



# A PROPOSED FRAMEWORK FOR STANDARDIZING INFORMATION TECHNOLOGY PROFESSIONAL SKILLS & EVALUATION SCHEMA FOR NEW IT EMPLOYEES

Mohanad Adam<sup>1</sup>, Nor Zairah Ab Rahim<sup>2</sup> and Suraya Miskon<sup>1</sup>

<sup>1</sup>University Teknologi Malaysia, Johor Bahru, Malaysia

<sup>2</sup>University Teknologi Malaysia, KL, Malaysia

E-Mail: [m.adam.istc@gmail.com](mailto:m.adam.istc@gmail.com)

## ABSTRACT

Educational and training institutions must restructure themselves to better prepare the arriving new workforce. Nowadays, hiring the right IT candidate and assign them to the proper position is becoming more of a challenge to companies & business owners. One effective tool for restructuring the hiring process is standardizing IT skills set. This paper will shed some lights on some of the IT skills evaluation elements. Therefore, related cases have been selected & studied to determine some the main elements affecting IT skills evaluation. Thus the proposed framework came to existence. The Impact of an IT skill standardized framework will create a common base framework for educators, industry, and other stakeholders to develop jointly the educational and training tools necessary to prepare students and current workers for today's workplace challenges as well as those that lie ahead.

**Keywords:** standardizing, business owners, educators, employees, certifications, soft & hard skills, evaluating, and assessment.

## INTRODUCTION

Information technology skills has become a mandatory instrument in the modern workplace, as it will determine the level of IT skill for any effective participation in most careers [1]. This places pressure on both the industrial and educational sector to provide fresh graduates with an appropriate level of computer literacy. Today computer skills has moved beyond basic Microsoft Word processing and file management, to active directory administration for desktops, knowledge of spreadsheets, and profound Internet skills. Furthermore, the ability to master various IT skills packages is now an overflowing demand, to the point where basic computer literacy tends to mean absolutely nothing in the rapid and competitive market of this new era [2].

As most careers require some level of a combined hardware and software skills, perhaps we have reached the stage where IT skills takes on a more complex and significance form[3]. Therefore, skill standardization can provide a common language for education and business collaboration. By definition, skill standards are specifications of *"the level of knowledge and competence required to successfully perform work-related functions within an occupational cluster"* as defined by the National Skill Standards Act enacted in 1994 [4].

The issue here is that various industrial sectors can face harsh times during recruiting for new IT candidates where by evaluating their academic and professional certification isn't quite enough to determine their position and skills required to fulfill their duties in the digital workplace [5]. Therefore, having a standard and comprehensive IT skill set framework will aid in defining the professional job related knowledge, skills, and abilities required to succeed in any organization. The principals and techniques of IT skill set evaluation are the

fundamental and the core of basic IT employment hiring process as well as the most important and complex application that any hiring committee and employment expert needs to learn [6]. This paper is organized as follows. Section I discusses the research background. Section II presents the research methodology and the approach used to conduct the research. Section III will review related work cases and its main findings. Section IV explains the research analysis & derived elements based on the literature. Finally, the proposed framework derived by the elements extracted from related cases & conclusion in Section VI.

## RESEARCH BACKGROUND

The current employment market, is looking for new ways to utilize technology to serve its economic growth. In response to such pressure some universities are changing the traditional way of learning, the question is whether these academic institutes are willing to integrate IT into their teaching to complement other teaching and learning experiences which will be reflected subsequently on the level of their graduates IT skills [7].

Modern studies indicate that most competitive industrial nations have evolved a well-established professional skill standards system [5]. So why do so? This is due to when applying a standard IT skills Framework it will aid the organizations in filtering and measuring employee's true IT skill which in return will define and determine the ideal position fit for each relate IT vacancy [4]. Any failure in constructing a framework that can properly measures and authenticate the candidates skills credibility will introduce – at least in the long run - an unbalanced staffing structure of the organization if the un skilled person has been assigned to the most sensitive position and cause the company's performance level to



decline or even worse, to place the organization way out of the competition among other peers [8].

