
**INFORMATION TECHNOLOGY INDUSTRY REQUIREMENTS
REGARDING BEHAVIORAL COGNITIVE SKILLS AND THEIR
REFLECTION IN THE ACADEMIC CURRICULUM**

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ABSTRACT

During the last decade there is a growing concern that a large percentage of the Information Technology (IT) graduates are lacking significant behavioral cognitive skills (BCS) such as teamwork, intelligent decision making and communications. For effective functioning as IT employees, these skills are very important. In this study, we map the industry requirements as regards to BCS for suggesting modifications to the academic curriculum. 8000 IT jobs classified advertisements both in the USA and in Israel were examined and analyzed. The study revealed that human interaction skills were high on the demand list followed by common skills, task interaction were third and organization skills were the least requested.

Index Terms: IT behavioral cognitive skills, IT industry demands, Human interaction skills for IT.

I. INTRODUCTION

Changes in the global economic climate and the shift to a service driven economy that occurred during the last decade had an impact on the importance of equipping the graduates with behavioral cognitive skills (BCS) for employability. These skills are relevant to all graduates and especially for IT (Information Technology) ones. There is a growing awareness that for the development of successful career in IT, in

addition to technical skills graduates have to possess “social skills” [1]. Due to the global economic fluctuations, organizations are constantly looking for better and more efficient ways to conduct their businesses. A common practice in dealing with the current complex, distributed and constantly changing workplace is by utilizing outsourcing, both inshore as well as offshore. These trends are made possible by

utilizing existing as well as additional IT infrastructure. As a result IT professionals have to possess additional different skills beyond their traditional technical skills [2,3]. In this paper, the term IT is used to refer to the entire computing industry, or the use of computers and software applications to manage information. In the past, nominees for various IT jobs were required to possess mainly excellent technical skills. This however has changed and currently, due to the rapid progression in computing technologies, flexibility and the life-long learning become more important. In addition, Due to the elevated complexity of the newly developed applications most of the development work is performed by teams of developers. As a result, interpersonal and social interaction skills as well as being able to work in a team-based environment became very important. Many new developments in the IT field address various business and organizational issues, so IT graduates; especially the ones who will be involved in designing, defining and developing such systems have to exhibit knowledge regarding business processes and functionality. These new developments in the IT discipline lead to a different understanding that graduates should possess not only technical skills, but BCS (or non-technical) as well. However, although many researchers as well as the recruiting organizations agree on the relevance and importance of BCS, the exact meaning of BCS remains fuzzy [3, 4]

The aims of this study were to map the various behavioral cognitive skills required by the IT market and to examine their relative importance. The research questions derived from these aims are:

1. What is the relative importance of BCS among the IT graduates' required skills as reflected by jobs' advertisements?
2. Which BCS are required and specified by the IT job advertisements?
3. Are there differences between Israel and USA regarding the IT job advertisements' BCD required?
4. How the academic programs address the market demands?

To address the above aims and research questions, 6000 advertisements related to IT jobs were examined and analyzed. For the elimination of possible bias, the 6000 advertisements were divided into three different processes; each one was performed on 2000 advertisement. For ensuring that each process samples a fresh set of advertisements, there was a delay of over eight months between two consecutive samples. For assessing the third research question a similar process was performed but this time on 2000 IT advertisements in USA.

II. RELATED WORKS

In what follows a literature review on BCS and the roles and meanings of them are presented.

A. Behavioral cognitive Skills

In the IT industry job requirements one can find different terminology for non-technical skills, such as 'soft skills', 'people skills', 'emotional skills', and so on. These skills refer to a collection of behavioral and cognitive traits and attitudes that drives one's behavior [5]. The IS 2002 Model Curriculum [6] as well as the IS 2010 Curriculum Guidelines for Undergraduate Degree Programs in Information Systems [7] classified these skills into some categories of non-technical capabilities that are required. Among these capabilities, are: "Strong analytical and critical thinking skills to thrive in a competitive global environment", or the graduates have to "exhibit strong ethical principles and have good interpersonal communication and team skills" [7]. Flynn, Valikoski and Grau [8] referred to listening skills as one of the "most neglected aspect of communication". For good qualifying of IT graduates for the real life tasks, various surveys were conducted. Some employers specified that novice employees "lack key inter-personal skills" [9]. Cappel [10] also specified that the most important BCS that apply to all IT jobs are oral and written communication, problem solving, and the ability to learn. Faheem [11] reviewed 250 job offers for software developers and came with nine BCS that were required: (1) communication; (2) interpersonal; (3) analytical and problems solving; (4) organizational; (5) fast learning; (6) team playing; (7) ability to work independently; (8) innovative and creative; and (9) open and adaptive to

changes. The data of this research was collected from several countries and although the cultural and economic differences between North America and the rest of the world regarding interpersonal, analytical, organizational and open to changes skills, the most important set of skills was behavioral ones. This can be explained by the characteristics of software (having open and of a global nature) and the fact that many software development projects are performed offshore or partially outsourced. These characteristics became an integral and necessary part of IT work in the 21th century.

