Promoting Undergraduate Engineering Students' Interest in Project

Radha Raman Chaudhary, P.Alagumanoharan

Abstract: ***projects are the basic curriculum need for the undergraduate level students. This covers 250 marks as minor and major projects during final year semesters. More than marks, students are expected to acquire skills necessary for their employment and future career. The outcome should provide the problem solving, solutioning and testing skills among the prospective engineers. How much of these skills are ingrained during the project among the students, are the point to ponder? It has been observed that the final year student's attention towards projects are casual because they are too much worried about their future career. Therefore, the execution of the minor and major projects should be shifted back to pre-final year semesters. The most important thing is that the project execution methodology should be based on pull method (based on student's own idea), which will create passion among students to complete the project enthusiastically. This paper is aimed at designing the target project processes which will produce the desired outcome to the students. In addition to that students may acquire skills helpful in lifelong learning. They may register for higher studies in large numbers which may be a positive change.***

Keywords: idea, commercial idea, sap-lap framework, idea base, research base, DELNET, google scholar.

I. INTRODUCTION

Once upon a time, we attended the AICTE conference on "Pathways to institutional advancement to research" where AICTE Chairman Prof. Anil D Sahasrabudhe after getting feedback from industry (CII – Industry representative) made a remark from the podium that "Todays engineering graduates are very poor, they do not recognize even a clear diagram". And this could be due to the lack of student's involvement in our academic processes. They are too much into rote learning which aimed at scoring marks and not the skills, students should possess once they pass out from their institute.

This is very evident in colleges, where in, if some college keep extra curriculum (other than prescribed by University) to give students the necessary skills, the students show lack of interest, as this is not contributing to the overall marks they will obtain. The lack of interest is seen in less attendance or less interest in learning. This situation needs to change else the outcome will be affected.

AICTE is aware of the problem and thru NBA mission is driving the colleges and universities to get the NBA Accreditation by 2020. By this it means the colleges and universities degrees will be skill based rather than the marks based.

II. SITUATION

Current state of projects in private engineering colleges are in shameful condition. The university curriculum allocates projects in final year. Seventh semester it is MINOR project of 50 marks and in eighth semester it is MAJOR project of 200 marks. The condition is bad due to the following inside reasons: -

1. Seriousness of final year students are mostly towards the job, so during their six-semester end summer training, some of the students fixed on a stipend in the same training company and just become casual during their final year studies affecting MINOR and MAJOR projects.
2. The absenteeism during final year studies in the wake of competitive exams makes the students casual towards final year classes.
3. The students have developed a habit of buying the projects from the market since the labs lack infrastructure required to do the projects.
4. The competency of faculty to lead the projects from begin to end in the lab is questionable. Most of the faculty ritually assigns some irrelevant projects to the students (Apply PUSH methodology), The Students lack interest in such projects makes the scene dull. In the end a collusion between faculty guide and students happen and the fictious marks are awarded.
5. Traditionally in school days or in fist year engineering, students have learned programming by taking problems and directly writing codes as a solution to the given problem. This habit has made them resistant to learning the software design method and practicing them to perfection.
6. Though there are teams assigned to the project, but very few members in the team does the actual work, rest just idling.

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Let's analyse the outside situation and see what is needed to be done in the projects with reference to market situation.

S. No	Situation	Market Need	College's Provide	Remarks
1	Historical	An Engineer – Who knows how to use TOOLS/Techniques/ Technology required for the job.	Engineering colleges thru prescribed syllabus use to teach them and students practice them.	Very few reputed and well-equipped colleges were there.
2	EXTERNAL	Is global therefore needs an engineer who has the capability to switch between tools/ tech fast, can innovate, can influence the customer soon.	Constantly changing syllabus to meet the requirement, but project process did not change	Project execution methodology need to match with the changing need.
3	COMPETITION	Is becoming highly young and performance oriented, young entrepreneurs are flooding market with lots of new and bright ideas.	Engineering colleges encourages new and bright idea-oriented projects thru PULL rather than PUSH methodology.	Quality? Knowledge Maturity? Learning Curve? Communication Skill?
4	Govt. Policy	To meet its need, opening up more and more colleges and creating fierce competition among colleges.	Colleges produce a given number of engineers every year.	An institute level competitive policy

