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TECH-IT-EASY

"IT Tool to support SMEs in systematic innovation, based on consolidated methodology and innovation knowledge domain structured trough specific ontologies"

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1. Final publishable summary report

1.1. Objectives

The TECH IT EASY project aimed at the development of an information system able to support European electromechanical SMEs in their technology innovation processes. The information system which have been implemented and tested, based on ontologies to represent the SMEs market, technology and innovation processes, has reached to objective of allowing users to structure and systematise the technology system (product /process) innovation process. The TIE software tool is an information system composed of:

- A methodological tool box to structure and define SMEs technology products, abstracting them from the specific industrial context, to allow the usage of external knowledge for technology innovation. Such methodological tool-box has been based on the combined application of QFD (Quality Function Deployment) market-pull approach with technology push potentials of TRIZ (Theory of Inventive Problem Solving).
- An information agent that analyses digital information within the enterprise, at information providers, and on the Web. Such information agent makes usage of defined ontologies (market, core technology and innovation process) as symbolic knowledge representation of the overall innovation knowledge domain.
- An Innovation-Process support tool, to guide users through the whole innovation process, connecting the technology system related to the product under study with the knowledge base constituted by market and technology information (gathered through the information agent), and by a set of pre-acquired knowledge (such as the so-called "trends of evolution" of technological systems) allowing SMEs to identify innovation opportunities out of their internal knowledge.

1.2. Technical approach

The TECH IT EASY approach has been based on the following main pillars:

- A detailed analysis of the innovation and market domain of SMEs, that have been formalised in three ontology as a way to represent knowledge. The TECH IT EASY system has been driven by such ontology, allowing flexibility in its usage and further updates;
- The combined usage of different process methodologies (TRIZ and QFD), supported by the IT system ontology-driven, to guide and structure SMEs innovation processes, allowing to face the current situation where SMEs innovation process is weakly structured process
- The TECH IT EASY IT system is a collaborative environment, allowing different users to interact while performing the complete innovation process.

To reach the planned objective, the TECH IT EASY consortium has developed a spiral approach, involving users since the very beginning of the project and allowing different iteration to be sure that the project results answered the SMEs needs. In such sense, a set of specific Case Studies have been set up with the involved SMEs. At the end of the project, SMEs have also received the

TECH-IT-EASY tool and are able to use it at their premises to further enhance their innovation processes.

1.3. Work performed so far

The activities related to the project have been carried out in line with the initial planning and have been successfully completed as described below:

1) In WP1, the coordinator and other partners managed the project, with six monthly internal reporting, six monthly internal meeting and a continuous check of project advancement with respect to planning and resource used. An internal file sharing platform was also set up.

2) The WP2, a market and functional analysis has been performed. The SMEs partners have been interviewed through an iterative process. Material and information has been gathered through a structured questionnaire, allowing gathering relevant functional and market analysis data on the SMEs partner. At the same time, 18 SMEs in the electromechanical sector have also been interviewed, to gather more general market and functional analyses relative to the innovation process in the sector, and to the functionality and possible exploitation of the TECH IT EASY tool. This work allowed to get a clear identification of SMEs needs and market possibility for TECH IT EASY.

3) The WP3 was completed, providing the knowledge domain of the market, technology and innovation processes of SMEs in the electromechanical sector. The market domain knowledge was gathered through the usage of the market analysis data. The Innovation knowledge domain was also developed, structuring the whole process of innovation, extracting the main concepts and the relation among concepts in the innovation process. Finally, the technology domain was also developed, using a different approach due to the vast domain, building a "light" layer of categorization applicable to all SMEs operating in the electromechanical sectors, and allowing SMEs to then customise the knowledge domain to their specific field of action.