B. Significance of behavioral cognitive skills for IT graduates

During their academic studies IT graduates, acquire a profound knowledge of applied computing and business, and are able to identify and analyze problems, design solutions, and implement them into a working application [12]. In the recent years and due to the rapid developments in the computing discipline, IT graduates are expected to develop auto didactical skills and to be able to learn and apply new emerging technologies. Moreover, as part of the transition to global working environments they are expected to be able to work in teams. Furthermore, since computer applications have become too large and complex for one programmer to deal with [13] most applications are developed by teams. Hence, for a successful career, IT

graduates need to develop and exhibit both technical and non-technical or BCS [14].

The shift to an information economy and various innovative developments in recent decades, have demonstrated once and again that technology in general and IT in particular plays a major role in the creation of new business opportunities. New and advanced products and services act as modern growth enablers. For that reason, Information Systems are defined as Technology-Enabled Business Development, a term that was used by the IS 2002 - Model Curriculum and Guidelines for Undergraduate Degree Programs in Information Systems [6]. These guidelines defined the high-level categorization of the IS graduate as a mixture of (1) Business fundamentals, (2) Analytical and Critical thinking, (3) Interpersonal, Communication and Team skills and (4) Technology. The updated guidelines (IS 2010) emphasize that foundational knowledge and skills are very important for the IS graduate by providing the core competencies required to exhibit the IS capabilities [7].

Due to the multi-dimensional aspects of IT and its ongoing contribution to a better and more effective work environment, the IT professionals have to possess the required technical capabilities as well as business understanding and excellent communications and people skills. IT professional may be involves in a wide range of position, however in general these positions can be divided into three main

categories: development, support and analysis. Development positions include mainly developers who in addition to their proficiency in various programming languages and technologies, have to possess good team and communications skills since most of the development is team based. Support positions that usually assist others in using technology must possess excellent communication skills in training users while adapting the proper approach for each organizational level. The IT analyst that bridges between the stakeholders and the developers has to exhibit excellent problem solving skills combined with good understanding of the organization and its business process. At the bottom line, the IT professionals regardless their specific position category must demonstrate oral and written skills for communicating with both peers and users at the whole spectrum of the organizational levels [15].

There is a growing list of foundational competencies required for a successful IT professional. A competency in this sense is a set of skills, abilities or behavioral characteristics that lead to success and better performance. In general, these competencies can be divided into two types: technical and non-technical competencies. Technical competencies combine various professional methodologies such as requirements elicitation and analysis, system design, human computer interface design, software validation and verification, software quality and software development and implementation. Non-technical

competencies or BCS refer to human related activities such as communication, teamwork, collaboration, planning, subject leading, presentation delivery, writing skills, and work assessment.

Due to its important role in advancing organizations as well as the society as a whole, IT is constantly changing and new technologies emerge at an increasing pace. In addition to their BCS skills IT professionals will have to exhibit a high degree of motivation and a drive to continue learning throughout their professional life. Furthermore, in parallel to the elevated stakeholders' demands, the developed solution become more complex. This requires additional levels of abstractions to describe and communicate the system and its functionality. Such abstractions are not easy to comprehend [13], nevertheless are required for conveying the system's functionality and benefits. The IT professional has to be able to communicate these abstractions even to users that lack the higher level of technical understanding.

IT project managers were among the first to realize the importance of BCS to their projects' success. Although the discipline went through a significant progress in tools and methodologies to support project's management, the success still heavily depends on the manager and team's BCS. The project's success can only be achieved through an organized effort of all parties involved. The manager's ability to assign work, delegate authority, motivate,

supervise and manage is an important cornerstone to success. These interpersonal or behavioral skills are sometimes the differentiator between a successful project to a failure. These skills' importance was observed by Sampson who wrote, "The skills required for project management are now often divided 50/50 into traditional 'hard' skills, such as risk management and scheduling, and 'soft', people oriented skills, such as interpersonal communication." [16] (p. 41).

