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## Mapping the status of and need for the Estonian labour with ICT competences

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Rapid development and widespread use of information and communications technology (ICT) solutions in all economic sectors and government have made the labour with ICT knowledge and skills highly appreciated in the whole world. The issue of the shortage of labour with ICT competences has also remained actual in Estonia for years and most studies conducted in the field conclude that there is a great shortage of labour with ICT competences. So far these have been qualitative assessments without knowledge on the more specific relationship between rapid growth and great shortage of labour. The employment of professionals with ICT preparation across background features and jobs of the employees of the structure has also not been analysed yet. **This study aims to assess the need for ICT professionals across jobs and professional preparation in ICT sector as well as in other fields of activity.** Also, the main bottlenecks in covering the need for ICT-related labour are outlined and recommendations for addressing these challenges are made.

### Methodology

As to methodology, a combined approach was chosen, which combines the forecast model components of quantitative labour, based on the present structure of the existing labour force and the potential development scenarios of the sector, and assessments of compatibility between qualitative skills and needs. Data about the structure of labour force were collected from the employers, but if required, the data of the Statistical Office were also used. Another important input was the assessments of employers and experts of the future developments of the sector, but also the quality and sufficiency of labour force and the necessary key competences with a view to the future. The relevant assessments were collected through in-depth and focus group interviews conducted with employers. The data from the Ministry of Education and Research were used for describing the labour supply.

### Results: labour force structure

The study focused on the need for ICT professionals in ICT sector as well as in other areas of activity. At present, the total number of ICT professionals in Estonia is 16 287, about half of whom (8474) work in ICT sector and the second half in other areas of activity (7813).

The labour structure was specified for branches offering the services of ICT sector (IT wholesale, publishing software, telecommunication, programming, consultations and the like, data processing, web hosting and the like). By jobs, the greatest proportion of employees with ICT-related preparation working in ICT sector is made up by software developers, (21%), followed by managers (12%) together with project managers (8%). The next largest group is formed by technicians, user support specialists (12%). More or less the same groups are formed by database and system administrators (10%), test specialists (8%), analysts and architects (9%), network specialists (9,6%), sales specialists (9%). Compared to ICT sector, there are more specialists dealing with system management (technicians, user support specialists, database and system administrators) in other areas of activity.



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**As to education**, it appeared that almost half of ICT employees working in ICT sector hold higher education degrees. Approximately 80% of them are made up by managers and analysts and architects. In other areas of activity, the proportion of employees holding higher education degrees is generally the same, but there are fewer specialists without specialised professional training (approximately 10% versus 25% in ICT sector). The proportion of employees with specialised professional training could be examined only for the services of ICT sector. It appeared that 60% of ICT specialists have acquired ICT-related education, 14% have their acquired profession related to ICT to some extent and 26% have acquired education in other specialties not related to ICT.

The proportion of **foreign labour force** in ICT sector is quite marginal - 6% of specialists have no Estonian citizenship, 3% have the EU citizenship, 1.6% have the citizenship of non-contracting parties and 1.5% have the citizenship of the CIS and former CIS countries.

### Forecast of labour needs and compatibility between supply and demand

In view of current proportions of labour force, turnover elasticity of labour force and future scenarios of the sector, the forecast of labour needs was prepared for ICT sector. It was found that **depending on the growth scenario of the sector, 2661-4456 more employees will be needed in ICT sector for positions requiring ICT professional preparation until the year 2020**. Since at present only about half of ICT professionals work in ICT sector, the demand for the relevant labour force is strongly affected by the need for ICT professionals also in other areas of activity. It was found that by 2020 the number of ICT professionals outside the core ICT sector will be increased by almost 4000 persons. This forecast is not based only on the forecast model, but on the statistics and expert analyses obtained.

When comparing the numbers of the need for labour force with ICT preparation (6661–8456) with the numbers of labour supply (8500), it appears that **adding the demand of public sector and other economic sectors may lead to the situation where the number of ICT graduates matches more or less precisely the labour needs if an optimistic scenario is realised**.

In assessing the need for preparation of labour force, general numbers are not sufficient. It requires a more detailed division by educational levels as well as by jobs where both supply and demand are very different. For various reasons, the precise analysis could not be prepared. However, some nuances can be outlined:

- **The number of higher education graduates needed is 4200-5600, while the supply remains at the level of 4550 graduates.** It appears that for employees holding higher education degrees the supply generally meets the demand, however, in case of a more optimistic scenario, the shortage of specialists may increase with the current teaching volumes.
- **However, compatibility between supply and demand is questionable for higher education across jobs.** No significant growth is seen in telecommunications sector, therefore additional need for e.g. network specialists is also little. It also affects the need for higher level technicians, user support specialists, system administrators and sales specialists. Still, thousands of additional employees are needed in software development – developers, test specialists, analysts, architects, relevant field managers.
- **The demand for new employees with vocational education reaches 2500-2900 employees, while the supply remains at 4000 graduates.** The discrepancy between supply and demand should be analysed more precisely – if the graduates who do not start work as ICT professionals



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do not find suitable jobs at all or start at positions for which the key competences are not related to ICT, but ICT competences still make up a significant part of the job content. As for the latter, ICT professionals rather stand for preparation of the so-called advanced users.

### Assessments by employers on the competences needed in the future

The numbers alone cannot describe all the aspects related to labour needs. The employers were consulted on this issue by examining their assessments of the quality of labour and the possibility of finding the employees today and the change in needs in the future.