4) In Wp4, several versions of the three ontologies were developed and tested until get the last version. Ontologies were built using Protégé tools (a free, open source ontology and knowledge base editor), and represented in the OWL language (standard knowledge representation language recommended by World Wide Web consortium). At the last version, the Market Ontology was refined by including the possibility of automatic monitoring of the market over the internet; the core Technology Ontology was refined in order to support the flexible process support implemented in TIE; the Innovation Ontology was further developed by focusing on interlinking key concepts between different TRIZ tools. Moreover, the document annotation tool has been implemented and made available to the TIE users both as a web service and as component to be integrated with the TIE platform. The new results obtained by the development of the final versions of the three ontologies have been integrated to support sharing data between individual Centres and TRIZ tools.

5) In WP5, a first prototype to test some of the tools for the innovation process was developed, including four tools, in particular the House of Quality (customer requirements, quality characteristics), the Function-Mechanism tree, the SuField analysis and the System Conflict at the first year of the project. The living prototype evolved to be the TIE demonstrator and was introduced to the partners. The Software tool prototype was submitted under the form of a deploy-ready Java application and also the innovation tools already developed in the first year and included in the prototype were ported to the Java Spring framework and included in the overall TIE tool. The functionality set of the TIE software tool was also revised in order not only

to better reflect the aims of the project, but also to better help the user in carrying out innovation projects using TIE. Regarding test reports, individual software components and the TIE system as a whole were evaluated, errors identified and solutions provided. All reported problems have been documented, investigated and solutions proposed and implemented. The final results of the WP5 activities have been: the TIE demonstrator, the TIE software tool prototype, the revised architecture and specifications (due to the spiral software development process), the Market and Technology centre and two video tutorials for minimizing the learning curve of the TIE software users.

6) In Wp6, the evaluation methodology was developed, based on the Information System Success Model of DeLone & McLean that is focussing on the impact of a software system on operational success. Although no formal deliverable has been foreseen, the methodology is being described in an internal report that is available for the partners.

   The system was tested. The test was done in two stages:
   - the first done in laboratory aimed to be an acceptance test on the implemented functionality in order to find possible bugs and take corrective actions
   - the second concern tests in real scenarios.

   The main positive results of the performed tests proved that TIE application facilitated a better understanding of what parts of some products were no longer valuable and what functions were no longer needed, as well as helping to identify the trends in the market. The evaluation and impact measuring was also carried out by each of the three manufacturing SMEs using their own innovation scenarios to and verify the usefulness of the TIE-Tool, while the software oriented SME (INNEN) was carrying out a software introspection to verify their exploitation expectation to sell the tool to other customers and to use the tool in other software products of their portfolio.

7) In WP7, all partners had an active role in the dissemination of TIE project's achievements and results. Communication and information material has been prepared (project logos, leaflet, templates, three videos showing the running of the TIE tool result of the project, papers presented at international conferences and workshops), the project web site was also created , maintained and periodically updated, six newsletters were also produced and sent by project partners to their network. The TIE project was presented at several international conferences and seminars as at the "*2nd Semantic Web Day*" in Leipzig in which more than 200 participants from enterprises, universities and research organizations and from public institutions were reached, at the event "EKAW 2010 - Knowledge Engineering and Knowledge Management by the Masses" (Lisbon, 11-15 October 2010) with the participation of 250 people among which research centres, universities and companies, at the event "TRIZ Future Conference 2010" (Bergamo, Italy 03-05 November 2010) with the participation of around 100 attendees and at some others.

   An exploitation plan was developed with the agreement of all the partners being the internal use the main usage for the SMEs in the electromechanical sector, the selling the main usage for the SME in the TI sector, the academic the main usage for the RTD performers, and the consulting to support other companies an alternative usage for all the partners.

1.4. Expected final results and their impact

The final results gained in TECH-IT-EASY are in line with what planned at the beginning of the project. In particular:

1) A complete information system, the TIE software tool has been further developed with a revised architecture and new innovative features, and it has been eventually implemented and tested in laboratory and in real scenarios. The system has proved to be able to support SMEs in the innovation process and to be used by SMEs to run a complete process (following each step of the innovation process), or just some of the tools/modules put at disposal (example: run a market analysis, or make searches for patents, etc.).

2) The information system has been tested directly at the SMEs premises through real case studies in order to assess the usability of the system. The TIE software tool has been installed in the SMEs local network to be further used in other processes.