However, the BCS that are mandatory modern competencies for project managers are not confined to managers only. As software becomes more complex, many of its attributes, such as code complexity, intangibility and the required abstractions apply to the IT professionals and not just to their managers. The importance of these BCS is not new and in an article dated back to 1981, Keen [17] who analysed the long term changes in organizations in relation to IT and IS, defined "new" skills that he thought should be developed among the systems staff. He refers to these skills as the "Hybrid" skills. He realized that for a successful implementation of Information Systems, the IT professionals have to understand and consider organizational and political issues. Over a decade later, in 1996 Earl, Edwards, and Feeny defined the Hybrid employee as "a person with strong technical skills and adequate business knowledge, or vice versa" [18] . The importance of BCS for IT professionals has fueled many surveys regarding IT graduates'

future employment. In many cases, the main aim of the surveys was to analyse future technological trends and address those as part of the curriculum. Nevertheless, as part of assessing the market's future demands some highly required BCS were revealed. Such a study [19] was intended to analyze the gap between the skills taught by academia and the skills required by businesses. The study revealed that while the academic studies emphasis mainly on the technical aspects, the profession requirements are more towards business and human orientation. Another study [20] supported these conclusions after it found that there was a misalignment between the IS curricula in academia and the business needs. Additional studies [21, 22, 23] were consistent as well and supported the understanding that for employers the non-technical skills are more important compared to the technical ones. A possible explanation was that the non-technical skills (BCS) apply to all IT positions' categories, while the technical skills are, in many cases relevant only to developers. Reference [24] wrote, "If you had asked project-management gurus five years ago to name the most important competencies project managers should have, most would have said technical skills. Today they'd be more inclined to place communications or negotiations acumen at the top of their lists" (p.22). In recent years, the relative importance of BCS is not confined to project managers only, but to the whole IT professional community [25, 26].

Many employers consider both technical and non-technical competencies to be equally important, and search for professional employees possessing both types of skills [27, 28]. In addition, graduate students with better BCS are often quickly placed on mission critical project teams [29]. Moreover, as suggested by some research, industry leaders pointed out that when they had to choose between a candidate with highly developed technical qualities and a candidate with highly developed interpersonal traits, the latter wins out most of the time [30]. This supports previous findings [21, 22, 23] that employers regard the non-technical (or behavioral cognitive) skills as more important compared to the technical ones when promoting employees to more significant roles with a higher level of responsibility. This of course applies to managers as well as to professional non-manager employees.

These changes regarding the understanding of the relative importance of BCS in the computing discipline were addressed in details specifically by the IS curriculum. The IS 2010 Curriculum [7] as well as the previous IS 2002 Curriculum [6] refer to both technical and non-technical skills, considering them as essential capabilities. The IS 2002 defined four high level capabilities graduate should possess: (1) 'Business Fundamentals'; (2) 'Technology'; (3) 'Analytical and Critical Thinking'; and (4) 'Interpersonal, Communication and Team Skills'. Only by combining all these four capabilities, the graduate will be able to

produce successful IS, which this model curriculum describes as 'Technology-Enabled Business Development'.

The IS 2010 used a different high-level approach and defined three knowledge and skills categories IS graduates should possess: (1) 'Information Systems Knowledge and Skills' that include all relevant capabilities related to the IS discipline; (2) 'Fundamental Knowledge and Skills' that are not specific only to the IS discipline, referring mainly to BCS such as 'leadership and collaboration, communication and analytical and critical thinking'; and (3) 'Domain fundamentals' that refer to knowledge related "to the domain to which a specific Information System program applies computing". The Guidelines presented in the IS 2010 specifically addresses the 'Fundamental Knowledge and Skills' and states that although these capabilities are not unique to the IS profession, more emphasis should be placed on enhancing these skills among the graduates.

III. THE STUDY

The study was initiated with two main aims. The primary aim was to find out what are the BCS required by the industry and the second aim was to assess the relative importance of these skills in the hiring process. The method chosen was to analyze real jobs classified advertisements published by organizations seeking IT employees.

In the first stage of the study we reviewed and analyzed 2000 IT jobs advertisements. In order to get a more reliable perspective, the advertisements' collection process was repeated three times with an artificial gap of over eight months between two consecutive advertisements' collections. This was done in order to get a more reliable data set. With the Israeli IT market situation, the assumption was that during the elapsed eight months all of the job requirements were fulfilled and the next advertisements' collection will produce a new set of requirements that do not overlap the previous set. The first cycle of collecting the advertisements was during the first half of August 2012. The second one was on April 2013 and the third was on April 2014. This means that overall we examined a total of 6000 advertisements. The relative importance of the BCS was assessed by comparing the number of advertisements that contain BCS to the advertisements that do not contain them.