AFTER ANALYSING THE INTERNAL AND MARKET SITUATIONS, IT BECOMES OBVIOUS THAT THERE IS AN URGENT NEED TO ADDRESS THE PROJECT PROBLEMS AT THE INSTITUTE

III. REVIEW OF LITERATURE

Software design lifecycle application to a real-world project is a critical skill required by the undergraduate computer engineer. Azim Abdool and Akash Pooran Singh (2014) believes that the interaction with the local professional software development community is also an equally important opportunity that should be provided. This fosters growth of both technical and soft skills, in providing quality software solutions for customers. This paper describes the structure of a group-based software development project that integrates industry mentors in the learning and assessment processes. Industry liaisons are given a forum to elucidate some of the industry's requirements of students in terms of knowledge of software design and industrial standards; students gain better understanding of some of the processes which take place in an actual industrial setting; and university curriculum gains industry relevance. The impact of this project is yet to be fully assessed. Assessment can be determined from two aspects: (1) in terms of the benefit to the student (effectiveness of learning objectives achieved, and motivation gained from project-based learning and group work) and (2) the impact of providing industry led mentorship.

According to Uschi Rick et el (2010) nowadays' projects must cope with increasingly dynamic and turbulent environmental conditions. Agile approaches are one possibility to successfully face this challenge. While combining agile with more traditional process models seems to be usual software development practice in industry, it lacks scientific reflection. In this paper, an approach for process design is presented that may be used in information management projects and that combines the advantages of agile software development methodologies and those of traditional information management methods. The agile information management provides process designers with a tool suite that consists of roles, values and principles and a set of various methods and that implements iterative and incremental processes in small steps. Early results of a case study confirm the appropriateness of the approach for challenging frequent changes (e.g. due to changing markets, user needs or vague requirements), interdisciplinary cooperation and communication between the involved roles.

According to Marian Daun et el (2016) a significant challenge within university education, especially regarding the teaching of highly theoretical topics like requirements engineering, is to maintain students' interest and motivation whilst addressing the core concepts that will enable students to work in industry upon graduation. It has long been established that experience-based learning can aid in both these feats: On the one hand, providing students with industrial case examples rather than "dry" academic assignments can increase student interest and motivation. On the other hand, a case example-centric classroom approach can yield a rich learning environment which fosters collaboration, communication, and self-directed exploration of the instructed principles. In previous work, we have reported on our experience in changing a graduate requirement engineering course towards using case examples based on real industry projects. As more and more curricula change in advance of project-based teaching paradigms, this paper discusses results from the long-term application of such a course design in a graduate setting. In addition, this paper reports our findings from the replication in an undergraduate requirement engineering course indicating that project-based learning techniques foster different teaching goals in graduate and undergraduate.

According to Dr. D Kavitha and Dr. D Anitha (2016) Project-Based Learning (PBL) is now an important area of focus in educational studies which is supposed to promote critical thinking

and communication through real time projects.

There is a lack of skills and awareness in implementing PBL in Engineering Education. This paper illustrates an effort in implementing PBL based teaching learning process and assessment methodologies using Information and Communications Technology (ICT) tools to achieve the course outcomes for the first semester MTech. course 'Microcontrollers based systems design'. The process is tested with two different set of students, where one set undergoes PBL with ICT tools. The student outcomes are discussed in terms of their end semester marks and their satisfactory index towards the course. It is obvious from the case study that satisfactory index is high for the students who were taught based on project-based learning.

According to Richa Awasthi et el (2017) preparing software engineering graduates with skills to satisfy the demands of industry has always been a challenge for universities. One way to overcome this challenge is to provide students with an authentic team project experience. Authentic student projects are those that are as close as possible to real projects in terms of uncertainty, complexity and diversity. In order to achieve this, collaboration with business and other external stakeholders is essential. However, such collaboration is often hindered by constraints around team structure, team and individual student assessment, the use of specific processes and technology, providing technical and other support, and fixed project durations. In this paper, we present a simple course structure and assessment process that has allowed us to remove the majority of such constraints, while maintaining integrity around student learning and assessment. By removing these constraints, we are providing students with authentic team project experiences that prepare them well for future employment. Preliminary evaluations of our approach indicate that despite several challenges, the experience has led to high levels of satisfaction among students and our external partners including employers.

