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Factors Influencing Hiring Of Graduates for Information Technology Projects

OmarHaddad[1], Mohamad Saouli[2], Bhaskar Sinha[3]
[1]*Argosy University, Orange, California, USA*
[2]*DeVry University, Long Beach, California, USA*
[3]*National University, San Diego, California, USA*

ABSTRACT*:This study focuses on determining a working 'selection criteria model' that will help Information Technology (IT) companies choose the right candidates to work on their IT projects in areas such as system design, requirement gathering and management, project management, systems analysis, etc. The studyanalyzesthe current perceptions in the IT industry and atuniversities that prepare students to seek careers in IT projects,bysurveying IT professionals and university professors, to better understand the selection process decision factors.This research will help candidates identify where the focus should be, such as the candidates' Grade Point Average (GPA), academic standing, experience, and soft skills, such as working in teams, leadership skills, communication skills, and problem solving and decision-making skills. Thisstudy also addresses demographic information as well as the technical skills of a candidate that are important to companies. The university professors' input and the IT professionals' input regarding potential candidates can be integrated through university career services and consulting services as well as talent acquisition providers to define students' criteria selection model for collaboration on IT projects between universities and the industry.Moststudies in the literature regarding university-industrycollaboration focus on the overall institutional capability and not on the candidates themselves.To define a working criteria selection model for university and industry collaboration for candidates to work on IT projects, this research addresses the research questions and identifies the dependent and independent variables.Mixed research design method wasused to conduct comparative and data analysis. The researchers used mixed closed and open-ended survey questions. Descriptive statistics is used to calculate the averages of the three main variables: student's attributes, soft skills, and technical skills. The means were used to identify the top key attributes to identify and select graduate candidates to work on IT projects and identify the importance of those skills. An independent samples t-test was used to test whether or not there is a significant difference between a manger's perception and a professor's perception in selecting graduate students to work on IT projects.*

Keywords: *Collaboration, employment status, employment type, experience, grade point average, information technology, professional experience, SPSS.*

I. Introduction

Developing a model for recruiting the right university graduate candidates to work on company IT projects is time consuming, costly, and may require multiple iterations to have a good and working model. Due to recent economic challenges and globalization, investing in multiple iterations to come up with a working model for the IT industry is expensive. As a result, companies are interested in having a model that works and requires limited resources to manage the effort due to the scarcity of the resources at hand. Consequently, there is a need for collaboration between industry and academia to improve graduate recruitments.The literature is replete with studieshighlighting the need for industry-academic collaboration in hiring skilled employees. Research institutions are forced to develop specific strategies of cooperation to respond to the challenges of increasing competition. The stronger the competition, the more crucial it is for research institutions to join forces with partners to reinforce themselves [1].University-Industry Collaboration (UIC) has existed for many years in the form of internships and faculty exchanges [2], but recent rapid changes in the business environments have triggered more attention among researchers to find ways to increase productivity and efficiency [3-5]. The rising cost 0f skilled labor, knowledge, and research has demanded strong partnerships between universities and industries [6].University and industry partnership simply requires the interaction and coordination of the two entities to develop innovative and creative solutions that are commercially viable. Such collaborations are crucial to technology advancements that produce socio-economic and life-saving benefits.

University and industry collaborations help overcome challenges resulting from such partnerships and generates productive solutions [7]. According to Fact sheets and briefing from the White House Press Releases 2011 [8], President Obama signed the America Invents Act which is targeted to help universities and research labs in the United States of America convert ideas into working new models and products.

There are many forms of such collaborations, including internships and faculty exchanges. Another form that is widespread is the post-graduate distance-education based collaboration, which has not led to successful outcomes in most cases [9]. Consequently, selecting the right form of collaboration is crucial to successful project execution. In other situations, collaboration through e-learning and distance education has provided commercial opportunities for higher education providers to promote academic products and leverage them for potential financial gains [10].IT has evolved drastically over the past decades and finding the right person with the right skills is crucial and contributes significantly to the success of the company, especially when competition is fierce. Current educational curriculums built on legacy educational models and structural interviews conducted by IT companies do not consistently filter the right candidates who successfully work and contribute to IT projects. To select the right candidates, IT companies and universities need to be on the same level of understanding,asto how new graduates are evaluated to work on such projects. So, there is a need to bridge the gap on what is being taught in universities with the skills required by IT companies. This research paper determines some of the top skills needed to work on IT projects from IT professional's perspective as compared to that of academicians. This will help identify gaps and level-set both IT professionals and professors'perceptions of the skills needed to work on IT projects [11].