There are many benefits to IT skill standardization. First of all, companies will communicate their performance expectations to their employees [9]. Secondly, educational institutions will reform their curriculum to match the skills workplace needs [9]. Finally, skills gap between workplace expectation and student preparation can be closed [9]. Among the major stakeholders benefiting from IT skill standards are businesses, IT professionals, students, educators, and government policymakers. For IT skill standards to be effective, they must reflect the consensus of the industry professionals in the IT career field. To ensure the integrity, quality, and continuity of the skill standards, several objectives must be achieved [9]:

1. To produce the necessary and essential tools & protocols required to develop a comprehensive IT Skill Set evaluation framework.
2. To create a dynamic IT Skill-Set evaluation framework.
3. To ensure that IT Skill standard framework represents the basic needs of IT industries.
4. To achieve an IT skill standards framework that defines work duties in the context of the work setting.

Therefore, this research will investigate the necessary IT skill set evaluation tools & measurement that needed to formulate the basic rules and requirements in order to formulate a framework that will compare, analyze and suggest the best way to determine each candidate's skill eligibility. Adopting such framework will illustrate a high quality employment standardization process that will results in employees who are ready to occupy an effective position in the information based workplace [10].

The next section introduces the research methodology approach used to study the related cases followed by the research analysis & derived framework. The paper concludes with a summary of the findings and recommendations for future research.

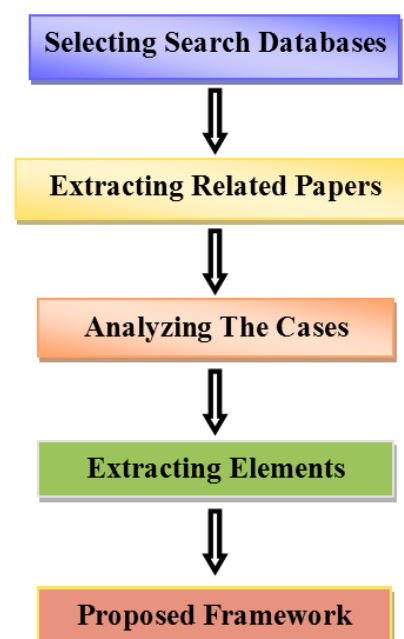
## RESEARCH METHODOLOGY

The focus of this paper is to create the proper mechanism to evaluate IT skills and produce a new framework for IT skills evaluation. Therefore, it becomes the motivation of this study to seek the understanding of its problem through reviewing various research approach, for seeking research findings & results [11]. Through review of previous works, we have noticed that some of the reviewed papers used the qualitative case study [12]. However, there are also research conducted in the field of information system context especially in the IT skills evaluation, using a combination of both quantitative and qualitative approaches, therefore it was necessary to

review both research approaches [11]. Moreover, reviewing papers of both methods would will provide an in depth data collection and analysis hence better understanding of the problem.

Selecting search databases was the first step in conducting this research and various scientific journals such as Science Direct & ACM Digital Library have been searched, focusing mainly on IT skills evaluation papers and cases. The second step was to extract the chosen papers, the papers have been chosen based on their level of influence on this paper's topic on IT, skills & evaluation. Additionally, the research was mainly focusing on conducting the search using selected keywords, such as: 'skills', 'evaluating', 'certifications' & 'information technology'. The third step was analyzing the cases and study them in order to understand the nature of each case and all aspects related to IT skills evaluation in general by reviewing retrieved papers. The forth step will be extracting elements affecting IT skills and analyzing them to determine which elements will be the corner stone for this paper proposed framework. The process of selecting the elements was based on three main criteria: the level of numerical iterations across the cases selected, level of impact on the IT industry, and its relevance and relationship to other elements, for example: soft skills vs. hard skills, certifications vs. tests. On that vein, the cross case analysis has been conducted among selected cases, hence elements have been extracted. Finally, those chosen elements contributed in constructing and deriving the framework to evaluate IT skills. This methodology of reviewing papers is considered dynamic, since IT skill evaluation and implementation will probably raise various issues that are complex to be discovered nor measured and understood without selecting the proper research method.

