FINAL PUBLISHABLE SUMMARY REPORT

The main objective of the project was to build a new method for strategic knowledge management based on innovation transfer in small and medium-sized enterprises (SMEs). The implementation of the project was also supported by the growing interest of entrepreneurs in the investment in knowledge and R&D as well as the development and improvement of transferring research findings between research laboratories and companies. The project was under done at the Vienna University of Technology, Institute for Software Technology and Interactive Systems, e-commerce group, headed by Prof. Hannes Werthner.

The whole project was carried out according to the methodology, defined in the project proposal:.

- In the period from 1st November - 2009 to 31st January -2010 (Stage 1) literature related to the subject in question was studied in detail.
- In the period from 1st February - 2010 to 31st January - 2011 (Stage 2) the author's method for assessing and forecasting the value of knowledge in SMEs was developed - "SKnowInnov method" - and the empirical studies were done in 10 SMEs at five workplaces in each of the companies.
- The project was suspended from 10.08.2010 to 09.12.2010 due to maternity leave.
- In the period from 1st February 2011 to 31st July 2011 (Stage 3) the author's system supporting decision making at the strategic level in terms of return on investment in knowledge was designed and developed - "SKnowInnov model".
- In the period from 1st August 2011 to 28st February 2012 (Stage 4) the author's IT tool for decision making at the strategic level as regards to the profitability of investment in employees' qualifications and skills was created - "SKnowInnov system".

The concept of intellectual capital as well as methods for the measurement and reporting of intellectual capital in enterprises were defined. Particular attention was paid to models of assessment and reporting of intellectual capital in SMEs. A state of the art review regarding research includes methods of intellectual capital assessment based on investment in staff's knowledge development. However, no methods for assessing the efficiency of decisions on acquiring knowledge could be identified.

Literature distinguishes qualitative measures (e.g. Danish project of IC measurement, 'Scandia' navigator, intangible assets monitor, IC model –TM Rating, VCSTM, balanced result sheet, report by Saratoga Institute) and quantitative methods of valuating intellectual capital (e.g. MV/ MB, q-Tobin, CIV, KCE, VAICTM, economic added value, IAV model, Strassmann's method, IAMVTM, technology broker) [Dudycz, 2005], [Edvinsson and Malone, 1997], [Fitz-enz, 2001], [Kasiewicz at al., 2006], [Mikuła et al., 2002], [Nonaka and Takeuchi, 1995]. Although attempts are continuously made to find methods for measuring intellectual capital, there is still no widely accepted recognized method enabling to build an intellectual capital reporting system. The difficulty is that the majority of the concepts are prepared for specific companies, in other words, such measuring methods are tailor made and their general application is not possible [Patalas-Maliszewska and Krebs, 2009].

Because of this niche in the area of concepts for assessing and forecasting value of knowledge in SMEs, this research focused on the creation of a method of assessment and prediction of the value of knowledge in an SME (see Fig 1.).
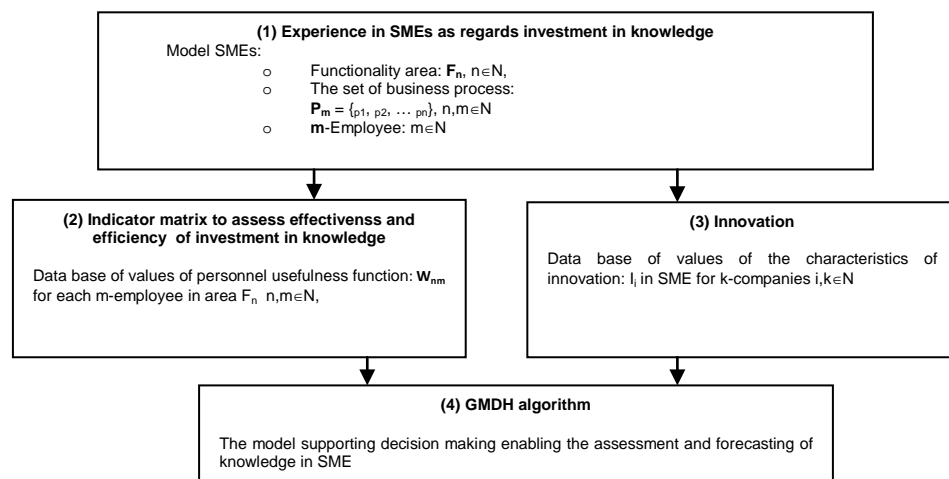

Fig. 1 "SKnowInnov method"

The method was created on the basis of methods for the assessment of capital value and on the characteristics of innovative companies. It combines available knowledge gained from literature, and experiences of SMEs which have the potential for innovation. It allows for making a forecast of the future value of the decision about the selection of an employee for increasing the innovation capacity in a SME-type company.