Companies face tough economic challenges; thus, finding innovative ways to increase productivity and efficiency is essential. Collaboration between universities and the industry may address these economic challenges if implemented correctly. There are many challenges that emerge from university and industry collaboration such as uncertainties of postgraduate coursework, uncertainties of distance education and e-learning, and uncertainties of skill shortages. The uncertainties of postgraduate coursework may result in uncertainty about target markets for which the courses are for and about outcomes and what can a graduate do. The uncertainties of distance education and e-learning signify the importance of investing appropriately in those programs. Graduate level courses need to be positioned in a way that addresses rapid social and economic pressures for a safe, ethical, competitive, productive, and sustainable production sector [9].Finding the right candidate to work on an IT project is usually considered at an institutional level, which is aligned with the university reputation, focus of study, and the quality of course material. The interview process from the industry perspective is usually structural because organizations are disparate to recruit young talents [11].

Collaboration between the universities and the industry comes with challenges, and to understand those challenges, this research attempts to identify the gaps from both university and industry perspectives. It has been suggested that these gaps be considered seriously for a successful partnerships between universities and the industry [6]. The industry is reluctant to contribute financially to the preparation of relevant and important training programs [6]. Funding college research is a key factor that needs to be considered in university and industry education; however, this is contingent on the willingness of businesses to invest in college research. According to the theory of academic capitalism, business-education collaboration can predict growth to secure external funds [10]. Study shows that business interest can be predicted to fund college research, and further adds that there is no statistically significant regression model to show that using collaboration and innovation challenges as variables, can help predict business interest in funding college research [12].

The industry does not take training provided by universities seriously and is not sensitive to the requirements of the training programs when selecting suitable, qualified, and interested candidates [6]. An important aspect of university and industry collaboration is research and knowledge exchange. An analysis conducted by [13] shows that doctorate and private sector programs are "increasingly driven by the development of more approaches to collaborative research and knowledge exchange", which can help in providing a better quality and sustainable doctorate courses. Action research, student interviews, and industry surveys suggest that postgraduate coursework can aid capacity building and facilitate technology transfer [14]. On one hand, the industry and its representatives may think that they know more and perhaps all the solutions, thus questioning the training programs formulated by the university. On the other hand, university trainers may not be sensitive to the industry's time constraints in improving human capital expertise, and the university may not be aware of the real problems faced by the industry as it may still be confined to its ivory tower characteristics (irrelevant programs), and the facilities may not be adequate to cater to the needs of the industry [6]. According to University of Alabama involved study (2011), multi-collaboration between industry and universities can help design safer homes through providing valuable research. An example of a successful university and industry collaboration is a study of the enterprise resource planning (ERP) systems, where the study explored the industry ERP training of employees new to ERP and compared with the training done in college ERP class.

University and industry collaboration allowed for hands-on experience in the classroom that mimics industry real world tools [15].Collaboration between universities and industries can be leveraged in many areas. An example of such collaboration is in the occupational health area where utilizing the university laboratory helped in finding a better ergonomic for MusculoSkeletalDisorders (MSDs) [16]. According to [17], study and analysis revealed that while collaboration with universities was the most common in their sample, biotech firms experiencing commercial success donot always get assigned a high value to such linkages.Even though partnering or collaboration between universities and industry has been in existence for many years, there has not been much research around finding a working model to define a selection criterion to work on IT projects for employers. Selecting a working model will help ensure successful collaboration and more positive outcomes.