**Figure-1.** The research methodology phases in conducting the research.





## RELATED WORK

A review of previous approaches and frameworks that is related to IT Skill set evaluations adoption within organization will be discussed to permit this paper to be situated among other studies of IT skills evaluation, implementation and use. An inclusive research has been conducted across various IT skills based related journals & multiple research databases.

Moreover, preceding frameworks and models used in the area of IT skills will be discussed, along with its various implementation and use particularly from an organizational perspective. Hence, the objective of this section is to review and analyze how IT skills evaluation schema can be constructed & implemented and then generate a conceptual framework in the next section to be used in this paper.

### 1. Expanding Pathways to IT Careers the case of (ExPEDIATE) Project in West Virginia

The Expanding Pathways for Educational Development and Information Technology Experiences (Expedite) Project is making a smooth move to a data engineering (IT) vocation for understudies in West Virginia. This National Science Foundation supported venture united an auxiliary school framework, group and specialized school, college and organizations in the innovation business to make a model for tending to the becoming requirement for IT experts [13].

The expedite undertaking was intended to take care of the developing workforce demand for IT experts, and enhance the engineering training of understudies and teachers who set them up. In view of complete examination and an assessment of vocation aptitudes and workforce needs, the undertaking accomplices are upgrading current auxiliary and advanced education IT related projects [13].

They are creating and supporting explanation assertions between auxiliary school, junior college, and college. The venture group has created and executed a thorough IT temporary position/tutoring system for understudies, optional educators and school teachers. They have likewise created and are utilizing IT mindfulness materials to draw in and hold understudies to IT vocation ways. The group has made an IT vocation proceeding with training course for online spread to auxiliary school advisors and instructors [13].

The expedite task techniques are reproducible and adequately give pathways to auxiliary and post-optional understudies to learn IT abilities while presenting them to extending IT vocation opportunities [13].

Finding from this study shows that delicate abilities like cooperation, critical thinking, composed and verbal correspondence were the absolute most craved aptitudes. To address this need, the junior college and college workforce created a lattice of delicate aptitudes for

specialized courses to give the premise to an examination of understudy learning open doors in these zones. This hole investigation shows where delicate aptitudes are at present being tended to and where they are inadequate in the educational program [13].

Therefore, the drawn conclusion & findings shows that the students improved their understanding of IT, additionally they came to value IT knowledge and various practical experiences gained through their internship. On the other hand participating teachers also improved their understanding of IT through their fellowship. The findings also indicated that this comprehensive summer internship program was a success in constructing an online professional development course for teachers that reflect principles of effective adult learning, as well as establishing working partnerships between the private sector and educational sector to promote IT career opportunities [13].

### 2. A Proposal for Skill Evaluation Via Complex Tasks in Virtual Learning Environments the case of EDECOM-DevalSimWeb Training Program (MAKE IT SHORT)

The EDECOM-Devalsimweb Training Program in "Assessment and Development of Professional Skills in Higher Education". Said Training Program, expects to create, in last year understudies, five expert abilities which are viewed as transversal to assessment. It will done by means of their interest in e-evaluation forms. With a specific end goal to do a demonstrative evaluation of the understudies' aptitude level, the "EDECOM-Devalsimweb Skill Level" virtual yard was outlined [14].

This is a space through which the understudies will have the capacity to give a reaction to diverse circumstances/issues which are identified with the chose aptitudes [14]. Their reactions will be assessed by outside evaluators utilizing e-rubrics to focus their beginning expertise level [14].

**Table-1.** Definition of the skills, according to the Devalsim-Web Catalogue of Skills [14].

Skills	Definition
Analytical & Critical Thought	Acts systematically, establishes hierarchies and uses tools for analysis; questions the situations which arise and discusses the pertinence of the judgments in order to make decisions within his/her role.
Problem Solving	Identifies, analyses, builds criteria and applies knowledge when facing specific situations, makes decisions and evaluates possible risks.