From all the BCS found in these advertisements, we produced a list of required skills. For a more efficient comparison, in the next stage, a content analysis [31] was performed in order to classify the required skills into categories on which we elaborate in the results and discussion section. Each researcher came up with his classification and then we discuss the minor difference and came up with an agreeable classification. In addition, the skills were classified based on the type of

hiring – on payroll employees and contractors (or outsourcing employees).

In the last stage of the study a similar process was done for advertisements in the USA IT market and 2000 USA advertisements were also examined and analyzed as well which brings to a total of 8000 advertisements that were examined. The main idea was to provide a base for comparison for both the BCS categories as well as the workplace requirements.

IV. RESULTS AND DISCUSSION

In what follows, results and a discussion relating to the research questions are presented.

A. The relative importance of behavioral cognitive skills

The relative importance of the BCS was measured by the proportion of advertisements that include BCS and the total number of advertisements examined. After collecting and analyzing the first set of 2000 advertisements, the analysis revealed that only in 29.1% of the ads BCS were required. This result contradicts all other researchers as well as the complaints made by future employers. For better understanding the large difference a more thorough analysis was performed. The 2000 ads were divided into two groups based on the hiring type. One group consisted of advertisements for direct hire (on payroll) and the other group was for contractors (or outsourcing temporary jobs). In the first set,

23.4% of the advertisements were for direct hire, while 76.6% were for outsourcing jobs. The second set produced a very similar distribution with 26.7% for direct hire and 73.3% for outsourcing. In 2013 a similar collection process was performed for the USA market and it revealed a very different split between the two types of hire. While in the Israeli market only 25-30% are direct hire jobs, in the US the direct hire are 52.1% as can be seen in Figure 1.

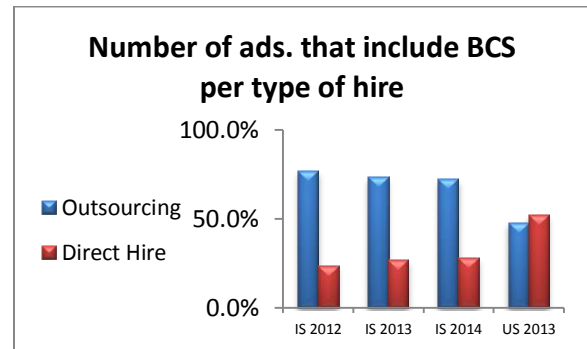


Figure 1: number of advertisements that include BCS per type of hire

Evaluating once again the relative importance of the BCS by measuring their proportion in the set, revealed a very large difference between direct hire (on payroll) and outsourcing hire. For the first set of 2000 advertisements, BCS were required by 70.2% of the direct hire advertisements, compared to only 16.5% of the outsourcing advertisements. In the second set there was a large fluctuation with 91.5% of the direct hire advertisements were looking or BCS compared to 41.1% of the outsourcing advertisements.

B. The behavioral cognitive skills requirements as represented in the jobs' advertisements

Among the 6000 advertisements there were twenty different BCS attributes, with a minor level of overlapping (Table 1). In what follows, we present the type of each skill, the skill and its description:

Table 1: classification of BCS from advertisements

Type	Skill	Description
Behavioral	Human relations	The candidate has to possess and be able to demonstrate excellent human relations (or interpersonal relations) within the team, the department, the organization and with external entities
Behavioral-Cognitive	Team player	The candidate has to be a team player, being able to work with others to accomplish the job. Demonstrates reliability, cooperates with others, does his or her share of the work, and meets his/her assigned commitments. Willingly shares knowledge and expertise with other team members and treats others with respect.
Cognitive	Self-learner	The candidate has to be able to learn new material by him or herself. Continuous and periodic learning while searching new sources of knowledge. High competencies for self-development.
Behavioral-Cognitive	Expressive	The candidate has to be able to speak up and express his/her ideas clearly to a large heterogeneous audience. He/she knows how to make a point, however it is done in a positive and respectful manner.
Cognitive	Independent	The candidate has to be independent, being able to

