1. Introduction

Globalisation is a catchword of 21st century, characterised in borderless information spreading via Internet and creation of new economic consortiums. Simple management scheme "manufacturer — trade mark owner — wholesaler — reseller" has changed to "subcontractor – contractual manufacturer – trade mark owner – wholesaler and distributor" multi-way realisation. In manufacturing it causes also changes in qualification structure and characteristic skills of labour force. Enterprises and trade unions are interested in certain vocational standards specifying skills level of employees. Academic world cannot react to these changes correspondingly without knowing the real needs of industry world. Hence the gap between the needs and reality of labour force structure and quality exists. By stimulating contacts and cooperation between the different factors both in business and educational systems, synergies can be achieved to realise the abovementioned main criteria successfully. This work focuses on a new monitoring tool ensuring qualified labour force for enterprises in the machinery, metal engineering and apparatus sector in terms of local and European needs.

2. Industrial Networking

A major challenge facing organisations is to make effective use of the data stored in their diverse data management systems. This challenge exists because these various systems are not integrated and many potential users not only lack the training to access the systems but often are unaware that they exist (Watson, 2002). Networks created so far in the world have problems in succeeding of co-operation of large and small sized enterprises, mutual relationships between competitive enterprises and shortage of really participating enterprises. Researches in Finland (Pyöriä, 2000) however have proved that representatives of enterprises respect the co-operation and majority of them have positive experience in that. Large and small enterprises have different motives for partnership. Large companies search possibilities for implementation of new and alternative technologies and try to benefit while small one needs in support. Such a trends as decrease of significance of size and increase of importance of know-how has been noticed as well. The Estonian companies are small or very small size, limited internal RTD resources, and lack of resources to spend on innovation, weak attitude to trans-national collaborations. In addition to that, confidentiality problems represent a key factor (Luik, 2002). One of the important factors in co-operation is trust. Mutual trust creates presumptions to further investments of time and finances into co-operation. Trust also generally diminishes partners' wish to gain unbalanced benefits. Therefore involving universities and industry field associations into the network is a key of success (Riives et al., 2002). There is no similar co-operation network model or database built for this purpose in any of the EU countries. The use of the integrated system in networking radically changes the traditional approach to collaborative activities. The experience of world leading industrial countries suggests that implementation of networking not only provides an effective approach for the management of industry resources, but also

cultivates a better working environment for SME. Presence of universities, industry associations and research institutions is a key factor for success.

3. Integration of Enterprises Management, Vocational Certification System and Educational Programmes

The primary objective is to increase the responsiveness of education institutions to business demands and to improve the access of vocational and higher educated specialists into labour market. For that purpose is proposed an integrated real time system for educational and industrial needs in the sector, which includes real time database, comprising existing educational opportunities, e.g. different levels of study programmes, as well as industrial needs for human resources based on the employee qualification standards. The system is a software application available on the Internet, whereas the test version development is in progress, involving Estonia, Hungary, Italy, Finland and Sweden. Estonia is under the reform of vocational education and training (VET), which main objective is to prepare skilled workers, who are competitive, both in the Estonian and European labour market. Considering the objective, the VET system must be attractive, flexible, accessible, relevant, and efficient as well as of high quality and adapted to demand of labour force. The main result of the VET reform in Estonia 1996-2000 is the preparation work of national employee qualification system, whereas 12 vocational councils are working and 135 vocational standards has been already confirmed in accordance with European countries. In Estonian metalworking and machinery the main weaknesses of the sector are lack of highly qualified workers, low co-operation between companies, and absence of clear national and international cooperation networks. Although the sector has lack of qualified labour force, Estonia has too high rate of unemployed people (12 %), so improvement of existing educational system as well as re-training and improved qualification award system and cooperation is needed.
In Hungary, the dominant problems in this sector are also related to the shortage of skilled labour force and improvement of co-operation between education institutions and industry. Therefore, development of new programmes and tools of learning of vocational education, training and re-training are needed.
In Finland there is a need to promote co-operation between the enterprises in the field and educational organisations in order to improve the requirements of labour demand and quality. In addition, the proposed database model as a databank will offer a good possibility to see how similar issues are taken care of in the other partner countries. Finally a databank will enable the enterprises that participate in the network to get in touch and make new contacts with each other.
In Sweden labour cost is high and product lifecycles are becoming much shorter than the lifecycles of the manufacturing systems. It is essential to develop knowledge about sectoral cooperation networks and mediums, human competence systems and flexible manufacturing systems. New tools as the sectoral interaction medium and the digital database test-version - sectoral cooperation model and “virtual system of human competence in manufacturing” also bring increased possibilities to design and