Sense of Ethics	Acts responsibly according to universal axiological principles and respects diverse cultural contexts.
Decision Making	Acts opportunely, efficiently and efficiently, agilely and proactively; uses support from relevant information which facilitates the identification, understanding, evaluation and acceptance of risks in situations of uncertainty; chooses the best alternative via consultation with the most appropriate sources, comparing and contrasting them and integrating them.
Teamwork	Makes responsible commitments and collaborates with other people in the achievement of common objectives, shares resources and knowledge, harmonizes various interests, evaluates the opportunities and therefore contributes to a working environment which facilitates the implementation and development of tasks.

In this experiment a selective group of students were choosing by skill evaluation experts to participate in the initial skill evaluation for the participants in the EDECOM-DevalSim Web Training Program. The experts concluded that an external evaluator should revise the students' responses and use said responses to establish their initial skill level in each of the skills which was achieved [14].

### 3. Development of Malaysia Skills Certificate E-Portfolio: A Conceptual Framework

The objective of this study was to discuss the framework and the conceptual model in the development of an E-portfolio system for Malaysia Skills Certificate (MSC). E-portfolio is an instructional system that uses ICT-based E-learning. It has the capability of storing kinds of information in any digital form [15].

The electronic portfolio has many advantages compared to the printed portfolio such as, the ability to save and organize material more easily, sharing of information, enhances the professional skills, enhances the generic skills of graduates and facilitates the search for information [15].

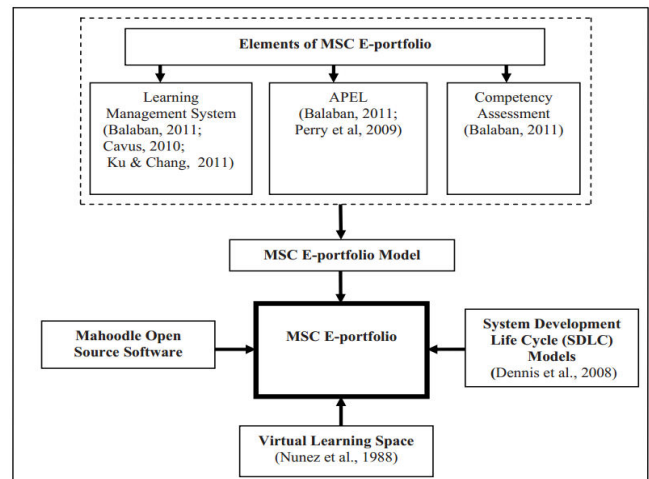


Figure-2. A conceptual framework of E-portfolio system extracted from [15].

Therefore, this study was conducted to produce an appropriate E-portfolio system for MSC to be applied in the vocational education in Malaysia. It is done to upgrade the existing skills training system, in order to enable the country to produce skilled work force that have more quality, highly knowledgeable, innovative and competitiveness [15]. The use of this E-portfolio appears to work only as a repository of database without connecting to the actual learning process. As a result, the E-portfolio could not achieve the actual goal behind implementing such system.

### 4. Gap of Proficiency For Skilled Workers And Employer Needs Towards Non-Technical Skills For Electronic Sector In Klang Valley, Malaysia

This study is emphasizing on the gap of proficiency for skilled workers and employer needs towards Non-technical Skills for electronics sector in Klang Valley, Malaysia [16]. This research is a quantitative research that mainly focuses on seven elements of Non-technical Skills which are; communication skills, creative thinking and problem solving skills, information management skills, leadership and organizational skills, teamwork skills, work attitudes, and personal traits and self-management skills [16].

Measuring the skill level of highly educated and knowledgeable technical workers who are able to use ICT are given grave consideration as Malaysia try to increase the number of skilled workers by the year of 2020. However, a challenging job market also requires employees to possess high level of creativity and innovativeness in the job [16].