This study focuses on finding a working selection criteria model that will help IT companies choose the right candidates to work on their IT projects in areas such as system design, requirement gathering and management, project management, systems analysis, and ad-hoc reporting just to name few. The research explores the university and industry perceptions through professors and IT professionals to bridge the gaps in candidate graduates in the selection process. It also identifies where the focus should be, such as candidates' GPA, academic standing, experience, and soft skills, such as working in teams, leadership skills, communication skills, and decision-making skills. The university professors' input and the IT professionals' input regarding potential candidates can be integrated through university career services and even consulting services to define students' selection criteria model for collaboration on IT projects between universities and the industry.Most of the university-industry collaboration literature's focus is on the overall institutional capability and not on the candidates themselves. To define a working selection criteria model for university and industry collaboration for candidates to work on IT projects, this research addresses the research questions by identifying dependent and independent variables. Cost, quality, and finding resources to work on IT projects are all crucial to a company's survival and competitive advantage. Selecting candidates based on feedback from professors is important because they are the ones who interact directly with the students; therefore, they should have the most valuable opinion of who should be selected to work on the project. IT professionals also add value to show their perspectives as they are the ones working directly with candidates on IT projects. There were many collaborative efforts and partnerships between universities and the industry that resulted in failures in some and had unfavorable outcomes in others [9].

This study offers advantages in helping hiring managers choose the right candidate for the job, reduced cost of talent acquisition, produce quality work, getting committed resources to work on IT projects, and getting innovative and creative solutions which can utilize advanced research methodologies and technologies.

II. Research Methodology

A mixed research design method was used to conduct comparative and data analysis of this research. Mixed survey questions using closed and open-ended questions were included in the questionnaires. The same survey questions were given to the IT university professors and the IT professionals, including managers, and the results were analyzed for significant differences and correlations. The goal of the comparison was to determine if there are differences between IT university professors' perceptions and IT professionals' perception. Critical attributes were grouped into three different variables: One is the student's attributes, the second is the soft skills, and the third one is the technical skills. IT experience was measured through technical skills. The survey was administered anonymously through Facebook and LinkedIn and serviced through Survey Monkey. It contained four sections. The first section contained demographic questions tailored to IT professors and IT professionals such as title, years of experience, highest degree of education, employment status, age, and gender.The second section focused on the student's attributes such as importance of GPA, GPA in core courses, professional experience, academic standing, employment status, subject matter expertise, and major/concentration. The third and fourth sections were taken from a Southern California company's data and others that focus on the importance of soft and technical skills in IT disciplines [11].Soft skills of the candidate, in this research, includes adaptability, positive relationship building, business acumen, coaching and mentoring, collaboration, continuous learning and improvement, decision-making, project management, analytical skills, problem solving, verbal communication, written communication, customer focus, quality, productivity, customer satisfaction, teamwork, acquiring technical skills and knowledge, leadership, listening, time management, and the ability to give and receive constructive criticism. Literature has ranked the top five soft skills [11,18]. This work also focuses on the technical skills such as data analysis, information protection, requirements analysis, software development tools, software architecture and design, software development lifecycle, software domain knowledge, software engineering processes, system integration, system analysis, ability to read, understand, and modify computer programs/applications written by others, ability to read design specifications for conversion to code, ability to read and write clear technical documentations, ability to code

programs/applications, ability to debug software programs/applications, knowledge of structured programming fundamentals, ability to implement programs/applications, knowledge of multiple programming languages such as C, C++, C#, Java, Perl, SQL, ability to adapt to new technology, ability to design user-friendly programs/applications, ability to research language syntax, and ranking the top five technical skills [11,18]. Demographics responses are based on nominal categorical data. Responses to students' attributes, soft skills, and technical skills are based on the Likert scale and are given a weight as

1=Strongly Agree, 2=Agree, 3=Neutral, 4=Disagree, and 5=Strongly Disagree.Top five soft and technical skills are ranked based on importance.

This study uses a purposeful sampling strategy where the researchers selected individuals and sites for the study because they formed an understanding of the research study [19]. The sample was randomly selected from IT Professionals and Professors population. Data was collected from a population that included but not limited to Software Engineer, Computer Scientist, Professor, Project Manager, Analyst, Technical Support Specialist, IT Specialist, Database Administrator, and Architect in Southern California. Data was collected about the professor's perception in the selection criteria to determine candidate students to work on IT project. The sample size is109 (n=109).The dependent variable is the selection of candidate student to work on IT projects and the independent variables are student's attributes, soft skills, and technical skills. Selecting the right candidate to work on IT projects depends on attributes, soft and technical skills that a student possesses.