manage flexible manufacturing systems apart from being an important tool for manufacturing education.
In Italy, the demand for qualified labour force in enterprises of metal, machinery and apparatus sector is increasing in the last few years, while there is low offer of high expertise and no interest in young people to work in the sector. That is particularly evident for machine tool operators, maintenance operators and welders. There are also differences between SME-s (small and medium-sized companies) and large industries. The presence of the automotive sector is quite evident; therefore, many small enterprises have become service agencies of Fiat. These small enterprises have special difficulties in recruiting manpower. There is an evident need to offer improved opportunities to learn in order to become a specialist in practice in a concrete field of the sector.
Dominant problems in this sector are similar in Europe, e.g. lack of qualified labour force, in the same time high unemployment rate, changing market situation when education system needs to be constantly up-dated and correspond to changing labour force demand. The proposed system has a valuable trans-national value-added, as none of the above-mentioned countries have developed an integrated sectoral model for cooperation and improvement of capacity of educational system and labour force demand.

4. Tool for Network Monitoring – a WEB-Based System

There has to be a tool for active cooperation and coherence between enterprises. This tool has to enable reviewing of general capability, technological possibilities, certain needs and remaining resources. The expected network consists of production resources database, engineering resources database and human resources database, connected by Web-based system (Fig. 1).

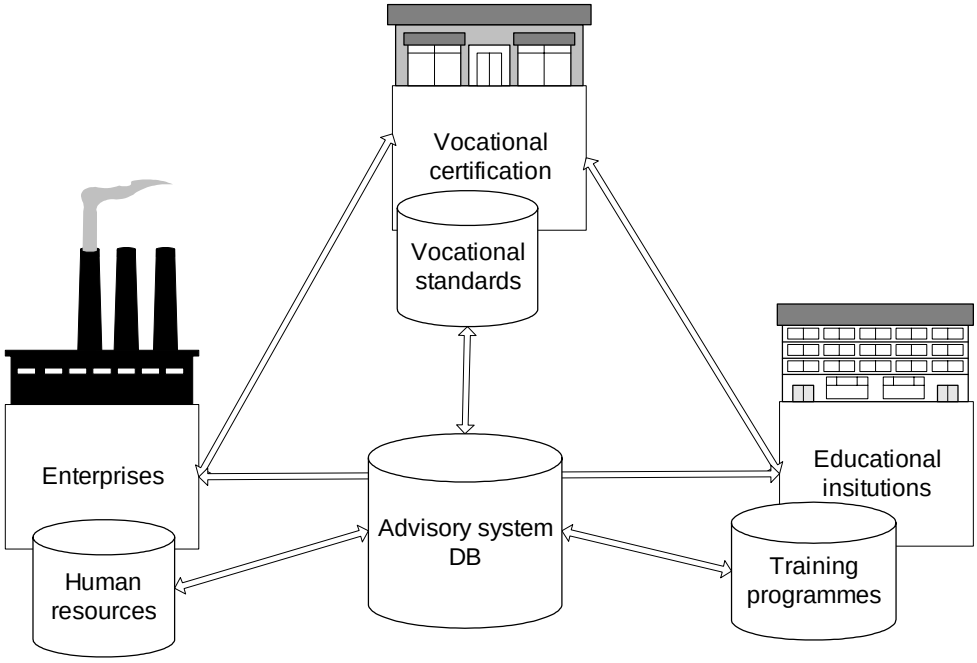

Fig. 1 Network monitoring of educational and industrial needs

As a result a knowledge supply chain is created. The user interacts with the control module, the role of which is to work out the search strategy on the basis of initial data given by user, via user's interface (Papstel, 1999). The knowledge base connects in a certain field manufacturing enterprises, consultancy firms, educational organizations and universities to handle local resources for larger subcontract orders and production volumes (Riives & Papstel, 2002). Such a network increases directly the competitiveness of enterprises located in periphery regions. The system provides know-how and practical examples how similar issues are dealt in different European countries. However, the system will be a practical tool not only for young vocational students, but for the use of re-training and life-long learning concerning the sector of metal engineering, machinery and apparatus.

