A Study on Software Engineers' (SE) Career Development

Introduction

The software engineer profession is one of the America's highest paying professions. It gained gigantic recognition globally in the recent years. Numerous qualified professionals have been sourced from a country to another to perform the particular engineer's specialized tasks. Due to the dynamics of local labor markets and increased competition among government contractor firms, fears of unemployment arose. Software engineer professionals were pressured on further improvement of their credentials. News reports on high standards and present joblessness affects graduates.

This paper aims to elaborate on the present-day status of software engineering by resolving the predicament on government contracting firms' suitable action to address employment issues.

Assumptions

Local government efforts are insufficient. Moreover, the government, its contractors and private firms need to develop staffing stratagem to provide flexibility in requiring and evaluating job suitability of this occupation.

Review of Related Literature

By definition, the local labor markets are geographic areas within in which transactions between buyers and sellers of labor are situated and occur on a regular basis. Economists model these dealings as set of labor supply and demand curves. Moreover, it is the area bounded by the commuting radius around a district of concentrated employment opportunities. This could be the current job market. Commuting is essential in local labor market for it affects supply chain and distance. There are two types of labor markets namely: regional and local. Both are distinguished by physical distance, travel costs, economic opportunities, communication barriers and travel time. Also, there noticeable disparities in space variables such as wages, job growth, unemployment rates, participation rates of sexes, partition of workers by gender, educational attainment of the workers, age group and occupational as well as skills structure. In labor market study, it is imperative to understand its drives on growing, promising and shrinking fields with respect to job seekers, availability of jobs, work qualification and employers system of hiring. Local labor market is unique per community based on service delivery areas of key agencies, city or county lines, areas served by public transportation and others. When local area is characterized indefinitely, it may mask crucial dissimilarities within the area. Via defining the local labor

market too closely, risks losing employment opportunities in the region.

Software engineering is the application of a systematic, disciplined, quantifiable approach to the development, operation and maintenance of software. The discipline of software engineering encompasses knowledge, tools, and methods for defining software requirements and performing design, construction, testing and other management tasks. It draws on knowledge from various fields such as computer engineering, computer science, management, mathematics, project management, quality management, software ergonomics and systems engineering among others. Based on literature, there is a 60 year time line involved in the software engineer history. It stared in 1940s, when the first computer literates wrote machine code manually. By 1950s, its early tools were created such as assemblers, interpreters and compilers. In 1968, the term software engineering was popularized by NATO Chairman F.L. Bauer at the Software Engineering Conference held in Garmisch, Germany. Also, the 2nd generation of optimizing compilers, inspections and other tools were generated. Unix, code repositories, mini computers and minute business software were made is the 70s.Personal computers and workstations were brought about in the 80s. In the 90s, object oriented programming and agile processes gained

mainstream acceptance. The WWW and laptop heightened software recognition. The 2000s started with managed code and interpreted platforms such as Java, dot NET, Ruby, Python and PHP. Offshore outsourcing changed the nature and focus of software engineering careers. The standard occupational description for computer software engineer is as follows. Develop, create, and modify general computer applications software or specialized utility programs. Analyze user needs and develop software solutions. Design software or customize software for client use with the aim of optimizing operational efficiency. May analyze and design databases within an application area, working individually or coordinating database development as part of a team. The latter is for application. On the other hand, computer software engineer for systems category description bears research, design, develop, and test operating systems-level software, compilers, and network distribution software for medical, industrial, military, communications, aerospace, business, scientific, and general computing applications. Set operational specifications and formulate and analyze software requirements. Apply principles and techniques of computer science, engineering, and mathematical analysis. Employers’ usual skill requirements are: analyzing needs and product requirements to create a design, using mathematics to solve problems, utilizing scientific rules and methods to solve problems, writing computer

programs for various purposes, determining causes of operating errors and deciding what to do about it, understanding the implications of new information for both current and future problem solving and decision-making, talking to others to convey information effectively, using logic and reasoning to identify the strengths and weaknesses of alternative solutions or conclusions, understanding written sentences and paragraphs in work related documents and considering the relative costs and benefits of potential actions to choose the most appropriate one.