Descriptive statistics were used to determine frequency and mean for the samples. There was one dependent variable, the selection of a graduate candidate to work on IT projects, and several categorical independent variables. An independent samples t-test was used to test the validity at $\alpha = 0.05$ significance level and accepting or rejecting a hypothesis. This level of significance is considered appropriate[20-21]. Descriptive statistics were used to calculate the average responses to all questions, and then the top five were identified from an IT professional's perspective and from a professor's perspective for research questions. The researchers compared the means for the survey results collected from university professors and compared them to the data collected from IT managers to test if there is a difference between the two responses. The soft skills average responses were also calculated from an IT manager's perspective. The researchers defined IT experience as measured by IT technical skills, and then calculated the averages in three different areas: student's attributes, soft skills, and technical skills. In a second iteration, the study separated the means based on IT managers, IT professionals, and professors.

The researchers used social media to target the population and the survey was administered on Survey Monkey. No Personally Identifiable Information (PII) was collected. College professors and IT professionals were coded to ensure anonymity. The researchers used an online survey sent to professors and IT professionals to gather their inputs.Results were captured in a few tools to accommodate the different formats of the research methods including but not limited to Microsoft Excel, Microsoft Word, and SPSS. The data collection procedures are valid because they have been used in other studies. To ensure validity of the instrument, a comprehensive instrument already validated for accuracy described in the literature was used [18]. Additionally, a pilot study was conducted to further test the validity of the instrument. The researchers also conducted a reliability analysis on the survey data collected using SPSS.

Results concluded and confirmed a reliability statistic of 0.913 using the Cronbach's Alpha test, greater than 0.7. This is a very acceptable test of reliability.

III. Findings And Results

The purpose of the study focused on finding a working selection criteria model to help IT companies choose the right candidates to work on their IT projects in areas such as system design, requirement gathering and management, project management, systems analysis, and ad-hoc reporting, just to name few. The researchers explored the industry and university perceptions through IT professors and IT professionals to bridge the gaps in candidate students in the selection process. The researchers identified where the focus should be such as the candidates' GPA, academic standing, experience, soft skills such as working in teams, leadership skills, communication skills, and decision-making skills. The researchers gathered demographic information as well as the technical skills that were important to companies in a candidate. The university professors' input and the IT professionals' input regarding potential candidates could be integrated through university career services, and even consulting services, to define students' selection criteria model for collaboration on IT projects between universities and the industry. A total of 109 respondents completed the survey of which 19 (17.4%) were managers, 27 (24.8%) professors, and 63 (57.8%) IT professionals, as indicated Managers could be combined with the IT professionals' population for a total population of 82 (75.2%) vs. professors' population of 27 (24.8%). This study analyzed five questions described as follows:

Research Question One (RQ1): What are the top five critical attributes an IT professional uses to select a new graduate candidate to work on IT projects?

The researchers defined the critical attributes from the survey questions and grouped them into three different variables: the students' attributes, the soft skills, and the technical skills. The researchers used a data filter to select only IT professionals. The descriptive command in SPSS was used to calculate average responses to all questions. The top five mean average values (all soft skills) were identified and noted as follows:

- Adaptability (M = 4.74),
- Positive Relationship Building (M = 4.67),
- Problem Solving (M = 4.66),
- Teamwork (M = 4.61), and
- Collaboration (M = 4.6).

Research Question Two (RQ2): What are the top five critical attributes a professor uses to select a new graduate candidate to work on IT projects?

Similar to RQ1, the researchers defined the critical attributes from the survey questions and grouped them into three different variables: the students' attributes, the soft skills, and the technical skills. A data filter was used to select only professors. The descriptive command in SPSS was used to calculate average responses to all questions. The top five mean average values (all soft skills) were noted as follows:

- Quality (M = 4.67),
- Teamwork (M = 4.67),
- Problem Solving (M = 4.63),
- Time Management (M = 4.59), and
- Acquiring New Technical Skills and Knowledge (M = 4.56).

Research Question Three (RQ3): Is there a significant difference between the professor's perception and the hiring manager's perception in selecting a new graduate candidate to work on IT projects?

An independent samples t-test was conducted to assess whether there were group differences between IT managers and professors in assessing the importance of student attributes of newly graduated students. The results in Table 1 indicate there was no significant difference in the assessment of student attributes between the two groups, $t(44) = -1.715$, $p = .093$. The significance level was greater than 0.05; thus, it was concluded that there is no significant difference between the professor's perception and the hiring manager's perception in selecting a new graduate candidate to work on IT projects.