		work with minimal supervision, make decisions, go forward and overcome various problems with minimal management interventions.
Behavioral	Service oriented	The candidate has to be service oriented being able to provide support to all kinds of customers representing various levels of understanding. Good listening attitude and willingness to serve and build customer goodwill
Behavioral-Cognitive	Work under pressure	The candidate has to be able to perform well even at periods of extreme pressure and volunteer for assignments to offload extra pressure from other team members and to get the job done.
Behavioral-Cognitive	Can-do attitude	The candidate should have a positive attitude and be able to perform beyond the call of duty. A proactive attitude that takes the initiative to make things happen. Cares about the overall work and expresses a commitment to succeed or to contribute to the team/organization success.
Cognitive	Analytical	The candidate has to possess analytical skills being able to analyze situations, data and information and provide creative solutions. Being able to assess the situation by reducing its complexity
Behavioral-Cognitive	Business oriented	The candidate should have a very good business understanding, including business processes and organizational behavior
Cognitive	Creative	Being creative providing solution even to complex events and situations, being able to deal with and solve all kinds of problems in a solution oriented way.
Cognitive	Initiator/promote	The candidate should be able to initiate new tasks and activities, as well as promote

	ter	existing ones. Entrepreneur mindset.
Behavioral-Cognitive	Highly motivated	The candidate has to be highly motivated willing to spend additional time and effort when needed. Cares about the team and the organizations and contribute to its success without being asked or pushed. Responds to requests for help and take the initiative to offer help to others
Behavioral-Cognitive	Systemic/holistic	The candidate should be able to see the whole picture without losing any details. Being able to consider multiple and different points of view and assess each one.
Behavioral-Cognitive	Instructor	The candidate should be able to teach and instruct other on how to use the system as well as assimilate it among the end users
Behavioral-Cognitive	Focused	The candidate should be focused on achieving the goal and not being distracted by other, non-relevant "surrounding noise"
Cognitive	Organized	The candidate has to be very organized and paying attention to details, absorb and understand. Sets goals, manages time and priorities and concentrates on the important issues.
Cognitive	Multi-tasking	The candidate should be able to work on several tasks in parallel
Behavioral-Cognitive	Flexible	The candidate has to be flexible in addressing the job requirements. This flexibility may relate to the working environment, customer, peers, etc. He/she should be able to adapt to the ever-changing situations without complaining.
Behavioral-Cognitive	Presentations	The candidate should be able to prepare and deliver effective presentations expressing ideas in a clear and convincing way, possess good public speaking

		skills and conveying the information.
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The above skills were grouped into four main categories: (1) Human interaction which includes the skills referring to the interaction with other people (i.e. employees, customers, peers, etc.) team player; human relations; presentations; service oriented and expressive. (2) Task interaction which includes the skills that are necessary for performing the task and working in a computerized environments and performing the required tasks; can-do attitude; analytical and organized. (3) Organizational interaction which includes the skills that are needed for proper functioning in the organization: work under pressure; multi-tasking and business oriented and (4) Common or general skills which include the general skills needed for proper functioning in all the above three categories: independent and flexible.

When analyzing the three sets of jobs' advertisements in Israel, some minor fluctuations can be observed. The most important group is the human interaction which appears in 35-40% of the advertisements. The second group is the task interaction that appears in 23-30% of the advertisements. The third and fourth places are almost identical, organization interaction with 16-19% of the advertisements and the common skills with 15-20% (see Figure 2). A possible explanation to the importance of the human interaction stems from the enormous change the software industry has

gone through in the last three decades. Originally, the IT peoples' most important qualifications were related to their technical capabilities. However, with the rapid technological developments and the pivotal role computers play in the organizational success and development, these qualifications have changed. Currently the IT department's employees are involved in many of the organizations' activities, communicating with users across all functional units. This type of collaboration required excellent communication and presentation skills.

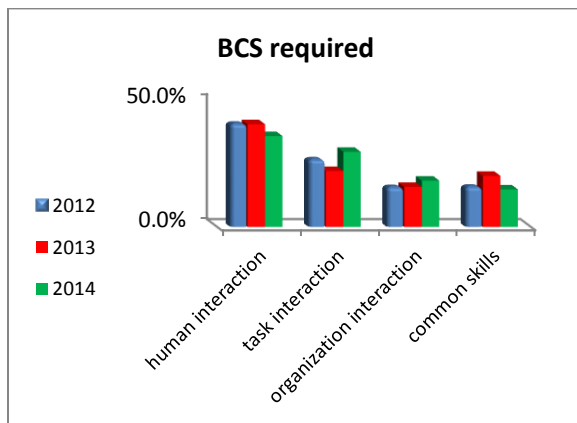


Figure 2: Number of advertisements per skills categories

Due to the elevated complexity of modern software based projects, developers have to work in teams. This represents an additional set of BCS such as being able to perform well as part of a team, listen, provide and accept constructive feedback and exhibit excellent inter-personal relations. Furthermore, new agile development methodologies such as Scrum stress fast functionality delivery over heavy

documentation. This is achieved following a rapid iterative process that quickly delivers a working version of the software being developed [32] and required excellent interpersonal traits. This may explain the large difference between the human interactions BCS to the other ones.