In 2004, the U. S. Bureau of Labor Statistics (BLS) counts 760,840 software engineers. This body of governance classifies computer software engineers as a subcategory of computer specialists along with occupations such as computer scientist, programmer, and network administrator. The BLS classifies all other engineering disciplines, including computer hardware engineers, as engineers. In 1998, the prestigious US Naval Postgraduate School (NPS) established the first doctoral program in Software Engineering in the world. Most software engineers work as employees or contractors in businesses, government agencies and non-profit organizations. Minor population of software engineers are freelancers.

Software engineering is a young discipline, and is still developing. The directions in which software engineering is developing include these soft wares: Aspects help software engineers deal with -ilities by providing tools to add or remove boilerplate code from many areas in the source code, Agile software development guides software development projects that evolve rapidly with changing expectations and competitive markets, Experimental software engineering is a branch of software engineering interested in devising experiments on software, in collecting data from the experiments, and in devising laws and theories from this data, Model Driven Software Development uses (both textual and graphical) models as primary development artifacts. By means of model transformation and code generation a part or complete applications are generated, Software Product Lines is a systematic way to produce families of software systems, instead of creating a succession of completely individual products.

Computer software engineers are projected to be one of the fastest-growing occupations from 2004 to 2014. Rapid employment growth in the computer systems design and related services industry, which employs the greatest number of computer software engineers, should result in very good opportunities for those college graduates with at least a bachelor’s degree in computer

engineering or computer science and practical experience working with computers. Employers will continue to seek computer professionals with strong programming, systems analysis, interpersonal, and business skills. With the software industry beginning to mature, however, and with routine software engineering work being increasingly outsourced overseas, job growth will not be as rapid as during the previous decade.

Median annual earnings of computer applications software engineers who worked full time in May 2004 were about $74,980 while computer systems software engineers who worked full time in May 2004 were about $79,740. According to the National Association of Colleges and Employers, starting salary offers for graduates with a bachelor’s degree in computer engineering averaged $52,464 in 2005; offers for those with a master’s degree averaged $60,354. Starting salary offers for graduates with a bachelor’s degree in computer science averaged $50,820.

Statement of the Problem

Considering the dynamics of the local labor markets and ballooning competition for competent job candidates in the engineering market, how can government contracting firms develop staffing strategies that provide more flexibility in requiring and evaluating specific education and experience requirements?

Methodology

SE characteristics would be compared and contrasted according to current happenings in the Information Technology industry as a whole. From the latter, further examination of the profession could be employed via the breakdown of updated happenings and matters evolving SE. This would be done via SWOT. High lights based on the latter are collaborated to the possible public and private firms’ due actions to alleviate the current situation.

Analysis

A SWOT assessment involves the identification of the situation strengths, weaknesses, opportunities and threats. Happenings and issues are grouped with the use of a SWOT table at the succeeding page.

Strengths	***Weaknesses***
A number of vacancies *High compensation* *Competition at its peak could bring the best in SE professionals*	*There are talent shortages* *Countless personnel in the industry without engineering degrees & certification* *Competition could cause demoralization.*
Opportunities	**Threats**
Certification may enhance professional growth and career progression. **As technological advances in the computer field continue, employers demand new skills.** **Government contractor firms could develop programs**	The same certification may discriminate non-takers and those who failed. Those who were unable to adapt to swift changes could be unemployed and belittled. Students in the developed world fears outsourcing

To begin the discussion of strengths or advantages, the website Money Magazine and Salary.com rated software engineering as the best job in America in terms of growth, pay, stress levels, flexibility in hours as well as working environment, creativity, and how easy it is to enter and advance in the field in 2006. Even if SE is not for every one, professionals are needed virtually all over the globe. If an individual has the ability to design, develop and test computer programs, s/he could venture into telecommuting. This is employment though cyberspace. SE jobs would be delegated via the Internet and accomplished tasks would be given back by SE professional. Correspondence may be done through email, video & phone conference as well as chatting. In addition, practically all firms need SE personnel. One could also opt to be a freelancer or per project basis to be flexible enough by working for more companies. In terms of competition, SE students and professionals are now encouraged to improved skills.