3) The knowledge domain and the ontologies have been refined in order to support flexible processes in order to be re-used by SMEs (or by the RTDs for future research actions) as a starting point for new projects on innovation; the final versions developed and tested using practical examples.

The results obtained by the project had a positive impact, as originally foreseen, since:

1) first of all, the three SME belonging to the electromechanical sector decided to install the tool having tested that it could be useful to improve their own innovation processes, in particular in facilitating a better understanding of what parts of the product were no longer valuable and what functions were no longer needed and in helping identifying the trends on the market

2) The project results have been widely disseminated in the countries the SMEs belong to and the TIE tool has been presented to several SMEs which have been particularly impressed of the Search facilities of TIE, as well as of the specific tools for systematic problem solving using TRIZ.

1.5. Communication material

Communication activities and material have been realised to increase the impact of the project. In particular:

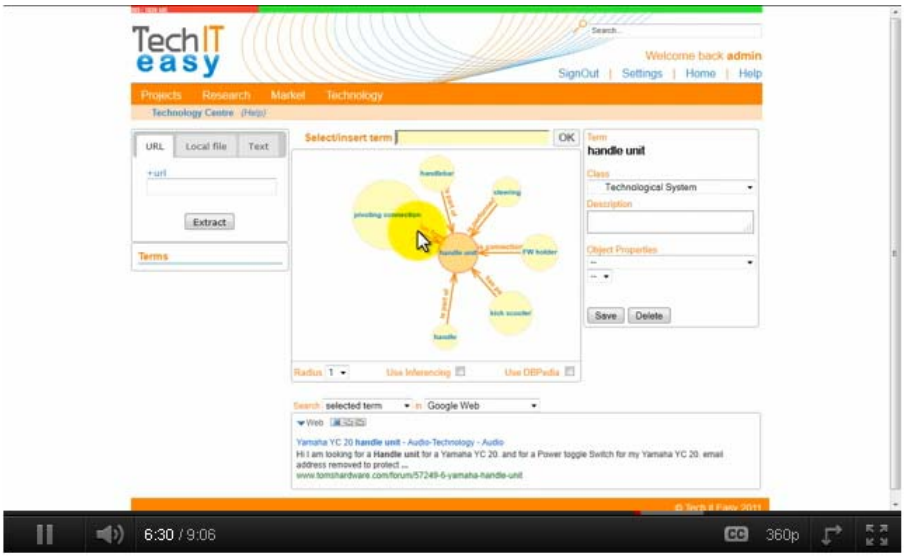
1) A **project logo** has been created at the beginning of the project. It was used at the design of all the communication material except at the interface of the TIE tool. In order to give a more professional aspect to the TIE tool a new logo has been created at the second year of the project. Next figure shows the first and the second logos.

2) A **project leaflet** has been produced, reported below. This leaflet was distributed at the dissemination events related to the project and was sent by email to the contacts of the partners.

3) Six **Newsletters** have been produced. See below the front page of all of them. The complete version are available for download on the project website at the Documents section: http://www.tech-it-easy-project.eu/index.php/documents and also at some partner's Web-site as http://tie.open.ac.uk/ontology/ (from KMI-OU), http://www.tacore.es/SP/imasd.html (from TAC) and http://www2.fh-kufstein.ac.at/ (from FH-KU).

4) Three demonstration videos have been produced. These videos were prepared both as user's guide and as dissemination material. These movies can be used at conferences and demonstrations to easily transmit the ideas and functions behind TIE, but it is also bundled with the tool itself to serve as an introduction, which is part of the tool documentation.

See below a screenshot of one of them.



To view videos in full you may access the following links:

- The Case Study demonstration video is available at http://www.youtube.com/playlist?list=PLE5A8C07E4D2BBA35&feature=mh_lolz
- The Market Centre video is available at http://www.youtube.com/watch?v=6nTZYbKlANQ.
- The Technology Centre video is at http://www.youtube.com/watch?v=f_lKTdcbXyA.

5) The project Web Site was published at www.tech-it-easy-project.eu, a screenshot is reported below:

1.6. Contact

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