The sectoral co-operation system and networking model helps to activate the labour market, transparency of labour force demand, lack of qualified labour force and links between all the different organisations of the sector locally and internationally. Pooling sector-wise information from different parties – companies, education institutions, students, and trainees is a very innovative approach. In implicit way, proposed system provides a set of tools: dynamic web-based sectoral job market, traineeship market, dynamic profiling of sector companies for analysing human resource needs with current situation.

The integrated real time system for educational and industrial needs in the sector includes also a real time database of existing educational opportunities – different levels of study programmes; industrial needs for human resources based on the employee qualification standards. The system connects in a certain field manufacturing enterprises, consultancy firms, educational organisations and universities to handle regional resources for larger subcontract orders and production volumes.

It focuses on enhancement of the competence of students, employees and industry to act successfully on the European market in order to strengthen the competitiveness of the European industry, especially the manufacturing industry. This will bring together a critical mass of "customers of education" and "suppliers of education" for resolving above mentioned shortcomings. Such a system increases directly competitiveness of the enterprises located in periphery regions. Elaborated model is usable with minor changes in any other industry field. This system has a wide range of target groups.

At the European level the interaction between training and working life increases between different countries. Through the system it is possible to compare vocational practices and working methods in different countries on European level. The system contributes opportunities for greater labour mobility and creates possibilities for the recognition and accreditation of know how and skills in Europe. Examples of getting answer to the problems of the companies are presented in Fig 2. After mapping the current situation in a n enterprise and answering to the question "What we have?" is possible to move on to the key question of next stage "What we want to know?", turning to the training programmes mapped by educational institutions.

The system can also be made use of in the development of trans-national skills' passports in Europe.