There is a substantial gap between all Non-technical Skills proficiency on skilled workers and the Non-technical Skills needed by employer for their employees. This study suggest that the corporation should



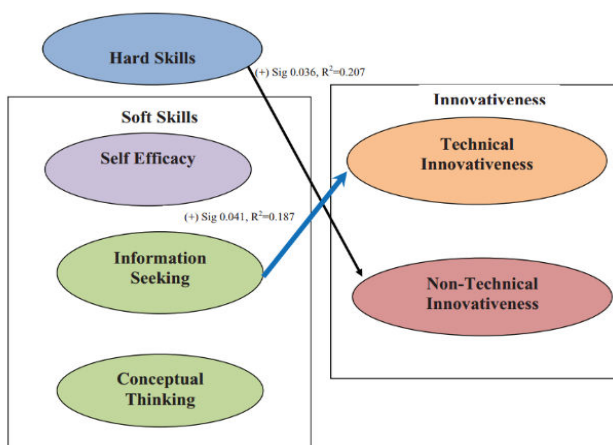


provide certified training which focus on enhancing the Non-technical Skills for the workers in the industry by using the National Dual Training System (NDTS)[16].

Consequently, the study shows that high demand of skilled workers not only depends on the technical skills but it also focuses on Non-Technical Skills. High proficiency in Non-Technical Skills is the treat to skilled workers who work in the challenging industry[16].

##### 5. Relationship Among Soft Skills, Hard Skills, and Innovativeness of Knowledge Workers In the Knowledge Economy Era

Knowledge economy is an economy based on creating, evaluating, and trading knowledge [17]. In a knowledge economy, labor costs become gradually less important and outdated economic concepts such as scarcity of resources and economies of scale [17]. The objective of this research was to develop a conceptual model which describes the relationship between the soft & hard skills of knowledge workers, innovativeness of knowledge workers in the context of knowledge economy in Indonesia [17]. This study shows that soft skills are personal aspects or attributes that enhance the individual's interactions and work performance. Dissimilar to hard skills, which are about a person's skills set and ability to perform a certain form of tasks or activities, soft skills are interpersonal and broadly applicable[17]. Furthermore, Well-educated and skilled individuals are essential for creating, sharing, spreading, and using knowledge effectively. The knowledge economy of the 21st century demands a set of new talents, which includes not only ICT skills but also soft skills as problem solving, analytical skills, group learning, working in a team based environment, and effective communication [17].



**Figure-3.** Conceptual Model Findings Extracted

from [17].

The main finding was that only information seeking soft skill that positively influenced technical

innovativeness and only hard skills that positively influenced non-technical innovativeness [17].

##### RESEARCH ANALYSIS & DERIVED ELEMENTS

In alliance with the related case works & information acquired through studying each case and trying to extract the findings and of each individually, we have extracted several elements that have played a major role in the classification & evaluation of IT skills, based on the three main criteria mentioned above which are the level of numerical iterations across the cases selected, level of impact on the IT industry, and its relevance and relationship to other elements. Derived main elements effecting IT skill evolution are listed in this table 2:

**Table-2.** Deriving the main elements related to IT skills evaluation.

Elements	Definition	Sources
<b>Business Owners</b>	Represents the various markets and industries or organizations.	(Darrah, Giorcelli, & Dodson, 2007)  (Nordin, Nasir, Noordin, & Buntat, 2013)
<b>Educators</b>	The academic sector which represents the universities, colleges and diploma institutes.	(Darrah, Giorcelli, & Dodson, 2007)  (Ibáñez, Saiz, & Gómez, 2014)  [15].
<b>Hard Skills</b>	Hard skills are teachable abilities or skill sets that are easy to quantify.	(Darrah, Giorcelli, & Dodson, 2007)  (Ibáñez, Saiz, & Gómez, 2014)  [15].  (Nordin, Nasir, Noordin, & Buntat, 2013)  (Hendarman & Tjakraatmadja, 2012)
<b>Soft Skills</b>	Subjective skills that are much harder to quantify. Also known as "people skills" or "interpersonal skills,"	(Ibáñez, Saiz, & Gómez, 2014)  [15].  (Nordin, Nasir, Noordin, & Buntat, 2013)  (Hendarman & Tjakraatmadja, 2012)
<b>Certifications</b>	Confirmation of certain feature or skill in an individual person, to conform proficiency.	[15].  (Nordin, Nasir, Noordin, & Buntat, 2013)
	Meeting that can be faced individually or	(Nordin, Nasir, Noordin, & Buntat,



