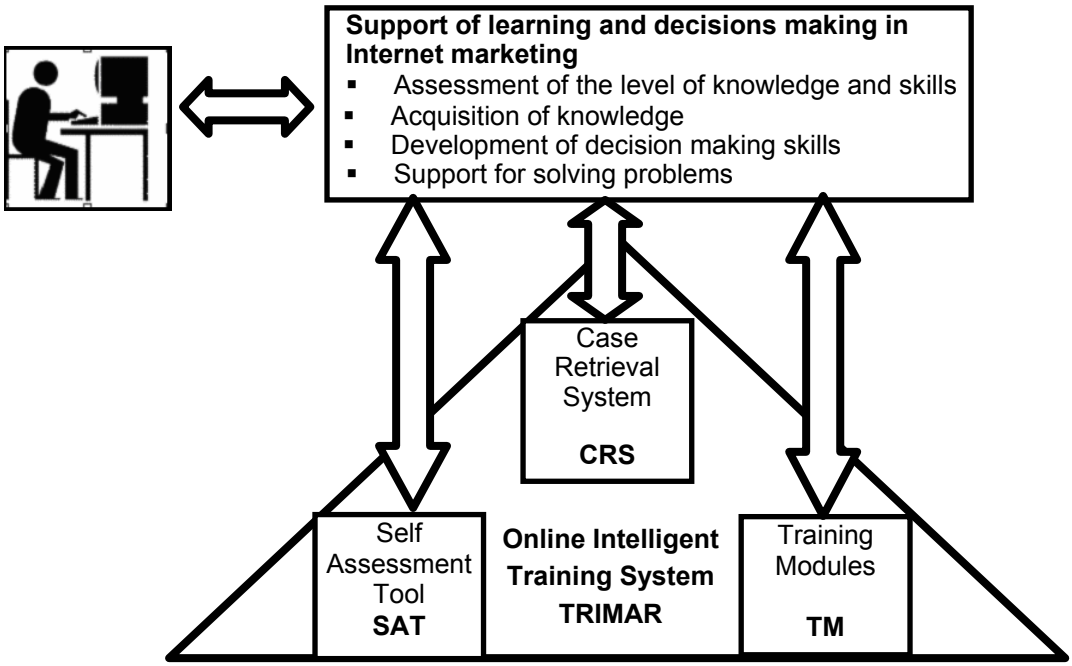

Figure 1. Architecture of the TRIMAR system

5.1 Self assessment tool (SAT)

Aspects of Internet marketing are frequently overlooked. The rationale behind developing the SAT was for it to serve as a mechanism for bringing these factors into consideration in a balanced and structured way. By the development of such a tool we could ensure that all respondent companies were giving sufficient credence to the assessment of particular aspects of Internet marketing. A review of the literature and of the Internet did not yield any equivalent Internet tool or framework. One of the basic elements of learning is structured direction of learning and self-assessment of knowledge and skills, and with this in mind the SAT module was designed to assess the knowledge of users in the field of Internet marketing (Gołuchowski and Ziemba, 2003). The SAT module provides access to on-line tests, facilitates passing subsequent stages of the training and enables tracking, managing and reporting users self-assessment process and results. Web-based training has the potential to provide users with personalised training materials, but first of all, preliminary determination of their levels of knowledge on any selected topic was obtained. This enables the system to direct users to an appropriate lesson at an appropriate level. That is what SAT is responsible for within the TRIMAR system.

The functionality of the desired system was drawn from assessment of Internet learning systems such as Blackboard that are known to be widely and successfully used (Gunasekaran, 2002). Other functional adaptations were made to the system to make it suitable for use by the target organisations. For example:

- A user should be given detailed information on completion of each test taken (date and time, test duration, number of questions, number of correct answers, exact indication of correct and wrong answers);
- A user should be pointed to or provided with additional information that would inform a selected question – this information and explanation come from the appropriate training module by providing hyperlinks to lessons that explain a selected question;
- To create an effective user interface (hiding the complexity of the underlying system);
- To provide questions in various formats including text, graphics and diagrams;
- To group questions according to their links to appropriate didactic modules;
- To create a large database of questions so that the tests produce randomly generated questions. This would allow the user to take

the test more than once and use it as a formative assessment; and

- To store and monitor a detailed record of completed tests.