For SE profession’s first identified weakness or disadvantage, the IT industry is inconsistent. Being side by side with demand strength, IT industry manifests inconsistency. In 2001, US software employment decreased harshly. Back in early 2003, students were warned that global off shoring trend would pull soft ware jobs out of developed countries. A vast percentile of

these undergraduates shifted into other courses. Come late 2003, SE jobs climbed and now near at its peak. There is no assurance that it would never fluctuate again. It is a fact that people from various educational backgrounds make important contributions to SE. Some universities are not yet accredited by official institutions. Also, a number of SE professionals are without degrees. Plus, certification of software engineers is a contentious issue. Some see it as a tool to improve professional practice while others as instrument for demoralization and discrimination. Truth is successful certification programs in the software industry are oriented toward specific technologies and managed by the vendors of these technologies. This tailor fits certain businesses which are existing clients. Aside from certification programs, there are other technologies SE professionals should learn promptly. Computer software engineers are aware they must continually strive to acquire such skills if to stay in the field.

In terms of opportunities, certifications could also bring in employment for SE professionals. Career and professional growth probability is bigger for those certified. As the certified personnel continue his technological advancement, the number of firms needing his expertise would also increase in number. SE personnel would be highly employable. From time to time, demand

of employers also increase knowing that SE personnel are pressured and most who desire to stay in the field continue learning on new technology to another. The software industry possesses positive challenges for public and private institutions to help and be recognized by doing their part to solve the SE related dilemmas.

For the threats, going back to certifications, these could be used by soft ware manufacturing companies to abuse the helplessness of SE professionals and gullible ness of consumer firms. They could require SE personnel to rapidly undergo from one certification training to another. Non takers due to various reasons of time, resources and other could be belittled at the work place. Same effect could be garnered by failures of certification exams. New computer soft wares being introduced in markets could not be learned in due time, these professionals could be unemployed & demoralized. Many students in the developed world have avoided degrees related to software engineering for the fear of offshore outsourcing or importing software products or services from other countries and of being displaced by foreign visa workers.

Recommendations

Based on the analysis above, short and long term recommendations are given. Short term is to be implemented immediately or in a year’s time. Long term covers five years while the short is being accomplished, this should as well. Both plans should be aligned. In lieu of short term plans, government contractor firms could conduct surveys, focus groups and interviews to learn more about needs pertaining to employers’ requirements of SE professionals. Surveys could be disseminated by fax or email. Focus groups with less than 10 members consist of employers could meet at a convenient location. Local businesses could be given incentive of promotions for they would be having the opportunity to share information about the company and what they do. It is ideal to keep the survey, interview or focus group meeting short. Surveys could take 1 to 2 pages. Interviews could last for 20 minutes or less. Focus group could be done in an hour. Regular annual data gathering based on the named methods could be employed. Yearly results could be compiled. In the long term, compare the year by year data. Based on the outcomes, studies on SE students and professionals could be linked. Trainings and seminars based on necessities identified by employers’ inputs could be done to improve the skills of SE people. Intermediaries could also submit studies to publications and software companies. Newspapers could publish the studies to appeal to software businesses to provide free trainings or