Table 1: Student's Attributes Independent Samples T-Test

Independent Samples Test	**Levene's Test for Equality of Variances**		**t-test for Equality of Means**						
								95% CI of the Difference	
	F	**Sig.**	***t***	***df***	**Sig. (2-tailed)**	**Mean Difference**	**Std. Error Difference**	**Lower**	**Upper**
Student attributes equal variances assumed	**.048**	**.828**	**−1.715**	**44**	**.093**	**−.27959**	**.16305**	**−.60819**	**.04901**
equal variances not assumed			**−1.705**	**38.081**	**.096**	**−.27959**	**.16401**	**−.61159**	**.05241**

Next, an independent samples t-test was conducted to assess whether there were group differences between IT managers and professors in assessing the importance of soft skills of newly graduated students. The results in Tables 2 indicate there was no significant difference in the assessment of soft skills between the two groups, $t(44) = -.980$, $p = .332$. The significance level was > 0.05. Thus, it was concluded that there is no significant difference between the professor's perception and the hiring manager's perception in selecting a new graduate candidate to work on IT projects for the soft skills variable.

Table 2: Soft Skills Independent Samples T-Test

Soft Skills Independent Samples T-Test **Independent Samples Test**	**Levene's Test for Equality of Variances**		**t-test for Equality of Means**						
								95% CI of the Difference	
	F	**Sig.**	***t***	***df***	**Sig. (2-tailed)**	**Mean Difference**	**Std. Error Difference**	**Lower**	**Upper**
Student attributes equal variances assumed	**.770**	**.385**	**−.980**	**44**	**.332**	**−.10429**	**.10642**	**−.31876**	**.11018**
Equal variances not assumed			**−.942**	**33.065**	**.353**	**−.10429**	**.11076**	**−.32962**	**.12105**

Finally, an independent samples *t*-test was conducted to assess whether there were group differences between IT managers and professors in assessing the importance of technical skills of newly graduated students. The results in Table 3 indicate there was no significant difference in the assessment of technical skills between the two groups, $t(44) = -1.369$, $p = .178$. The significance level was > 0.05; thus, it was concluded that there is no significant difference between the professor's perception and the hiring manager's perception in selecting a new graduate candidate to work on IT projects for the technical skills variable.

Table 3: Technical Skills Independent Samples T-Test

Independent Samples Test	**Levene's Test for Equality of Variances**		**t-test for Equality of Means**						
								95% CI of the Difference	
	F	**Sig.**	***t***	***df***	**Sig. (2-tailed)**	**Mean Difference**	**Std. Error Difference**	**Lower**	**Upper**
Student attributes equal variances assumed	**.710**	**.404**	**−1.369**	**44**	**.178**	**−.21071**	**.15390**	**−.52087**	**.09945**
Equal variances not assumed			**−1.348**	**36.668**	**.186**	**−.21071**	**.15632**	**−.52755**	**.10613**

Research Question Four (RQ4): What are the top five soft skills IT managers look for, given the appropriate technical skills, in a new graduate candidate to work on IT projects?

The study used a data filter to select only IT managers. The descriptive command in SPSS was used to calculate average responses to all questions that pertain to soft skills. The top five mean average values were identified and noted as follows:

- Teamwork ($M = 4.74$),
- Collaboration ($M = 4.63$),
- Problem Solving ($M = 4.63$),
- Adaptability ($M = 4.58$), and
- Positive Relationship Building ($M = 4.58$).

Research Question Five (RQ5): How important is IT experience in the selection criteria of new graduates to work on IT projects?

The researchers identified IT experience as a measure of the technical skills variable. Using the means command in SPSS, the researchers looked at the averages for all questions that measured technical skills. In all cases, technical skills were rated in between the students' attributes and the soft skills; technical skills were rated higher than students' attributes but lower than soft skills. Additionally, the ratings of technical skills of professors were close to the ratings of IT professionals, 4.0829 compared to 4.0302, respectively. In a second attempt, the researchers separated these means based on IT managers, IT professionals, and professors. The

results also showed that technical skills were more important than students' attributes but less important than soft skills.