<b>Interviews</b>	in a group to determine the criteria of a candidate.	2013) (Darrah, Giorcelli, & Dodson, 2007)
<b>Tests</b>	Oral or written form of evaluation.	(Darrah, Giorcelli, & Dodson, 2007) [15].

Table-2 describes the extracted elements that plays an important role in evaluating IT skills, which can be used to formulate this paper's Framework. However, some of the elements where more focused upon in the context of the related work cases. Taking certification for an example, nowadays obtaining a specialized certification in any IT fields from any world top IT solution companies like Microsoft & Oracle is considered an essential factor for any IT hiring process. Additionally, gaining the necessary hard & soft skills required for any IT job will present the candidate or employee as a dynamic team player whom will have better chances in any hiring decision. Occasionally, employers are well informed of the job description and criteria needed to fill any IT job, still, working in or with a team from a different cultural back ground will require more personal criteria, behavior, attitude and ethics that has to fit in the organization's own code of conduct.

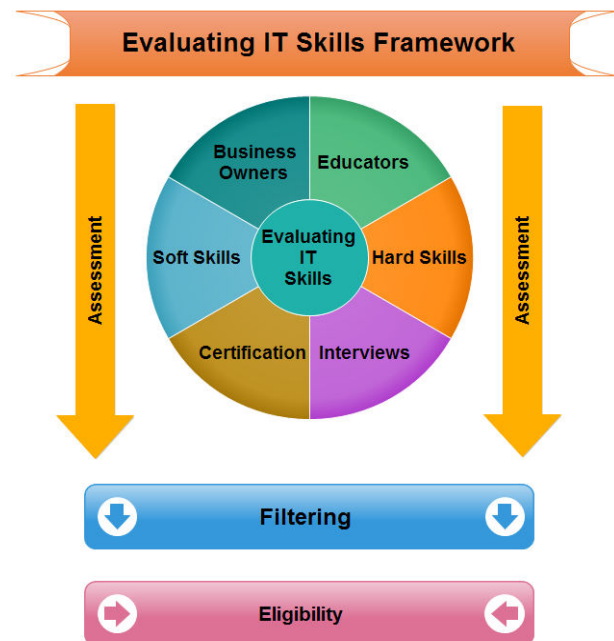
Furthermore, academic Institutes like Colleges and universities plays a major rule in preparing their students for the real and practical work field, it's unfortunate that most academic institute can't emphasize and focus enough on the practical part of the field or profession, it will only be focused upon during the practical training period prior to graduation, however this gap could have been bridged if the practical training was conducted in parallel or at least semi-annually in order to prepare the new work force for the rapid changing IT market.

## PROPOSED FRAMEWORK

Earlier in this paper, certain cases have been highlight and analyzed, with the data obtained from the analysis of the relevant cases in the earlier section a conclusion has been reached, therefore the following elements are now considered quintessential for the proposed framework:

1. **Business Owners:** represents the various markets and industries or organizations.
2. **Educators:** the academic sector which represents the universities, colleges and diploma institutes.
3. **Hard Skills:** Hard skills are teachable abilities or skill sets that are easy to quantify, like: proficiency in a foreign language, a degree or certificate, typing speed, machine operation, computer programming ... etc. These hard skills are easy for an employer or recruiter to recognize.