According to Ilenia Fronza and XiaoFeng Wang (2017) a high-functioning team is a decisive factor for a successful software development project. However, building such a team is not easy. Among many issues and obstacles encountered by teams, social loafing is a common but difficult one to tackle. [Aim] We intend to construct an approach to effectively prevent social loafing behaviours in software development teams. [Method] We built one social loafing prevention approach based on existing literature and survey instruments.

It has been applied in an Educational ContextWith 2nd-year computer science students working on software development projects in teams. [Results] The approach starts with increasing team members' awareness of social loafing. Team Expectations Agreement (TEA) is then used to help the team to write down the terms that explicitly prevent social loafing. During the project, a small survey instrument is used to track regularly if the specified terms are followed by the team members. At the end of a period, the presence/absence of social loafing is assessed by the team using another short survey. How to interpret the results of the surveys is explained as part of the presented approach. [Conclusions] This approach has potential to improve teamwork skills of students, which is not adequately addressed in higher education programs. Meanwhile it can be adapted in professional software development environment stop event social loafing and improve teamwork. The next step of our study will be using the collected data to evaluate the proposed approach and formulating a set of recommendations to use the approach in the professional software development context.

ACTORS

S. No	Actors	Role	Relationship	Remarks
1	Student	Project Team Member Project Team Leader	A team of students having common consensus is assigned a project	
2	Faculty	Project Guide	Does periodic inspection of the team and guide them to successful completion Encourage students to express their ideas and do the projects based around these ideas. Encourage students to choose HACKTHON problem or any listed problem for Project.	
3	Institute	Project Sponsor	Must have a resolve to solve the problems around the student's projects. Provides infrastructure to complete the projects. Allows the teams to participate in competitive forums	

4	University	Project Knowledge Exchange forum like TEQUIP-III etc.	University keep giving the resources as a research centre or allowing colleges to login to university infrastructure for the projects. Also exchange best practices followed in the projects at a college.	
5	AICTE	NBA Accreditation	AICTE has given mandate to all colleges and universities to get NBA accredited by 2020. NBA gives credit based on the project methodology followed and outcome availed.	

IV. PROCESS

It has been tradition in our society, that engineers have been providing solutions to most of the developmental challenges that we face in our living. In the modern days, all the gadgets that we use in our life are having intelligence build by the engineers either devising a new tool/ technique/technology or finding extended solutions from existing tool/technique/technology.

Keeping this in mind, universities have assigned MINOR and MAJOR projects in engineering curriculum which has more weightages than any subjects in the curriculum. The skills that students acquire thru projects are having both immediate and long-term effects. Immediate skills are – problem solving in a team, analytical, synthetical, communication and quick learning curves. Long term skills

When students do projects properly the engineering colleges gets benefited in many ways – Students writing research paper and presenting them in different forums, Students creative ideas could produce patents, During NBA accreditation college is given marks, Students can provide solutions in HACKATHON, or other competitive platforms and win rewards for the college.

Therefore, college must give extra attention to the student's project and MUST provide necessary infrastructure required for the successful project execution. Denying these leads to various types of plagiarism and can bring bad repute for the colleges.

The trend in the industrial organizations is changing from client focus to employee focus. These days' employees are assets, as they can revitalize the business by injecting fresh ideas or new product ideas. The product managers bring new vitality to the products as they understand the changing taste of the customer for the product. Though, the industry looked to the employee for the new ideas. But they implement only short-term ideas as they have limitations to roll out their product in the committed time to the market.

Therefore, the institutes are in favourable condition for the short term as well as long term implementations of the new ideas provided we setup the right infrastructure to seize the opportunity gap. Other reason could be that we have the resources for four years with us and therefore the scope for plenty of working IDEAS.

In this paper we have suggested a PULL model adopting which the students and colleges both gets the desired outcome. By PULL model we mean is that it is the students idea which forms the basis of the project and not thrust upon them by faculty or supervisors.

