**SOFT SKILLS ENGINEERING FOR INFORMATION TECHNOLOGIES PROFESSIONALS**

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**Abstract:** The development of information and communication technologies at the beginning of the 21st century created a huge labour market that employs experts in this field. In scientific and professional literature, as well as in the daily practice of human resources management and the practice of developing higher education programs at technical faculties, the question on professional (hard) skills needed by the widest range of professionals in the field of information and communication technologies arises. However, scientific research and professional practice focus to a much lesser extent on the issues of development of the so-called soft skills necessary for professionals to achieve the results in this field. During June 2018, managers and professionals in the field of information and communication technologies in Belgrade, Serbia, were interviewed in order to identify the so-called soft skills necessary for employees in the broadest spectrum of information and communication technologies. Based on the analysis of the results, the basic model of the soft skills (core and additional) necessary for employees in the field of information technologies is engineered, as well as the method for developing these skills through workshops.

**Keywords:** Information and communication technologies, professionals; soft skills.

**INTRODUCTION**

From the beginning of 21st century, information technologies (IT) are becoming the essential part of everyday life. Business processes rely on information technologies and there is growing need for employees with both extensive and specific knowledge in this area. Nowadays, the widest range of job positions related to IT are emerging on a daily basis, with new or updated job descriptions and job specifications. The question which often arises is how the educational system can follow or anticipate fast technological changes that require new professional competences (hard skills). Some of the researchers use the term technical skills instead, based on Katz’s classification of skills which includes technical, human and conceptual skills [1]. Many universities and colleges are interested in developing programs engineering the hard/technical competences that will better align with the future employers’ needs.

In building hard skills for information technologies jobs, many educational systems and companies are encouraging the students to choose education and careers in STEM (Science, Technology, Engineering, and Math) [2]. In order to prepare the students to choose the STEM education, many countries are building programs for the students to develop an interest for STEMS from early secondary education but also from elementary education, thus securing educated human resources for the future needs [3]. The key in building hard skills for

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information technologies professionals is, therefore, laying in the formal educational system, especially in secondary and higher education.

The other important question, that hasn’t been completely answered yet, is focused on the issues of so-called soft skills required for the professionals in information technologies. There are lots of definitions of the soft skills existing today. Soft skills are defined as the interpersonal, human, people or behavioral skills needed to apply technical skills and knowledge in the workplace [4]. Hunt simply stated that the hard skills show what we know and the soft skills show we use the knowledge [5]. The researchers from the beginning of the 21st century surveying employers from the information technologies field, realized that in employment of information technologies specialists at the starting positions, the companies emphasized soft skills (teamwork, communication, etc.) as even more important than professional (hard) skills [6], [7].

**SOFT SKILLS FOR INFORMATION TECHNOLOGIES PROFESSIONALS – LITERATURE REVIEW**

The main goal of any human resources selection process in order to reach organizational success is getting both qualified and adaptable staff [8], [9]. As it is previously said, soft skills are needed for applying technical skills and knowledge, and in information technologies job positions, using the acquired knowledge is of the essence for the success of IT projects. So, it is important to emphasize that the soft and hard skills are difficult to divide, because they are inseparable in undertaking any project tasks, including information technologies projects.

Even in the 1980’s, research showed that some programmers performed better than the others with the similar background, and from the beginning of the 21st century there were efforts in developing a methodology for identifying soft skills of the top software developers [10]. Gallagher et al. analyzed essential hard skills for IT professionals (programming, etc.) and found out they were crucial for getting a job, but that their value weakened during time and that the soft skills were getting importance instead [11].

One study, analyzing soft skills for software development job posts on online job portals, stated communication, interpersonal, problem solving and analytical skills, teamwork, organizational skills, fast learning skills, working independently, innovativeness, openness and adaptability to change as the most mentioned in the job ads for software development positions [12]. The other study stated change management, commitment to excellence, communication, creativity, decisiveness, empathy, innovation, leadership, knowledge management, motivation, objective oriented negotiation, personal development, persuasiveness, proactive, problem-solving skills, strategy and planning, and teamwork as top soft skills for the professionals in information technologies [13].

A study conducted in nine US states named various soft skills as crucial, such as (in order of relevance): honesty/integrity, attitude, willingness to learn new skills, oral and written communication skills, analytical skills, professionalism, ability to work in teams, flexibility/adaptability, motivation, interpersonal skills, adaptability, creative thinking, organizational skills, etc. [14]. Lavy and Yadin concluded that the shift to soft skills was caused by the growing need for IT professionals to communicate with different categories and levels of employees and managers, and the appearance of more large-scale projects gathering various business functions [15].
Mtsweni, Hörne and van der Poll research analyzed relevant *soft* skills for different information technologies job positions and found out that for business analysts the most important *soft* skills were: team player, personal integrity, group work, effective questioning, learning skills, etc., for project managers: listening skills, personal integrity, group work, team player, conducting meetings, etc. for software developers: team player, personal integrity, group work, time management and open communication [16].