4. **Interviews:** An interview is a meetings and discussion between two or more individuals where inquiries are requested by the questioner to address specific issues or to obtain definite information from the interviewee.
5. **Certification:** a process of validating certain professional characteristics in an individual candidate. This validation is subject to an external review or an assessment often through examination, to determine the qualification of a candidate to execute certain task or job.
6. **Soft Skills:** on the other hand, are subjective skills that are much harder to quantify. Also known as "people skills" or "interpersonal skills," soft skills relate to the way you relate to and interact with other people, like: teamwork, communication, flexibility, patience, persuasion, time management, motivation etc.



**Figure-4.** A derived conceptual framework for evaluating IT Skill Set.

However those six main derived elements will be subjected to a process of an assessment, filtering & finally eligibility. Where:

1. **Assessment:** is the process of measuring the knowledge & skill of an individual, in this case all the derived elements in the framework. The candidate should be evaluated firmly according to the above elements and criteria in order to place his/her applicant in the flirting process.
2. **Filtering:** is process where new employees' applications will be sorted and prioritized according



to its score in addressing the required criteria needed for the job.

3. **Eligibility:** is the final stage to select the best fit & qualified employee to the vacant job according to his/her level or score in the filtering process.

Those three combinations will work as a combined toll that can ensure the organization valid choice in selecting the right candidate [18]. The above elements embedded in the proposed framework of IT skill set evaluation are the fundamental and the core of basic IT employment hiring process as well as the most important and meaningful application that any hiring committee & employment expert needs to learn.

A comprehensive research on the required tools is needed to develop an IT skill standard that will perfectly insure the utilizations of technical and non-technical skills among the staff and employee of local organizations. First of all, it will provide the company with a comprehensive framework that will ensure the quality of the employee's IT skills. Second, the study will be beneficial to local leading companies in the field of IT in general. Third, the study will be significant to the policy makers of the organization's top managers, regarding the selection of the best candidates, which possess the ability to recognize any task giving and executing these tasks with unique sets of skills that will insure the ultimate outcome and result of any projects at hand [19].

## CONCLUSION

IT skill set evaluation is an essential issue whereby it's related to wide IT career clusters & representative job titles, related by close association with a common set of technical skills, knowledge, and abilities [19]. Based on the cases that have been studied in this paper, the proposed framework consist of six main derived elements which are: Educators, business owners, hard skills, soft skills, employees & tools and kits. By applying such framework the evaluation process will be easier more smother, accurate and professionally acceptable, whereby employers will screen all aspects before reaching their final decision [20].

To emphasis more on the importance of having standard IT skills evaluation framework, the Technology Association of America (ITAA) at present evaluating 342,000 unfilled IT occupations. ITAA additionally reported that in the following seven years, a million new IT specialists will be required in the U.S., yet under 25,000 software engineering graduates enter the work constrain every year. Coupled with that disturbing reality, the people born after the war who are innovation experts are presently beginning to resign, and there will be a real setback in the general IT workforce.[13].

IT skill set evaluation is an essential matter whereby it's related to wide IT career clusters & representative job titles, associated with a common set of

technical skills, knowledge, and abilities [5]. In the nearby future, giving to the initial findings in the analysis section this research will be approached closely via extensive interviews with local leading organizations as it will try to explore & reflects how IT skills is organized today, especially among technical & non-technical representative job titles in the current competitive market.

The impact of an IT skill standardized framework will create a common base framework for educators, industry, and other stakeholders to develop jointly the educational and training tools necessary to prepare students and current workers for today's workplace challenges as well as those that lie ahead [9].

This paper will also be used as input to construct a comprehensive research intended to validate the IT skills evaluation; results of which will yield insights on the relative importance of the IT skills mainly in the process of hiring new employee. Furthermore, this proposed framework will improve the information technology workforce, increase the potential cooperation between education and business, and establishing criteria and standards for assessment, certification, compliance, and degrees [21]. Therefore, among stakeholders benefiting from this proposed framework are businesses, IT professionals, students, educators, and government policymakers.

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