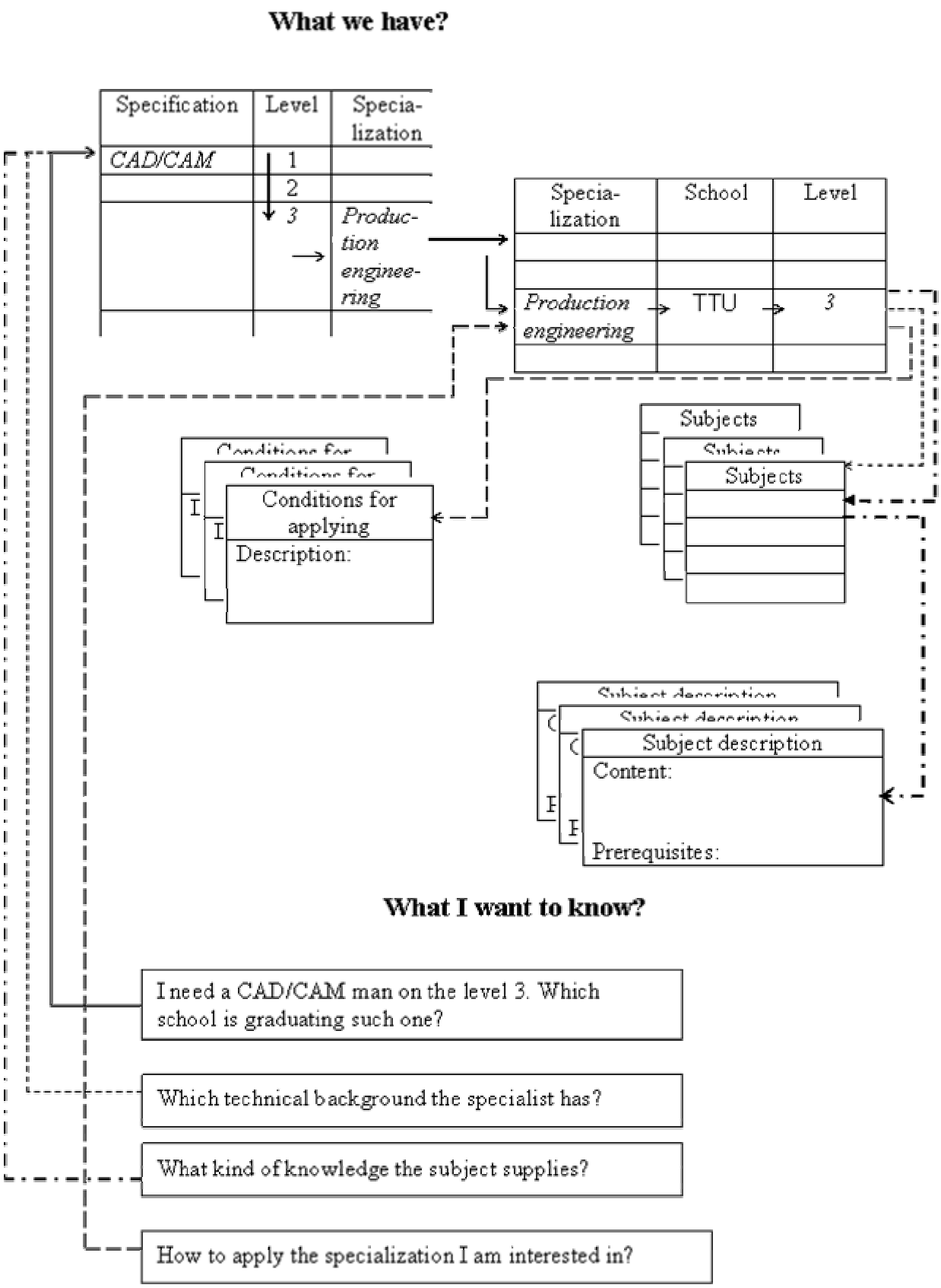

Fig. 2 Examples of getting answer to the problems of the companies

5. Implementation of the Advisory System

In order to create the advisory system, a database test-version will be introduced as an open access type system, which structure includes two main parts:
1) all the education institutions, study programmes, re-training programmes and links to e-learning platforms of the sector in detail;
2) private sector - human resources and labour force demand taking into account present situation and strategic development of manufacturing sector, and based on the existing employee qualification standards - detailed human competence system. Partners develop a common structure of advisory system; however, each partner is responsible for the further development and management of advisory systems in their regions.
The advisory system aim to improve the links and cooperation between the existing vocational and higher education system with private sector demand for labour force. Through sectoral interaction and cooperation, the objective is to improve and complement the existing study and training programmes (higher and vocational education) and improve access to re-training, life-long learning and e-learning platforms of the sector, as well as to labour market.
In the first phase is researched the current situation and the capacity of education programmes of the sector in providing qualified specialist into labour market in partner countries. This material is disseminated as national reports on the sector, which are presented to vocational schools and universities, companies and other partners in the sector. The objective of the reports is to influence the content and quality of existing vocational and higher education programmes to better meet the market demand. Based on the research, the structure and the elements of the advisory system and the database structure are developed focusing on the existing employee qualification standards of the sector in partner countries and companies of the sector – development trends, labour force, and human competence system (including lack of qualified labour force).
Finally, having the study results (real situation on the labour market changing in time run and offered opportunities for learning) on national level as well as in partner countries - the list of needed qualified labour force with their qualification content will be introduced. This list will be as basis for the educational institutions for elaborating complementary study and training programmes and modification existing one. The advisory system can also be transferable to other sectors inside the partner countries as well as across the European boundaries.
Number of enterprises from each partners' region are selected to test advisory cooperation environment model and database test-version in order to gain the widest possible variation of the elements of the advisory open-access environment. This system contributes to a better efficiency and transparency of needed education and training in this sector based on private sector labour force demand. Through the development of the advisory cooperation environment, the system improves practices and access to e-learning and life-long learning platforms. In addition, the image of metalworking, engineering and apparatus sector is also improved through the open

dialogue between education institutions, students (helps to improve training possibilities and other links to private sector), companies and other organisations.
Educational organisations are expected to exhibit their relevant courses in a database linkable manner (Fig. 3). Data from universities and colleges is as a rule not uniform. As a reward they will have a possibility to predict future needs by using information feeds from variety of enterprises.
The main information from enterprises is also gathered by completed questionnaires. Needed specialists skills are mapped (Fig. 4). The enterprise evaluates employees in four occupational categories: general skills, basic skills, additional skills and personal skills (Fig. 5). Human resources potential in the company is evaluated by subgroups (Fig. 6). Companies following ISO certification rules can find it helpful.