In order to provide a reliable assessment of knowledge, a process of random selection of questions were applied in the SAT. Such a solution minimises the risk of multiple generations of the same tests. Complex multiple choice questions constituted the basic form of the tests. However the database structure does not preclude formulation of "true or false" tasks, and additional questions may be added into the question database. Preparing a test should commence with determining a set of questions and answers. Particular questions may include text, graphics and a link to a website that will explain given questions. Subsequently a teacher/trainer matches the questions with all the possible answers – correct and wrong ones. Answers may also be selected from the list if they have already been input into a system. The prepared questions are then grouped into modules that relate to sets of similar tasks. It is assumed that each module is a set of questions on a common thematic scope. Creation of the actual test involves determining which modules will provide randomly selected questions and the number of questions to be selected.

The functions in the Microsoft Access software that are concerned with preparing and managing the tests were implemented using a client/server architecture. Such a solution significantly shortened the time that was necessary to construct a prototype of a system. In the future this element of the system will be recreated using alternative Internet technologies, such as XML technologies, and the LAMP architecture (Linux, Apache, MySQL, PHP) (Putterill, 2004). To initiate the SAT system and take a test, the procedure starts with logging onto the TRIMAR SAT system. Then a user may choose to complete a new test or examine and use one of the already completed tests.

5.2 Training modules (TM)

The basic function of the TM module is to provide SMEs with theoretical and practical knowledge that refers to the introduction and utilisation of Internet marketing in business. Two levels of training are developed: basic and advanced levels. At the basic level, training materials are accessed from a list of Internet marketing topics that correspond to the needs identified by SMEs in the TRIMAR surveys. The advanced level comprises case studies that allow for implementation of the case-based learning method and constitute practical examples of performing Internet marketing activities by enterprises. The aim of the case studies is to enhance training effectiveness, develop decision-making skills and to solve problems by reviewing appropriate cases. Case studies were developed in cooperation with SMEs that have already acquired experience in implementing and maintaining Internet marketing activities. Such co-operation includes those undertakings that were successful as well as those that failed. Each case study describes problems of SMEs in reference to three levels of management: strategic, tactical and operational. The problems are formulated into five groups:

- Establishing the nature of a venture;
- Detailed company analysis;
- Strategic development planning;
- Business plan implementation;
- Monitoring and controlling of performance.

In each group, specific problems to be solved by the SME were identified. Each case study is summarised in a form of a Case Study Report and a Case Study Analysis. In the Case Study Report a company presents the character of its activity (Introduction), Challenge, Campaign, Problem, and Solution. The Case Study Analysis provides a summary referring to Strategy, Challenge, Problem, Expectations of the Market, and Solutions at specific levels of management that indicate the breakdown of the activities along with a final conclusion. Each case study is summarised in a form of a "Case Study Report" and a "Case Study Analysis".

5.3 Case retrieval system (CRS)

CRS serves as a learning tool as well as a decision support subsystem. It contains 70 cases and incorporates case searching and matching activities underpinned by case based reasoning methods. A CRS was adopted as this allowed ready analysis, comparison and contrasting of participant companies and at the same time provided the material for an engaging online tool. By and large companies were familiar with the use of individual cases in their dealings with government agencies and the like. Though for all involved, it was a novel experience to assess cases comparatively using an online tool. The main task of the CRS subsystem is to develop decision-making skills and provide support for solving problems. It implements a case based reasoning approach that includes:

- Reasoning through recollection (Leake, 1996);
- Solving new problems by adapting solutions that were implemented in case of old problems (Riesbeck and Schank 1989); and
- Approach to solving and 'learning' problems (Aamodt and Plaza, 1994).

Choosing the indexing vocabulary (features used for describing cases) is essential for efficient case retrieval. Good indexes should be predictive enough to describe the factors responsible for solving the case and its outcome, be able to address the purposes the case will be used for and be abstract enough to allow for widening the future application of the case (Watson, 1997). The majority of problem domains cases can be successfully indexed by hand, using the following guidelines suggested by Kolodner (1993):

- Determine what the case could be useful for by designating its points with respect to the set of tasks the reasoner is being asked to carry out.
- Determine under what circumstances its points would be useful for each of these tasks.
- Translate the circumstances into the vocabulary of the reasoner.
- Re-interpret the circumstances to make them as recognisable and generally applicable as possible.