In order to solve the research problem, a polynomial decision-making model was designed for the selection of an employee for an innovative SME. The model compiles all the elements of the method and consists of:

- the values of strategic knowledge resources and the values of the qualifying criteria for an innovative company – both based on the empirical research in SMEs,
- A GMDH algorithm,
- An analyser of a logical model and an answer generator.

A decision-making model for the assessment of the value of strategic knowledge resources (the SKnowInnov Model) was built using the GMDH algorithm [Iwachnienko, 1982], [Farlow, 1984]. Then the author's own IT tool for supporting the decision making at a strategic level regarding the profitability of investment in employee qualifications and skills, based on the collected data, was created. Afterwards the method was evaluated and verified using an experiment and the results were compiled (the quality of the forecasted value for selected indicators to assess the rationality and effectiveness of any investment in knowledge using the model was checked).

Real world case study to exemplify the approach: At an SME named "A11" it was decided that the organization needs to find a new employee to fill the position of 'Sales Specialist'. It was assumed that the company as a result of the employment of such a new employee wants to maintain its level of innovation. The SknowInnov Model was used to assess the employment decisions:

$$m_2^* = -34,1402 + 10,12823X_4 - 4,3094X_{13} + 0,0861X_4^2 + 0,8112X_{13}^2 + 1,0611X_4X_{13},$$

where: X_4 - number of completed research topics in a given year (for the last 5 years): at A11 for the last 5 years were completed 4 research topics, X_{13} - the number of purchased and used licenses: at A11 are used 3 licenses.

The estimated value of the personnel usefulness function (Wm_2) for the new employee to fill the position 'Sales Specialist' was obtained as: Wm_2^* = 14,86.

Then the prospective employee completed the test, in order to obtain the value of the personnel usefulness function (Wm_2) according to the employee personnel evaluation sheet (described in detail in the monograph). The actual value of the personnel usefulness function for the prospective employee was: Wm_2 = 11

So, the managing director of A11 should not select this person since he received an unsatisfactory value regarding his personnel usefulness function compared to the projected value of this function at a given level of innovation characteristics.

This approach seems to be, apart from a common calculation of the profitability of investment, an excellent tool for an "economic" quantitative knowledge analysis. The developed IT tool for supporting decision making at a strategic level regarding the profitability of any investment in employee qualifications and skills (based on collected data) connects the selected determinants described in an innovative SME with the value of the personnel usefulness function. It thus enables the assessment of the rationality and effectiveness of knowledge. In consequence, this method allows for the quantitative evaluation of knowledge.

Fifteen articles were published during the whole project (the Personal Career Development Plan was established in 10 publications). In addition, the monograph "Strategic Knowledge Management in an innovative SME" has been finished and is currently being prepared for printing.

These results indicate that the research work achieved the objectives of the project, stated at the beginning.

The realization of this project may represent a core area for the creation a future potential universal knowledge-management model. The research was centered around describing a reference model of an SME and creating a model of intellectual capital management. In particular, empirical research which was carried out in those SMEs which have already implemented an innovative undertaking and conformed to the concrete model of an enterprise as assumed in the research.

The participation of Justyna Patalas-Maliszewska in the project contributed to the development of her personality traits, such as openness to new views / topics, self-disciplined, teamwork-oriented in working with colleagues, being well-organized and also showing responsibility.

After completing the project, Justyna Patalas-Maliszewska will continue her research on knowledge management at the University of Zielona Góra, Poland. During the whole project Justyna Patalas-Maliszewska acquired:
- interpersonal skills, namely communication (speaking and writing) skills in international groups (communicating both in German and in English),
- the ability to solve conflicts within a team and within the project environment, as well as the ability to delegate responsibilities.

This project achieved the goals of Marie Curie Actions, especially in supporting the young researcher in attaining and strengthening her leading position at the University at Zielona Góra. And thanks to the project Justyna Patalas-Maliszewska gained new experience in cooperating with industry as she also acquired additional personal skills like: problem defining and solving, decision making and setting realistic goals.

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