An additional analysis relates to the internal proportion of the skills among the ads of the two types of hire. It turns out, that although only a small fraction of the outsourcing ads require BCS, the proportion is very similar to the one in the direct hire ads (Figure 3).

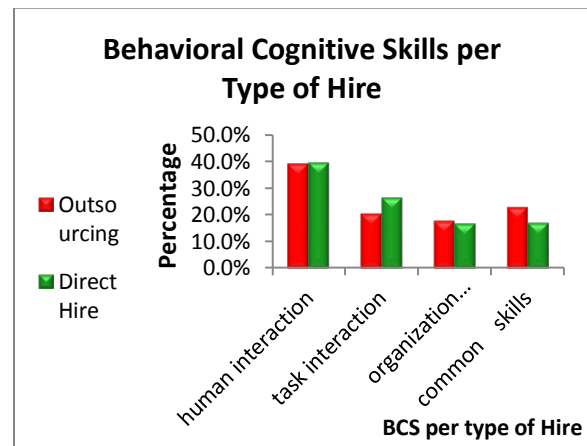


Figure 3: BCS per type of hire

The last stage of the study relates to a comparison of the BCS required by the Israeli market (calculated as the average of the three samples) to the BCS required by the US market as can be seen in Figure 4. While in the US the human interaction BCS were required by 45.8% of the ads, in Israel these skills were required by 39.6%. On the other hand the task interaction skills were required by 26.5% of the ads compared to

21.5% in the USA. The Organization interaction skills are very close with 17.4% in the US compared to 16.8% in Israel. And the common skills were required by 15.3% in the US compared to 17.2% in Israel.

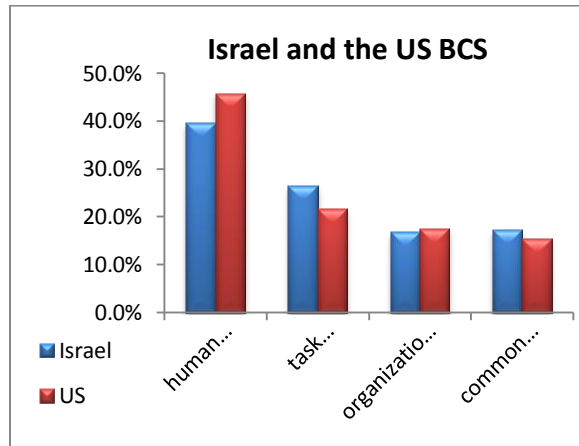


Figure 4: Israel and US BCS

The most important result of the study is the unbiased understanding of the market requirements regarding BCS. The fact that about 40% of the BCS advertisements required human interaction skills is very significant although understandable. This supports previous findings [13, 14, 15, 23] to name just a few, however the importance of this study is in the concrete figures it produced by relating to a real market situation. The growing autonomy of the modern employee [33, 34] can be used to explain why the task interaction skills appeared in over 20% of the BCS advertisements. This growing autonomy is due to economic pressure and the need to be more efficient which leads employers to hire employees that can deliver with minimal supervision. Organizational skills (roughly

15% of all BCS ads) are important mainly for the jobs that relate to business type systems. This supports the IS 2010 [7] which defined a requirement for 'Business Fundamental'.

C. Implications to academic teaching programs

Despite the growing understanding among IT educators as regards to the importance of developing BCS for the vocational lives of the IT graduates, there is a lot to be done in the academic curriculum regarding these issues. Informal talks with IT educators reveal that some of them implement teaching interventions to nurture these BCS but feel that there is much more to be done. As a direct consequence of this study, some courses' structures were modified. An example of such intervention is a Software Analysis and Design workshop (a 3rd year course) that employs team based projects in which the students have to study a real client's problem, design and provide a solution for it. During the project, the students have to work in teams, which enables them to practice and develop their human interaction and communication skills. In addition, they have to present their product to the client, which is intended to strengthen their presentation capabilities. To enhance their critical thinking capabilities and ability to provide effective feedback, they are also engaged in peer assessment. However, in spite the changes already introduced we believe that additional activities that might nurture the development

of BCS among IT students that are required by the industry have to be intertwined in the IT curriculum from the first study year.