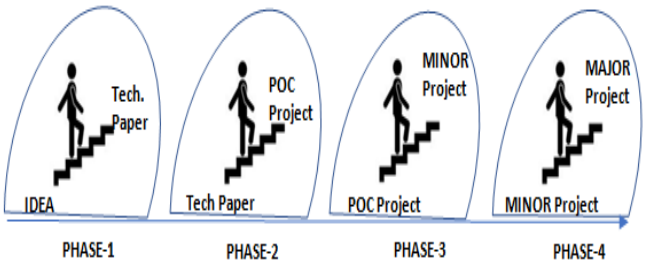


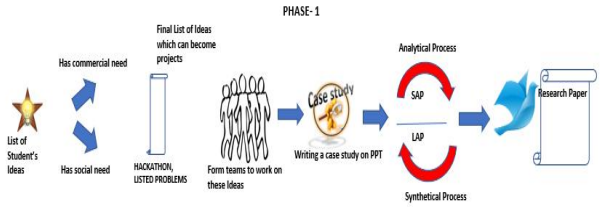
Fig. 1 The Project architecture

Each phase mentioned in the diagram is done in a semester. The phase wise detail is mentioned in the following diagram. are – ability to dig deep for solutions (research ability), ability to listen and express point of views and learning importance of the teamwork.

PHASE – 1. Input – Students Ideas – picked up a commercial idea or social need of the idea for project

Process – writing a case study on the idea – Convert this to technical paper

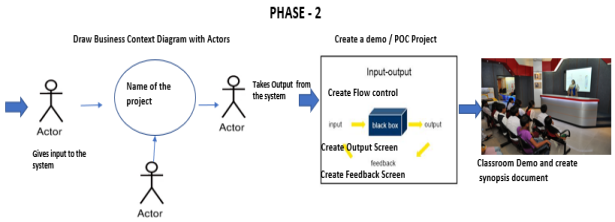
Output – A technical paper or a case study doc



PHASE – 2 Input – Case study doc – Business context diagram or Use case Diagram

Process – Writing a POC (Proof Of Concept doc) and Synopsis Document.

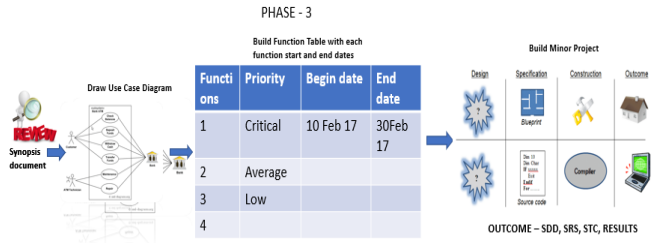
Output – Synopsis document, POC Doc



PHASE-3 Input – Synopsis Document

Process – Prepare SRS, HDD, STD and do coding and testing for the critical functions.

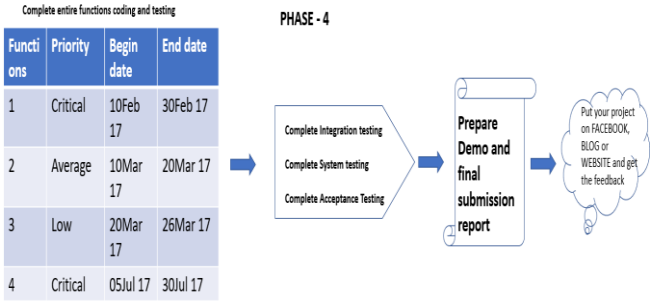
Output – Apps with coded functions, A prototype application



PHASE-4Input – Prototype application with limited coding functions.

Process – Complete the project with all functions coded

Output – A complete project along with demo and write up.



V. LEARNINGS

General Issue: - Students are least interested in projects in final year and their attention is more towards career. Either preparing for the competitive exams or appearing for the interviews. Some of the students even join job in final year and submit the projects done outside the institute.

Institute remains casual in terms of project outcome. The faculty and students come into tacit agreement as to how the project work will be completed. Since the evaluation is internal therefore the student and faculty have their way.

Specific Issue: - It is very important for the institute and students at large to take interest in projects and its execution methodology.