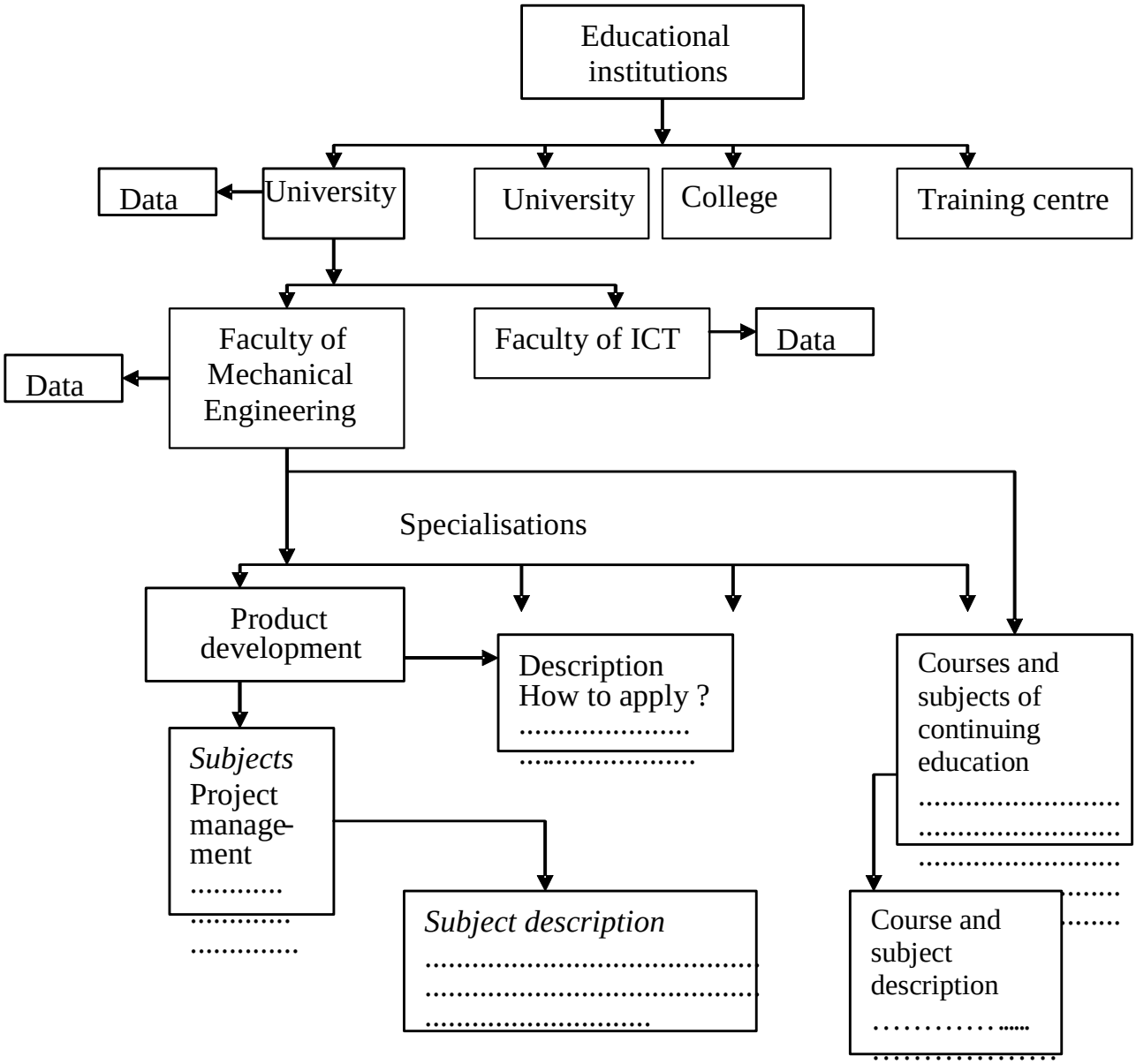

Fig. 3 Information model for educational institutions

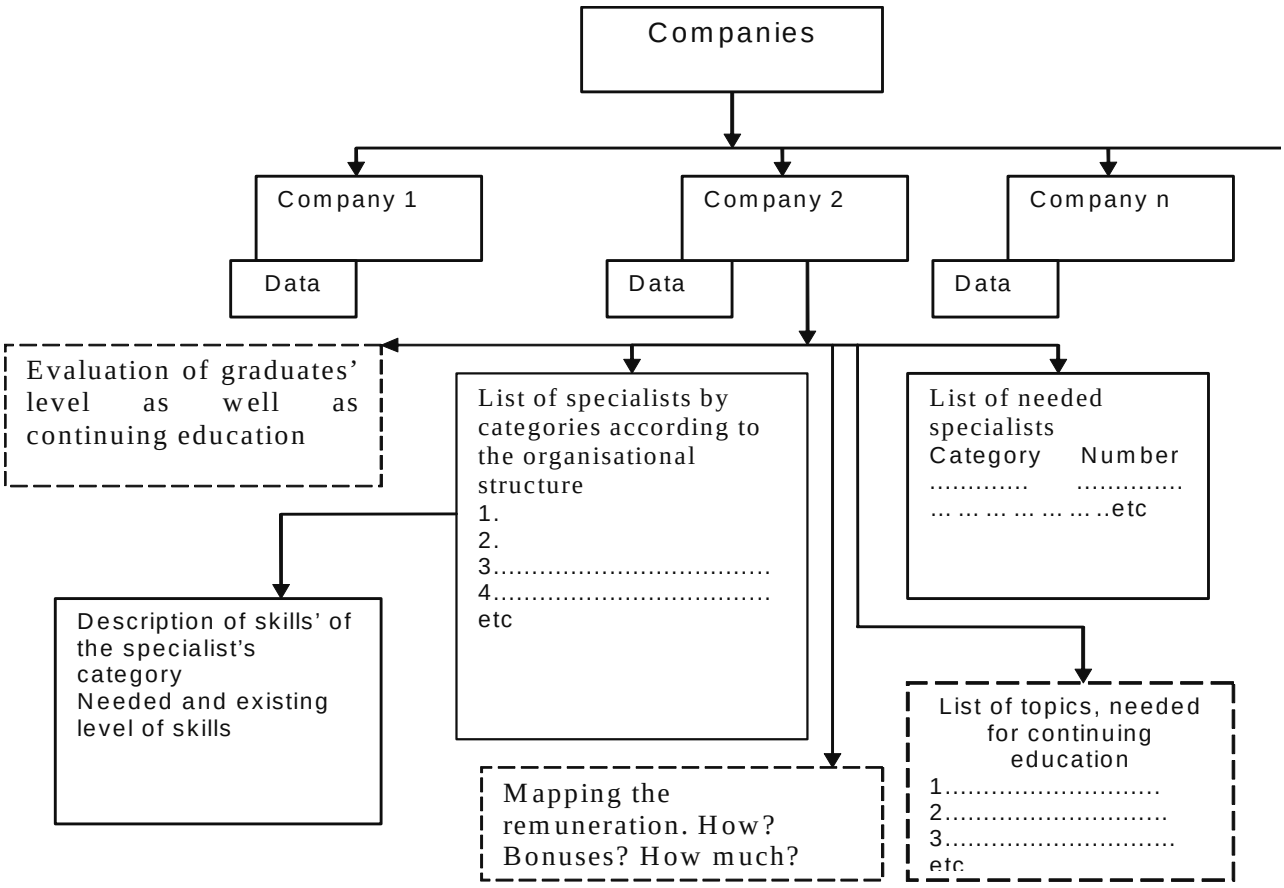

Fig. 4 Needed specialists - information model for companies

Needed specialists are described by skills. For workers level the possible solution is shown in Table 1.

Table 1 Categorised skills of workers in machinery sector

General skills	Basic skills	Extra skills	Personal skills
Specific skills of profession	Knowledge of specific materials	Selection of working tools	Sense of duty
Management and economy	Skills of reading technical drawings	Knowledge of manufacturing technologies	Precision and punctuality
Work safety	Knowledge of necessary handling operations	CAD/CAM	Independent working capability
Work law	Knowledge of working principles and procedures of necessary equipment	Knowledge of standard technologies	Sense of responsibility
Computer skills	Knowledge of necessary technologies	Adjustment of machine tool	Concentration capability
Language skills	User skills of lifting and handling equipment	Benching skills	Ability of cooperation and team-work