It appeared that **the employers are generally satisfied with the existing labour force**, which is probably also related to the fact that they themselves have trained their employees a lot. The latter describes the fact that it is not easy to find ready-made ICT professionals with sufficient knowledge and experiences. With a view to the future, **an increasing need for multifunctional employees can be seen**, flexibility is expected from employees, more and more **general competences** are evaluated in recruitment of employees for almost all jobs – communication skills, problem solving skills, teamwork and management skills in combination with professional skills, which are in conformity with the issue of the need for multifunctional employees.

Almost all those interviewed also reported **the importance of integration between the fields**. With a view to the future, it is believed that there is an increasing need for those who are specialists in two fields – the field where a product/service solves a problem (banking, medicine, different technologies, etc.) and ICT.

### Assessments of ICT education

During interviews employers were asked to assess ICT education in case they had been in contact with schools or new graduates. By using information gathered through interviews, as well as the results of earlier studies and evaluation reports, the compatibility between education and demand was analysed. The main conclusions are as follows:

- **The quality of ICT professionals' preparation has not caught up with the increasing number of students**, which is why professional education does not necessarily reflect the quality of ICT professionals. By increasing the admission, the quality will probably suffer even more because of the teaching content as well as due to the lack of students with necessary abilities. **The quality of vocational education** is satisfactory only in some schools and assessments by enterprises are in compliance with accreditation of vocational training curriculum groups.
- **The level of general competences** (e.g. communication, presentation, self-management and project management skills) **and low capability to combine these competences with professional skills have been the subject of general criticism** for the students who have passed the curricula providing ICT education.
- It is considered that **applied learning in higher education has rather remained in the background** and the proportion of academic training is far too large. In some places the focus of training remains unclear for the students from the beginning, which results in frustration and increases the already high number of dropouts.
- Employers fully agree on the **criticisms of internship in both vocational and higher education**. Complaints are taken about the length of the internship, the organization as well as content. In

essence, there is nothing new in that criticism, the employers have brought up this message for many years, but the changes for the better have still not been felt.

- There are successful examples of **cooperation between businesses and schools** in vocational as well as higher education, but in general cooperation is **not perceived as systematic and effective**. It is expected that cooperation would be more consistent, mobility between businesses and academia at the level of lecturers would increase and practitioners would reach out to more students and lecturers, why not, would go to businesses for internship.

### Main recommendations

Recommendations are based primarily on the view of employers, although based on higher and vocational education institutions' evaluation protocols also the assessments by education experts have been reflected. Still, the recommendations reflect mainly those bottlenecks, which are important from the employers' point of view, i.e., approximate education and labour market. This study should be followed by thinking about how exactly to deal with these problems and what solutions might be best.

#### Higher education:

- **In terms of the number of students, the focus should be on the preparation of software developers** (developers, test specialists, analysts, architects, relevant field managers)
- Due to the large number of students, more emphasis should be put on **ensuring the quality of preparations**. One of the first aspects is paying more attention to the choice procedures of students; on the other hand, the qualitative careers advisor would be helpful.
- The development of **general competences** (e.g. communication, presentation, self-management and project management skills) and practical knowledge and skills need to be more clearly dealt with. This is possible through making internship systems more effective, actively using more active learning methods (project based learning), **closer collaboration between disciplines** (e.g. economics, engineering or something similar and collaborative projects of IT students for systematically solving concrete business problems) and accordingly determined learning outcomes arrangement.
- Systematically review the **arrangement of internship**, objectives, funding, process, requirements and control over their implementation. Delaying respective activities or confining to tiny improvements would increase the gap between institutions of higher education and businesses.
- **Cooperation arrangement between entrepreneurs and educational institutions** needs systematisation. Carefully thought out cooperation process, determination of clear objectives and outcomes and time modification would contribute to the fact that both parties feel the effectiveness of cooperation.

**For vocational education**, the supply of ICT-related vocational education should be revised in terms of quantity as well as first of all quality of education:

- There is a need to think through more clearly what the **output of ICT vocational education graduates and expectations of employers for that education are**. Currently, there is no great need for professionals graduated from vocational schools in ICT sector because the quality of teaching does not correspond to the employers' expectations both in ICT sector as well as in public



sector. Thus, there is an essential need for professionals with vocational education in other fields of activity – the quantities are known, but the content needs to be clarified.

- Partially, the name of ICT professionals stands for the so-called **advanced user training**. Curricula need to be put in order, i.e., profession titles need to be reconciled with the actual content of the study, which partially solves the problem of overproduction. By doing so, repeatedly mentioned **flexibility** should be taken into account - a strong ICT module provides advanced users with the opportunity to move in the next stages of ICT learning path, if desired, to the areas more closely related to the ICT.
- **In terms of quality**, it is definitely important to develop graduates' general competence level and capability to combine general competences with professional skills, which has been currently criticised by the entrepreneurs.
- **In terms of internship and cooperation between schools and employers**, the recommendations are the same as for higher education (see above).
- Through **cooperation between vocational schools** it would be rational to support specialization between the vocational schools, which would bring together expertise and raise the graduates' quality of preparation.

#### Basic education:

- Acquisition of general competences and the ability to self-learn are competences which evolve over a long period. Therefore, the development and guidance of general competences in the level of basic education are of utmost importance. This enables to build additional basis on the flexibility and life-long learning attitude in the next educational levels. Good learning skills are an essential condition for successful completion of the curriculum.