IV. Conclusions And Recommendations

Information Technology has evolved significantly over the past three decades and finding the right candidate with the right skills to work on IT projects is crucial to the success of companies, especially when competition is fierce. Current educational curriculums built on legacy educational models and structural interviews conducted by IT companies often does not filter the right candidates to successfully work and complete IT projects. To select the right candidates, IT companies and universities need to be on the same level of understanding as to how student candidates are evaluated to work on such IT projects. So, a systematic approach is needed to bridge the gap between what is taught in universities and the skills required in the industry by IT companies. This research determines and presents some of the top skills needed to work on IT projects from IT professionals' perception compared to perceptions of professors. This will help identify gaps and level-set both IT professionals' and IT professors' perception with regards to students' skills needed to work on IT projects [11].

This study focuses on finding a working selection criteria model that will help IT companies choose the right candidates to work on their IT projects in areas such as system design, requirement gathering and management, project management, and systems analysis. The researchers explored the industry and university perceptions through IT professionals and professors to bridge the gaps for the selection process. The focus areas were identified such as the candidates' GPA, academic standing, experience, soft skills, leadership skills, communication skills, and decision-making skills. Demographic information of candidates as well as the technical skills that are important to companies were identified. The university professors' input and the IT professionals' input regarding potential candidates can be integrated through university career services and even consulting services to define students' selection criteria model for collaboration on IT projects. Most university-industry collaboration literature focus on the overall institutional capability and not on the candidates themselves. To define a working selection criteria model for university and industry collaboration for candidates to work on IT projects, this research addressed the research questions and identified the dependent and independent variables as applied to the research objectives. The study used a mixed research design method to conduct comparative and data analysis with the mixed survey using closed and open-ended questions. The researchers gave the same survey questions to IT university professors and IT professionals including managers, and then compared the results to identify similarities and differences. The goal of the comparison was to determine if there were differences between their perceptions. An independent samples t-test was conducted to assess whether or not there is group differences between IT managers and professors in assessing importance of technical skills of newly graduated students. Other questions used descriptive statistics to compute the average to identify skills needed in graduate students to work on IT projects.

The top five attributes from an IT professional perspective to select a graduate candidate were Adaptability, Positive Relationship Building, Problem Solving, Teamwork, and Collaboration, in that order. These are all soft skills, which concludes that soft skills are more important than a candidate's aptitude and technical skills. From professors' perspective the top five attributes were Quality, Teamwork, Problem Solving, Time Management, and Acquiring New Technical Skills and Knowledge, in that order. These were also all soft skills. It is noted that Problem Solving and Teamwork were two common attributes.

V. Future Research Opportunities

This study produced some possibilities and opportunities for future research that would be a value-add in the literature on this topic. Some of these areas are as follows:

1. There were few limitations to the study as only Southern California was selected to conduct the research. This work could be extended in the future to expand the population sampling to a state-wide or even national-wide to see if there are regional or national differences.
2. The study was limited to IT discipline, which can be expanded to other similar technology or engineering disciplines.
3. The study used open-ended question which resulted in a lot of variations of responses. Some of these responses were no value-added data to extract conclusions. Future research could focus on closed-ended questions.
4. The study uses averages to identify the top important attributes, in which the researchers had to identify categories. A better method to do exploratory testing is to use Factor Analysis. Using this method, SPSS

will use all the questions in the survey and identify dimensions. Then the researchers can use the Eigenvalues to identify all the variables that will provide a better descriptive and analysis of the data.

5. The study showed the importance of soft skills, which were ranked higher than technical skills and student's attributes by both IT professionals and Professors in selecting candidates to work on IT projects. Currently, universities focus on technical skills, but need extend this to also focus on soft skills. Studies could be done to understand how to integrate these soft skills into the programs curriculums to better prepare the future workforce generation.
6. Future research should also consider new technologies emerging and disrupting traditional approach to learning. Critical to developing soft skills today, is the use of technology and multimedia, included within a Learning Management Systems (LMS). The use as an integrated system that facilitates course materials, connectivity with the participants, educators, trainers, and learners alike, affords them knowledge exchange, and many new features that provide breadth and depth that enhances learning. It is important to evaluate their values and impacts in developing soft skills and training the new workforce.

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