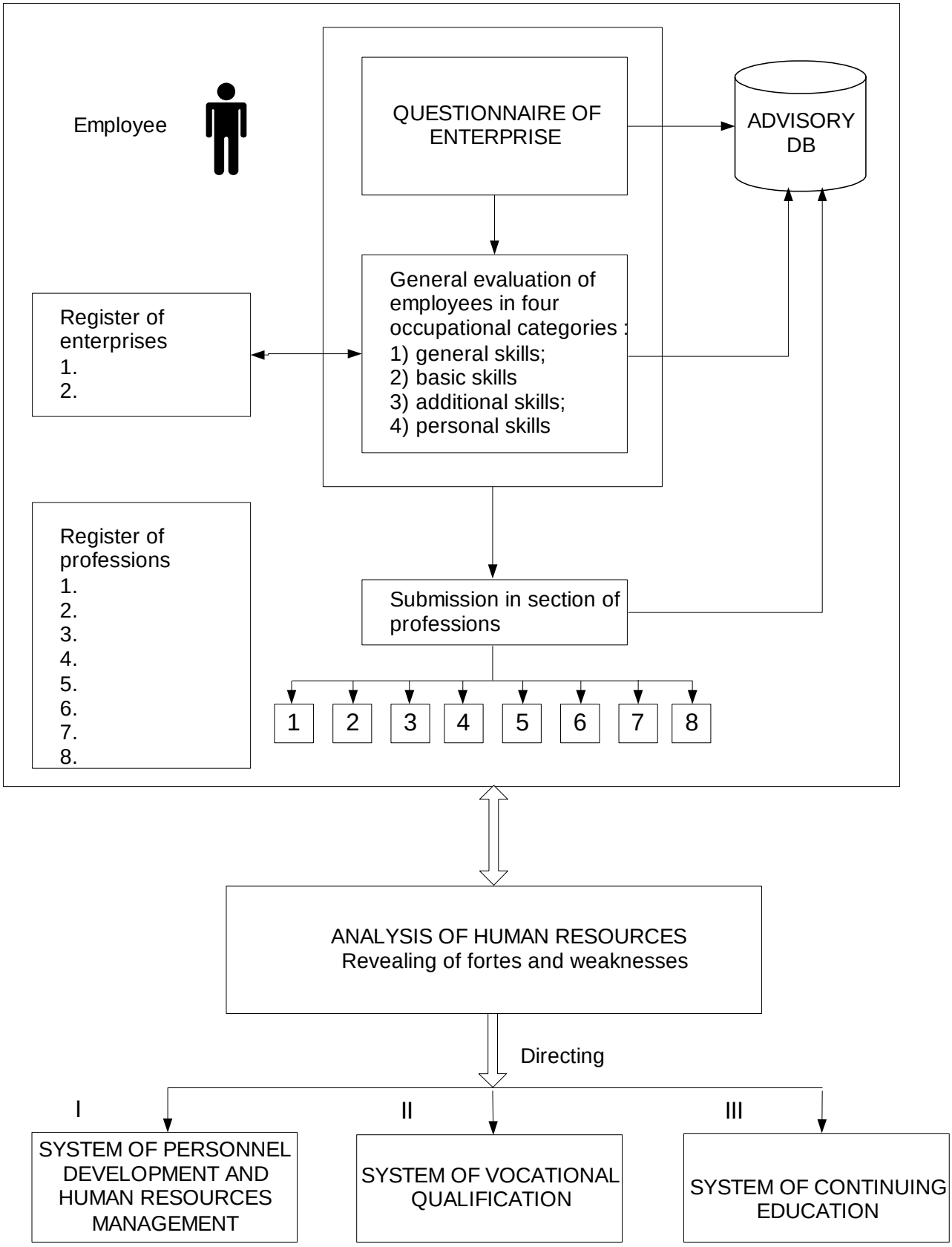

Fig. 5 Tasks to be solved on the basis of companies human resources description

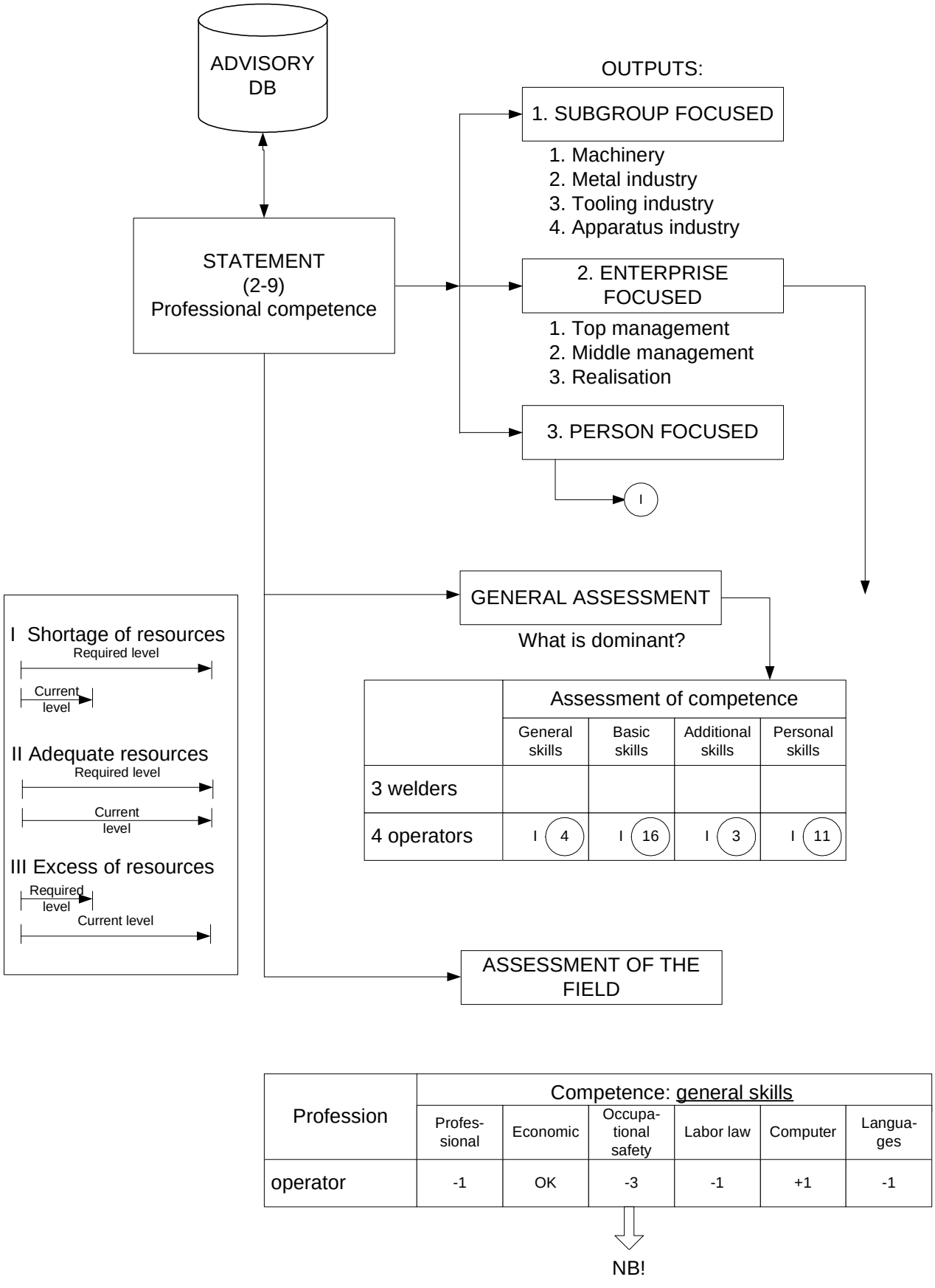

Fig. 6 Human resources potential in the company

6. Conclusions

The main objective of the proposed system under the construction is to supply enterprises and educational institutions with the updated information related to the needs, structure and qualification as well as about the opportunities to find needed labour force. An important step towards this goal is to define and understand the needs for the manufacturing industry for training and education in manufacturing education on global. Regularly updated data by enterprises and educational institutions will contribute to the development of a time based information system as supporting environment by everyday business planning concerning human resources. This will also give companies the opportunity and benefit to upgrade employees within the latest courses of manufacturing and management based on global industry needs and with the state of the art of educational methodologies. For increasing mutual trust the professional non-profit organisations as well as local authorities should take the initiative in creation such networked systems. An important key factor is concurrent development and implementation of vocational standards, including different levels for workers, engineers and managers. Such a system forming the networking between Estonia, Finland, Sweden, Hungary and Italy is under the development. The initiated advisory system can also be transferable to other industrial sectors, e.g. for forest or textile industries, across the European boundaries.

7. References

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