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Informatics Related Branch's Curriculum and Role of Project Management

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Abstract

The most important goal of the software industry is to produce successful product. During the process of production several times the product fails due to lack of proper management. This paper is exploring the role of software engineering courses in computer engineering related branches and then reasons why software developers lack project management in proper software management trainings. Our findings reflect that in majority of computer related branches like computer science, computer engineering, information system engineering there is no place for software project management course. Our findings are based on a survey of course curriculums of computer engineering, computer science and information system engineering courses taught in Turkish universities.

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1. Introduction

In recent years, several researchers have given emphasis on modifying curriculum, which is more useful for software industry [1][2]. The basic motivation behind this is to produce more practical software engineers for fulfilling the requirement of software industry. In fact, the failure of measurable number of software in the industry forces to find out the loop and holes in the system [3]. The lack of proper training and education, which is relevant to industry, is one of the reasons for this crisis. In a survey [4], it is observed that several important software engineering related topics are not covered in curriculums of informatics related branches.

Software Project Management (SPM) teaches the fundamental practices of good project management needed by ICT practitioners [5]. It explains how people, processes and problems are managed, how effort, cost

and project duration are estimated, how risk is assessed, how a set of software engineering work tasks is selected, how the project schedule is created, how the quality through various quality assurance activities is controlled and how the change requests and maintenance activities are managed [6]. Accordingly, a team/project leader should have the above qualities. In practice, a person becomes a team leader after gaining some experience in software development or related activities but it is not necessary that with experience he acquired all qualities, which are required for a project leader.

Majority of software developers in the industry are simply graduated in different disciplines related to informatics: computer engineering (CE)/science (CS), information system engineering (ISE), and software engineering (SE). All these software engineers will be the IT managers and they will have responsibilities of managing big tasks, teams and handling the complex projects. However, most of them do not have any practical training for project management. They gain the knowledge of project management only by experience, which certainly may not be sufficient to be a successful team leader.

This article explores the situation and availability of software project management course in Turkish universities. In the next sections, we are performing an analysis based on data collected from Turkish Universities on this matter. Discussions and conclusions follow afterwards.

2. Analysis of curriculums of CE related departments and role of SPM course

As mentioned earlier, we aim to highlight the role of project management course in the academic curriculum of departments in the field of informatics in Turkish universities. These departments are computer engineering, software engineering, information systems engineering and computer science. Almost all of the curriculums of computer engineering departments in Turkey show significant similarities to computer science departments in western countries. However, since the establishment of the first department in Middle East Technical University in 1967, the departments' preferred title appears to be computer engineering. This is because of the fact that engineering graduates have some advantages according to the "state personnel law" and have more popularity in the society in Turkey. Currently, the total number of universities is 168 in the country. Of these universities, 40 (25 state+15 private) do not have any CE and CE related departments. The number of CE and related departments in these universities is 143 (Table 1). This means some of the universities may have more than one CE and related departments.

Table 1. Distribution of CE and related departments

Universities	CE(#)	SE(#)	ISE(#)	CS(#)
State	1	2	0	2
Private	3	4	2	9
TOTAL	5	6	2	11

Actually, the chi-square test results indicated significant relationship between the university categories (state and private) and types of departments ($\chi^2 = 0.001$; $df = 3$; $p\text{-value} = 0.001$). In other words, state and private universities are using different strategies in the establishment of informatics related departments. This is probably because private universities are considering not only CE departments but also SE, ISE and CS departments.

For some of the universities the curriculum data was not available due to different reasons such as inaccessibility, unavailability or nonexistence of department's web site or curriculum information etc. The distribution of accessed departments is given in Table 2 and this table is used in further analysis.

Table 2. Distribution of accessed CE and related departments

Universities	CE(#)	SE(#)	ISE(#)	CS(#)
State	32	0	0	1
Private	37	10	2	7
TOTAL	69	10	2	8

The distribution of software engineering related courses (SE: Software Engineering; QA: Quality assurance; PM: Project Management) in CE departments of state and private universities are given in Table 3.