We suggest that the following interventions should be employed in the IT curriculum:

Include team-based assignments right from beginning of academic studies. In the basic programming courses, engage the students in small programming projects in which they will employ teamwork and peer assessment. After the first experience, there should be a class discussion in which the student will reflect on the process and internalize its benefits.

Later on, to develop their communications skills in general and their presentation skills in particular, the students will be required to defend their solution while elaborating on its uniqueness in front of the whole class.

To convey the importance of BCS, educations should assign a relative weight to each skill while assessing the students' works. They have to relate to aspects such as simplicity, creativity, originality, and not only focus on the technical capability of the student.

V. CONCLUDING REMARKS

The results obtained from this study revealed that the IT graduates' BCS profile as represented by the industry requirements has gone through a big alteration. Over a decade ago, during the hiring process, the focus was mainly on technological skills. Over time, the importance of BCS increased

and currently the BCS are equally important as technological skills in assessing the future employee success.

The study results emphasize the conceptual shift that occurred during the last decade regarding the relative importance of the BCS for IT professionals. This conceptual shift is fueled by the increasing importance of IT and the fact it touches and influences so many fields. Furthermore, due to the role it plays, IT has become a vital component in every business from large multi-national corporations to small, one person companies. The steady increase in competition and the economic pressure pushes organizations to improve productivity and enhance end user support. This is usually done by implementing additional information systems and is the explanation for the vast amount of money invested in such systems. As a result a larger percentage of employees have to use applications in their daily activities. The IT professionals, who act as the technological knowledge brokers, and bridge the gap between technology and business, have to successfully communicate with all organizational levels. This partially explains the importance of the human relations competencies for IT professionals. In addition as the developed applications increase both in size and complexity, joint development efforts are required. Being able to work as part of a team, accept and provide constructive feedback and take the initiative to get things done are extremely vital and

extend the importance of communication and human relations competencies.

The changes in the extent and complexity of software packages nowadays, necessitate possessing of good interpersonal and team based skills. Moreover, even new working styles such as the agile development methodologies emphasize the importance of human interaction. We suggest that the obtained results should be taken under consideration by academic programs that qualify IT graduates and modify their learning programs to include the necessary modifications that will address the IT market needs, especially related to BCS.

REFERENCES

- [1] Joseph, D. Ang, S. Chang, R.H. and Slaughter, S.A . (2010). "Practical intelligence in IT: assessing soft skills of IT professionals", *Communications of the ACM*, 53 (2), 149-154.
- [2] Ang, S. and Slaughter, S. A. (200). "The missing context of information technology personnel: A review and future directions for research". In *Framing The Domains of IT Management: Projecting The Future From The Past*, (Pinnaflex Educational Resources, Cincinnati) 305-328.
- [3] Enns, H.G., Ferratt, T.W. and Prasad, J. (2006). "Beyond stereotypes of IT professionals: Implications for IT HR practices". *Communications of the ACM* 49 (4), 105-109.
- [4] Tobin, P. (2006). *Managing Ourselves - Leading Others*". ICCEL2006, *Inspiring Leadership: Experiential learning and leadership development*. Vol.2, 36-42.
- [5] A. Roan, A. G. Whitehouse. (2007). "Women, information technology and waves of optimism: Australian evidence on mixed-skill jobs". *Work and Employment*, 22(1), 21–33.
- [6] J. Gorgone, G. B. Davis, J. S. Valacich, H. Topi, D. L. Feinstein, and H. E. Longenecker. (2003). "IS 2002 Model Curriculum and Guidelines for Undergraduate Degree Programs in Information Systems". *The Communications of the Association for Information Systems*, 11, article 1.
- [7] H. Topi, J. S. Valacich, R. T. Wright, K. Kaiser, J. F. Nunamaker, J. C. Sipior and G. de Vreede. (2010). "IS 2010: Curriculum Guidelines for Undergraduate Degree Programs in Information Systems". *Communications of the AIS*, 26(18).
- [8] J. Flynn, T. R. Valikoski and J. Grau. (2008). "Listening in the Business Context: Reviewing the State of Research". *The International Journal of Listening*, 22, (2008): 141–151.
- [9] A. Fisher. (2007). "The Trouble with MBAs". *Fortune International*, 155(7), 33–34.