orientations either for SE students, teachers or professionals. Outsourcing should be thoroughly discussed to students for the eradication of irrelevant fears. The value of competence should be instilled. Job fair orientations could also be given by firms to students so that, they could prepare. For these companies, they would be publicized in doing the latter. Speakers on symposiums must be SE professionals and if possible, those who left the SE field. Prior to enrolment orientation should be done to ensure that students are really passionate on SE. These potential SE professionals should be briefed on the true characteristics and prerequisites of an SE professional namely: understands the real requirements of their project and keeps focused on those requirements, comprehends who the client is in order to prioritize, maintains open, frequent, and straight up communications with the client, produces a design for all but the simplest specified project, produces, and follows, a plan to implement that design, chooses the best tools for the job, not according to what's popular today, but by the given project requirements, maintains high standards of professionalism and doesn't accept low standards from those around them, maintains the discipline to consistently uphold development coding and testing standard, fully and properly tests code to ensure the highest levels of reliability and maintainability in delivered code and understands that maintenance is the most expensive

phase of any software project and follows standards that help reduce this cost through good documentation and comments in code. While these students still decide to stay in the course, interpersonal skills should also be focused on to be used for discussions with clients. In the long term, these beneficiaries of well-balanced SE curriculum could advise the next generation. Long term plans could be directed on the development of school curriculums, certifications programs' policies, government regulations of these programs and defining appropriate direction of SE. School curriculums should be modified as fast as it can based on the software developments. This should be backed up by the government. Certification program costs and qualifications should also be evaluated further by the government to avoid discrimination. Sample law could be the provision of alternative free training such as demo tape or online video or a simple book to be understood. In order to avoid fluctuations specifically in demand, the government and private firms should join in building the action plans.

Conclusion

To reiterate, the question posted by this paper on the action steps to be defined by government contracting firms for the staffing enhancement purposes. In conclusion, for the government contracting firms to mold appropriate employment tactics which

would provide added flexibility in the job related requirements of employers, communication and initiative are vital.

Bibliography

Labor market is a concept which refers to all of those ways in which sellers of labor (workers) and buyers of labor (employers) come into contact so that transactions such as hirings, firings, promotions, transfers, and so forth could take place. Since manpower policy has two goals: (1) satisfying and remunerative working careers for people and (2) efficient use of available labor in producing the goods and services needed by society -- the manpower planner might conceive of himself or herself as representing all actors in the labor market drama: workers, employers, various intermediaries, and the public. However, most manpower planners operating in the public sector at state and local levels have a narrower assignment: Improve the employment and income of those suffering the greatest disadvantages in the competition for jobs within the labor market. Such a planner is less plagued by inconsistent objectives, but any improvement in the lot of the target populations will likely occur in the labor market. Its overall workings must be understood for any manpower plan to be practicable. Labor Force: All persons 16 years of age and over who are classified as employed, unemployed and seeking employment, or involved in a labor-management dispute. Labor

Force Participation Rate is the he proportion of the total civilian non institutional population or of a demographic subgroup of that population classified as "in the labor force." Labor Market Area (LMA) is defined by the U.S. Bureau of Labor Statistics, an economically integrated geographic area within which individuals can reside and find employment within a reasonable distance or can readily change employment without changing their place of residence. Labor Market Information (LMI)is the body of information that deals with the functioning of labor markets and the determination of the demand for and supply of labor. It includes, but is not limited to, such key factors as changes in the level and/or composition of economic activity, the population, employment and unemployment, income and earnings, wage rates, and fringe benefits. Labor Surplus Area is a civil jurisdiction where the average unemployment rate is at least 20 percent above the average unemployment for all states, or its unemployment during the previous two calendar years was ten percent or more. The designation allows establishments in the area preference in bidding for certain federal contracts.

Software Engineering has come to mean at least two different things in our industry. First of all the term software engineer has generally replaced the term programmer. So, in that sense there is a tendency to extrapolate in people's minds that

Software Engineering is merely the act of programming. Secondly, it has been used to describe building of software systems which are so large or so complex that they are built by a team or teams of engineers. SE is synonymous to coder, computer programmer and programmer. Computer science, computing is the branch of engineering science that studies with the aid of computers computable processes and structures wherein SE belongs.

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