Table 3. Distribution of SE related courses in universities

CE Dept.	SE course	QA course	PM course
State Univ.	28	0	1
Private Univ.	32	2	5

It can easily be observed from the table given above that software related courses have more weight in the curriculums of computer engineering departments in private universities than their state counterparts. However, the chi-square test results indicate non-existence of a significant difference between state and private universities' computer engineering curriculums in terms of existing software courses (chi-sq = 1.942; df = 2; p-value = 0.379). Additionally, chi-square goodness-of-fit tests clearly state the rejection of the hypotheses meaning there is no significant difference between the SE course and others (QA and PM courses) in state (chi_sq= 0.0 df= 2 p-value=1.000) and private (Chi_sq = 0.0 df= 2 p-value=1.000) universities. This means almost all of computer engineering departments include an SE course in their curriculums. However, this is the just opposite for other software engineering related courses such as quality assurance and project management. Among these courses project management has a special importance since quality of a software highly depends on the project management in a Software Development Project (SDP). It is easy to imagine the level of complexity for resource planning, budgeting, scheduling, supplier logistics, staff coordination and leadership required to deliver such a project on time and on budget considering a large SDP. According to Schwalbe (Schwalbe, 2004), the average time overrun is 163% in 2001 and 227% in 1995, and average cost overrun is 145% in 2001 and 189% in 1995 in SDPs.

In general speaking, it is difficult to keep the productivity and quality at a significant level in an SDP because software is not visible and is developed as a result of brainwork. Mainly, a project team is organized to create software, in which case human relationships and work environment affect productivity and quality. This makes project management to be one of central issues in management of technology, engineering and human resource in an SDP. Therefore, it is important to study the project management of software development for the cost of management and the quality control [8].

Project Management uses a systematic and disciplined approach to develop software since previous research has documented that software projects are frequently prone to escalation [9] Project Management activities mainly include: determining the scope of the project, project planning, implementation of project components in a timely manner, review of activities, and a listing of courses learned during the project [10]. These activities follow the typical life cycle of a software project and a Software Project Management Plan (SPMP) can be used to outline the structure of the project and how it will be managed. The SPMP will outline all project management activities including configuration management and team management/roles [10].

These imply that it is necessary to give students a fundamental knowledge for project management including nine areas of project management such as [11]

- Cost Management,
- Risk Management,
- Scope Management,
- Resource Management,
- Communications Management,
- Quality Management,
- Time Management,
- Procurement Management,
- Integration Management.

3. Discussion and Recommendation

Once we analyse the course curriculum of the mentioned universities we find that majority of the universities have the software engineering course in computer engineering and computer science departments. Sometimes software project management is introduced in the software engineering course. Students learn variety of courses related to basic sciences, i.e. mathematics, physics and chemistry (Sometimes too much emphasis is given on these courses [3][6][10], computer languages such as C++, JAVA, PHP; hardware courses such as computer organization, operating systems; and software courses such as Web-design/development and some database and networking courses. However, they do not gain much knowledge about software project management and other related skills [12]. It was observed that, in all informatics related disciplines (i.e. CE, CS, ISE, SE), software project management is - not a core/must course in the curriculum. We also observed that in the universities which have a software engineering department/program and another informatics related department, the undergraduate students of informatics related department have the chance of taking SPM course given by software engineering department as a technical elective. It is worth mentioning that majority of the software engineers in industry are from computer engineering and other related disciplines but not from software engineering. It is because software engineering is not available in majority of universities and also it is not as popular as other computer science related discipline (e.g. CE, CS and ISE). Software project management is also given as an elective course in master programs of computer engineering in universities. However, majority of the software developers do not want to attend master programs in computer science/engineering, except they are interested to switch to academic life, which is normally a rare situation/case. Some of them prefer to go for master program in business administration to improve their skills in project management. As a result, majority of graduates are not able to learn the principles of SPM.

Most of the software companies have 5-20 employees in Turkey and, therefore, can be considered as either Small or Medium size Enterprises (SMEs). Additionally, majority of the software personnel in these companies are inexperienced professionals, who will be expected to act as project/team leaders soon after their graduation without having a formal training on PM. For this reason, big software companies like IBM, Motorola, CISCO, Microsoft provide inhouse training to their staff so they normally do not possess any crises for lack of trained staff in project management. However, due to several constraints and problems of SMEs, trained and experienced professionals are scarce [13]. By considering all the above mentioned discuss, it is highly recommendable that SPM should be introduced as a core course in undergraduate curriculum of all informatics related branches so that students gain some knowledge regarding SPM during their educational training. Furthermore, the high load of other courses such as mathematics in the curriculum of computer science [14] and computer engineering [15] should be reduced and more emphasis on subjects, which make

the software engineering education more practical [16] should be given. Some of the literature considers business as one these fields [17].

4. Conclusion

SPM is an important course for practitioner's point of view. However, our observation reflects that this course has not been given proper emphasis in the curriculum of undergraduate departments of CE, CS, ISE. Lack of proper knowledge in project management is one of the major reasons for not achieving the objectives of the projects. In this point of view, this course should be included as core/must course in all informatics related disciplines, which graduates the software engineers of the future.

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