- [10] J. Cappel. (2002). "Entry-level IS job skills: A survey of employers". *Journal of Computer Information Systems*, 42(2), 76–82.
- [11] A. Faheem. (2012). "Software Requirements Engineer: An Empirical Study about Non-Technical Skills". *Journal of Software*, 7(2), 389–397.
- [12] C. Bishop_Clark. (1995). "Cognitive style, personality, and computer programming". *Computers in Human Behaviour*, 11. 241-260.
- [13] O. Hazzan and J. Kramer (2007). "Abstraction in Computer Science & Software Engineering: A pedagogical perspective". *System Design Frontier Exclusive Frontier Coverage on System Designs*, 4(1), 6–14. Retrieved from http://edu.technion.ac.il/Faculty/OritH/HomePage/FrontierColumns/OritHazzan_SystemDesigFrontier_Column5.pdf
- [14] S. Gillard. (2009). "Soft Skills and Technical Expertise of Effective Project Managers". *Issues in Informing Science and Information Technology*, 6, 725. Retrieved from <http://iisit.org/Vol6/IISITv6p723-729Gillard599.pdf>
- [15] L.F. Capretz, and F. Ahmed. (2010). "Making sense of software development and personality types," *IEEE IT Professional*, 12(1), 6-13.
- [16] B. Sampson. (2007). "Get with the project". *Professional Engineering*, 20(12), 41–42.
- [17] P. G. W. Keen. (1981). "Information systems and organizational change". *Communications of the ACM*, 24(1), 24–33.
- [18] M. J. Earl, B. Edwards, and D. F. Feeny. (1996). "Configuring the IS Function in Complex Organizations". In Earl, M. J. (Ed.) *Information Management: The Organizational Dimension*. 201–230. Oxford. University Press.
- [19] E. Trauth, D. Farwell and D. Lee. (1993). "The IS Expectation Gap: Industry Expectations Versus Academic Preparation". *MIS Quarterly*, 17(3), 293–303.
- [20] D. Lee, E. Trauth and D. Farwell. (1995). "Critical Skills and Knowledge Requirements of IS Professionals: A Joint Academic/Industry Investigation". *MIS Quarterly*, 19(3), 313–340.
- [21] T. Richards, R. Yellen, L. Kappelman and S. Guynes. (1998). "Information Systems Manager's Perceptions of IS Job Skills". *Journal of Computer Information Systems*, 38(3) 53–57.
- [22] D. Young. (1996). "The Relative Importance of Technical and Interpersonal Skills for New Information Systems Personnel". *Journal of Computer Information Systems*, 36(4), 66–71.

- [23] C. R. Woratschek and T. L. Lenox. (2002). "Information Systems Entry-level Job Skills: A Survey of Employers". In The Proceedings of the Information Systems Education Conference 2002, 19. San Antonio.
- [24] D. Zielinski. (2005). "Soft skills, hard truths". Training, 42(7), 18-22.
- [25] Sukhoo, A., Barnard, A., Eloff M. M., van der Poll, J. A., & Motah, M. (2005). "Skills in Software Project Management". Issues in Informing Science and Information Technology, 2, 691–704.
- [26] R. Bancino and C. Zevalkink. (2007). "Soft Skills". Association for Career & Technical Education. Retrieved from: <https://www.acteonline.org/WorkArea/DownloadAsset.aspx?id=3073>
- [27] L. Bailey and G. Stefanizk.(2002). "Preparing the information technology workforce for the new millennium". ACM SIGCPR Computer Personnel, 20(4), 4–15.
- [28] C. L. Noll and M. Wilkins (2002). "Critical skills of IS professionals: A model for curriculum development". Journal of Information Technology Education, 1(3), 143–154.
- [29] Stader, T. "State Farm Insurance Information Systems Student Recruiter, Interview", Northwestern State University, September 24, 2004.
- [30] J. Russell, B. Russell and W. Tastle. (2005). "Teaching Soft Skills in a System Development Capstone Course". Information Systems Education Journal, 3(19).
- [31] K. A. Neuendorf. (2002). Content analysis guidebook. Sage Publications Ltd
- [32] K. Schwaber. (2004). Agile project management with Scrum. Redmond, Wash.: Microsoft Press.
- [33] K. Martin and R. E. Freeman. (2003). "Some problems with employee monitoring". Journal of Business Ethics 43(4), 353-361.
- [34] F. Hairi, B. M. Ahmad Toe, and C. W. Razzaly,(2011). "Employers' perception on soft skills of graduates: a study of Intel elite soft skill training," In International Conference on Teaching and Learning in Higher Education, Melaka, 8.



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