All the researchers agree on the importance of *soft* skills for high performance of information technologies professionals at different job positions. Different researches show different importance levels, but it could be stated that the most important *soft* skills, according to current research are: communication, teamwork, analytical skills, problem solving skills, creativity, and willingness to learn.

### 2. SOFT SKILLS ENGINEERING FOR INFORMATION TECHNOLOGIES PROFESSIONALS

**Research methodology**

In order to engineer the list of the most important *soft* skills for IT professionals in a wider study focused on overall information technologies, employees and the employees in particular information technologies areas, experienced experts in information technologies were interviewed through semi-structured interviews regarding their attitudes on *soft* skills that are essential for information technologies professionals. Two open questions were raised:

What *soft* skills IT professionals should possess?
Sort these skills in order of significance.

For the purpose of this paper, the answers on these questions were analyzed and the list of the most important *soft* skills was engineered for overall job positions in the field of information technologies in order to enable future in-depth research of a wider sample using the statistical methods.

**Sample**

In the period of two weeks, from June 4th to June 15th, fifty-five participants from Belgrade, Serbia area: experts in information technologies, IT start-up owners, web developers, software developers, senior programmers, network administrators, etc. with significant professional experience, were interviewed through semi-structured interviews regarding their attitudes on *soft* skills essential for the professionals in the widest range of job posts in the information technologies.

**Results and Discussion**

Based on the answers the *soft* model of competences for the professionals in the widest range of IT jobs was engineered as presented at Table 1.
Table 1. *Soft* skills model engineered for IT professionals

<table>
<thead>
<tr>
<th>Core competences</th>
<th>Relevance</th>
<th>Additional competences</th>
<th>Relevance</th>
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<tbody>
<tr>
<td>Creativity</td>
<td>1</td>
<td>Flexibility</td>
<td>8</td>
</tr>
<tr>
<td>Analytical skills</td>
<td>2</td>
<td>Anticipation</td>
<td>9</td>
</tr>
<tr>
<td>Problem finding and solving skills</td>
<td>3</td>
<td>Achievement orientation</td>
<td>10</td>
</tr>
<tr>
<td>Teamwork</td>
<td>4</td>
<td>Time management</td>
<td>11</td>
</tr>
<tr>
<td>Willingness to learn</td>
<td>5</td>
<td>Emotional intelligence</td>
<td>12</td>
</tr>
<tr>
<td>Communication</td>
<td>6</td>
<td>Ability to work independently</td>
<td>13</td>
</tr>
<tr>
<td>Working under pressure</td>
<td>7</td>
<td>Trust(^{109})</td>
<td>14</td>
</tr>
</tbody>
</table>

As it is previously seen, the research at available literature showed the awareness of the defining the basic set of *soft* skills in the field of information technologies with no consensus on the most important ones for the professional success. Nevertheless, the most significant ones are very often the following: communication, teamwork, analytical skills, problem solving skills, creativity, and willingness to learn. The *soft* skills model engineered in this research is not particularly different than the ones stated in the previous research, though the levels of importance are somewhat different, especially regarding creativity, and the inclusion of trust as significant professional (*soft*) competence.

In the second part of the interview, the interviewees in additional remarks stated the necessity of creating programs for developing *soft* skills of information technologies professionals, especially those at the early stage of their careers. As key stakeholders were identified higher education institutions, training and development providing agencies and consultancies, and the information technologies companies themselves.

As the programs for developing soft skills were proposed, and the higher education institutions were suggested as key providers, the authors of this article propose courses and workshops on undergraduate and graduate level for developing *soft* skills of the students in the field of information technologies. The workshops would include case studies, situational and behavioral exercises, role play exercises, simulations, etc. as seen at Table 2.

Table 2. *Soft* skills development workshops\(^{110}\)

<table>
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<tr>
<th>Workshop type</th>
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<tr>
<td>Competitions (Hackathons)</td>
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<tr>
<td>Simulations</td>
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<td>Situational exercises</td>
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<td>Behavioral exercises</td>
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<td>Case studies</td>
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<td>Group presentations</td>
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<tr>
<td>Project work</td>
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\(^{108}\) Source: Authors’ findings.  
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Limitations of the study

The sample size was rather small and in the following stages will include wider set of participants which will provide more valid results in order to get a more complete depiction on soft skills critical for information technologies professionals.

Implications for further research

The aim of this research was to set a basis for a further study which would include survey and the statistical analysis of surveyed answers; nevertheless, it engineers the model of the most important soft skills for information technologies professionals.

CONCLUSION

The question focused on the issues of so-called soft skills required for the professionals in information technologies is becoming one of the most important issues of developing the workforce in information technologies industry. There are several attempts to catalogue the most important soft skills, stating various but similar competences. After interviewing the managers and professionals in the field of information and communication technologies in Belgrade, Serbia, during June 2018, the basic model of the so-called soft skills (core and additional) necessary for employees in the field of information technologies is engineered in order of relevance, as well as the methods for developing these skills through workshops offered at various undergraduate and graduate programs.

REFERENCES