The selection of the indexes in TRIMAR involved the collection of a small number of Internet marketing cases from SMEs within the EU. This was achieved by providing these companies with a pro-forma (Barletta and Mark, 1988) with which to record past cases of a particular problem, the resolved solution to that problem and other aspects relating to the company's strategic, tactical and operational procedures. Initially, 10 cases were selected in order to search for and define appropriate case index fields. The analysis forwarded 7 initial fields, which seem to provide the most appropriate description of the problems and their associated solutions. On the basis of the first findings, the pro-forma was modified in accordance with the selected index fields and distributed to a larger number of SMEs. There were 60 new cases returned for analysis, and from these, another 2 index fields, "Management Structure" and "Corporate Identity" were added to the initial 7 because many SMEs cited interesting challenges and crisis with these two areas in relation to exploiting new technologies for marketing. This made 9 index fields in total. The index fields were also validated with discussions among project partners before formally being accepted for the CRS system development. The selected indexing fields are shown in Table 2.

The small business case is summarised into the 9 fields listed under Indexing Fields label. The field named Content explains the options presented to the small business and explains examples of the type of information expected in that field, and for some fields the small business can include additional information.

Table 2. Case indexing fields

Indexing Fields	Content
Company Category	The business function of the company. These were identified as different category groups. A company's business function would fall into one of these groups.
Problem Category	The problems the various companies seem to be experiencing. These were identified as different category groups. A company's problem would fall into one of these groups.
Business Strategy	The level of business strategy, as in the use of business models and planning, that a company was using for general business activities
Company Size	The size of the company as the number of employees employed
Website Strategy	The level of website strategy, as in website planning, that a company was using for the development and presentation of their website
IT Knowledge	The level of IT knowledge a company has at its disposal
Market Reach	The market in which the company was active
Management Structure	The type of management structure that exists within a company
Corporate Identity	The level of company visibility within its trading sector.

The linkage between the three modules, TM, SAT and CRS; is a core aspect of the e-learning training system. Their linkage encourages interactivity and participation between the learner (SME) and the system. The linkage between the modules in the system also engages the SMEs because the content in the form of the training materials and the case studies are context sensitive and related to SMEs current situations, and it provides feedback and support necessary to ensure repeated visits. Finally, all training systems have a duration, and it important that those deemed to be useful should be updated and maintained in light of new research and developments in the field of e-learning.

6. Conclusion

The paper discusses the importance of engaging SMEs in effective Internet marketing activities and analyse their training and decision support needs in the context of a TRIMAR project. It then presents a case based approach for enhancing the training and decision making for SMEs in adopting Internet marketing technologies. The web-based intelligent training system provides

training for decision makers in making decisions related to introducing and performing Internet marketing activities. The self assessment tool aims to test the users' prior knowledge on Internet marketing and directs them to the appropriate level of training. The training module provides two levels of training: basic and advanced. The advanced level of training is supported with a case base, which contains about seventy case studies on small business Internet marketing implementation. The case retrieval subsystem adopts a case based reasoning approach to help managers to learn and to find solutions from similar cases in previous contexts. The intelligence of the system is based on case-based learning methods and case-based reasoning techniques.

The TRIMAR system attempted to combine traditional ways of delivering text-based learning materials with a case base to enhance web based training and knowledge acquisition. The TRIMAR system was tested and evaluated by various users via an online evaluation questionnaire. The online feedback form was unstructured allowing the respondents complete freedom to express their views of the system. The feedback was positive and encouraging. For example, some users said:

> *"The system offers the possibility for an integrated theoretical and practical learning for companies."*
>
> *"The examples shown in the case studies allow the user to find solutions for potential business problems without having to experience them. Problems concerning cultural and social differentiation are evident through the case studies and solutions for the problems that are supplied."*

However, its small case base limits the system's power, especially its capability to enhance training with case base. Some users noted this, e.g.

> *"The idea of the system is very good – especially the case base. But at the moment the volume of the case base is too small to find matching problems. I hope that many SMEs will put in their cases so the case base will grow."*

It is hoped that with the "add new cases" function provided in TRIMAR the case base can be extended to provide better training and services to SMEs. The online feedback survey was optional, and return rates were low. However, without exception feedback received from companies was favourable with no problems with the system identified. The case studies obtained particularly positive responses although respondents felt the system needed to be populated with more cases studies.

The TRIMAR system has been in place for six years and recent feedback and research findings suggests that there is a need to update and enhance the system. However, there are a number of challenges and issues, which need to be addressed for the further enhancement. It is clear that to maintain authenticity the training system must be redesigned to keep up-to-date with the changing needs of SMEs. The case based approach needs to be revised and redesigned to maintain the authenticity, personalisation and interactivity currently delivered by the system. Other challenges include how to keep the training content up-to-date and inform users with the new development, how to measure the effectiveness of the skill improvement and knowledge transfer of TRIMAR users, how to incorporate more human intervention in TRIMAR system, such as expert tutoring sessions, online community, and discussion forum.

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