ACTION PLAN

S.No	List of activities	Role Player			Remarks
		Student	Guide	Institute	
1	Students should list down all problems around them in their focus area.	2nd Year Student	Submit the list to project Guide	Project Guide helps in firming one problem as a prospect project, which has highest commercial value or social need.	Students will write a list of problems in the subject area of their liking.
2	Productive problem converts to an idea	---DO----	Using Idea Generation Technique	Project Guide / Project Head	Students will write a mini doc or ppt based on idea and area of interest
3	Idea to Idea Document	--- DO---	Write selected problem in form of Idea Document	Project Guide / Project Head	Activities will be supported by project guides, project head.
4	Conversion of selected Idea document to activities using tools & technologies	--DO--	Sample exercises or case studies	Project Guide / Project Head	Activities will be supported by project guides, project head

5	Write Synopsis document based on refined idea document or a case study document in a specific format.	----DO---	Exercise for domain / Technology mapping	Project Head Approves the Synopsis document	Activities will be supported by Project Guide and Project Head.
6	Idea – domain – opportunities in that domain (Do Literature review on your project area)	3rd year students.	Exercise to do SWOT analysis of a domain / technology.	Student, Guide and Project Head will brainstorm on the synopsis and suggest changes if any.	Activities will be supported by Project Guide and Project Head.
7	Finalize the Context Diagram or use case diagram. Do project analysis and design with appropriate tools / techniques / technology.	--DO--	Help students in identifying projects and understanding tools / techniques/ technologies.	Student, Guide and Project Head will brainstorm on the synopsis and suggest changes if any.	Activities will be supported by Project Guide and Project Head, Experts.
8	Project Plan and phase-2 execution.	--DO--	Teach the students how to do application development plan and execution.	Student, Guide and Project Head will brainstorm on the context diagram and project plan..	Activities will be supported by Project Guide and Project Head, Experts.
9	Project phase-3 execution.	--DO---	Quality / Impact criteria to be prepared and metrics used to measure	The project can be presented as a paper / patent /Award	Activities will be supported by Project Guide and Project Head, Experts.
10	Mini Project Submission.	--DO--	Mini Project report submission along with presentation.	The project can be presented as a paper / patent /Award	Activities will be supported by Project Guide and Project Head, Experts.
11	Complete the project in all respect (Functionality, Design,coding,testing,packaging etc)	4th year Students.	Improve the quality of the projects by having good test mechanism	The project can be presented as a paper / patent /Award	Activities will be supported by Project Guide and Project Head, Experts.
12	Do Branding and presentation of the project	--DO--	Evaluate the product on Quality / Impact again	May be considered for late entry for Award	Activities will be supported by Project Guide and Project Head, Experts.
13	Design and develop project website or a blog or a facebook page of your project.	--DO--	Do the remaining formality	Update your resume with the website link.	Marketing Final Projects

14	Apply for project grants with AICTE, DST or other sources.	---DO--	Do the remaining formality	Wait for the response.	Marketing Final Projects
15	Submit your project for the university curriculum	---DO---	Do the remaining formality	Compete for the "Best Project Award"	Director / Dean / HOD / Project Head.
16	Keep ready a DEMO version of your project with appropriate test cases and snapshots.	---DO---	Do the remaining formality	Demo at appropriate forum	Director / Dean / HOD / Project Head / Experts from Industry..

PERFORMANCE

The performance measurement of the research program is fairly simple. Since this is the first time we are introducing the research program therefore matrices will be as following.

No of Ideas generated by students
No of ideas generated by faculty
No of feasible ideas converted to synopsis
No of synopsis converted to projects
No of synopsis converted to papers for publications
No of synopsis converted to patent filing documents
No of projects given grants
No of grants applied for.
No of papers got published in national journals
No of papers got published in international journals
No of papers published in IEEE
No of projects won award at various forums

VI. CONCLUSION

If the students and the project guide, follow these procedures then there will be definite improvement in quality of projects done in the college. At the same time the students will be more confident in presenting themselves before prospective employer. It will also inculcate among students to work on their own ideas and try entrepreneurship. Colleges will get advantage in improving their project metrices like number of papers, number of patents, and project sponsorship. College may fare well before granting project grants by esteemed organization like DST, ISRO and AICTE themselves.

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