

USING FACEBOOK AS A SUPPLEMENTARY COMMUNICATION CHANNEL FOR ACTIVE LEARNING

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ABSTRACT

Active Learning as CDIO Standard No. 8 is all about engaging students in discussion, argumentation, interaction, and eventually, the creation of new ideas and concepts. Through Active Learning, students will not only learn about the materials at hand but also manage to figure out how they should structure their learning approach and what topics they should focus on to enhance their own personal skills and knowledge. A key element to successful Active Learning, however, is the interaction channel between students, instructors and other stakeholders, who are involved in the overall teaching and learning process. While online communication channels are increasingly promoted at many universities and colleges as the best way to enhance Active Learning, the effectiveness of those channels for Active Learning, are usually left unmeasured or ignored in most studies. This paper, as a result, will attempt to measure the pros and cons of using one specific online channel of Facebook for CDIO study groups. In particular, Facebook sites have been set up for CDIO projects at Duy Tan University with the purpose of:

- (1) Fostering neat and timely communication and interaction amongst CDIO team members,
- (2) Facilitating different brainstorming and design-thinking tactics for the conceiving of new ideas,
- (3) Collecting and comparing data on students' postings and participation so as to propose an appropriate approach in the use of Facebook for CDIO teamwork,
- (4) Developing a data pool on Facebook about different Active Learning tactics to be used in specific CDIO-based courses.

Different measurements and comparisons between teams which facilitate Facebook and teams that do not will be carried out to compare and contrast the strengths and weaknesses of our new Facebook approach versus other communication channels. This study is supposed to be of interest to schools which are looking for ways to smoothen and fasten their Active Learning approach in the overall CDIO adoption.

KEYWORDS

Active Learning, brainstorming tactics, CDIO Standard No. 8, CDIO Project, communication channel, design-thinking social network, Facebook

INTRODUCTION

As of late 2015, there are up 1.6 billion users on Facebook, of which the majority are youngsters and college students (Stutzman, 2006; Roblyer et al, 2010), who spend an average amount of 30 minutes or more on Facebook on a daily basis (Pempek, Yermolayeva and Calvert, 2009). This is a significant difference when compared to earlier generations of Internet users who tend to use email for online communication (Roblyer et al, 2010). So, the question becomes whether Facebook may help foster a productive learning environment? This is very much possible given the fact that Facebook also include other software utilities like email, chat rooms, and bulletin boards. College instructors can easily make announcements, assign tests and exams, or carry out class activities through Facebook. It also helps keep parents well-informed about what is going on in school with their college kids (Uzun et al, 2014). Moreover, research results have shown that students who use Facebook for their study tend to be more active, positive, and motivated in their approach (Mazer, Murphy and Simonds, 2007), part of the reason has to with the fact that most students have used Facebook for a long period of time before, with many friends and fans to recognize and support their online identity and participation (Bosch, 2009). Hence, would it be great if Facebook is to be used for the deployment of CDIO projects so as to enhance various benefits of Active Learning tactics? And how great would those benefits be in reality?

In the first part of this paper, we will present the purpose, structures, and settings of the CDIO projects designed for IT disciplines at Duy Tan University (DTU) using the guidelines and advice from the CDIO Framework. Issues concerning communication will be highlighted at different points to signify the importance of an appropriate communication channel. In the next part, we will attempt to measure the pros and cons of using one specific channel of Facebook for CDIO project teams. As a matter of fact, during the last two to three years, Facebook has been used for CDIO projects in IT at Duy Tan University with the original purpose of:

- (1) Fostering neat and timely communication and interaction amongst CDIO team members,
- (2) Facilitating different brainstorming and design-thinking tactics for the conceiving of new ideas,
- (3) Collecting and comparing data on students' postings and participation so as to propose an appropriate approach in the use of Facebook for CDIO teamwork,
- (4) Developing a data pool on Facebook about different Active Learning tactics to be used in specific CDIO-based courses.

CDIO PROJECTS IN SOFTWARE ENGINEERING & IT-RELATED DISCIPLINES AT DTU

In this section, we will describe the deployment of the CDIO projects in Software Engineering, Network Security and Information Systems at the Faculty of Information Technology (IT) of Duy Tan University in a university-wide effort to foster quality engineering training.

A. CDIO Projects and their Implications:

CDIO projects are set up for students to solve some practical problems through the integration of many learned skills and knowledge (IEEE Computing Society and Association for

Computing Machinery, 2004). For DTU, the main purpose of its CDIO projects is to provide students with some sense of "real-world", "on-the-job", teamwork activities. Using the CDIO Framework, the CDIO projects at DTU utilize typical teaching/learning methodologies like active learning, team learning, experimental learning, design-implement experiences, etc. (CDIO™ Initiative, 2016). Another motivation behind the adoption of CDIO projects is to support the ABET accreditation effort for different engineering programs of the Faculty of Information Technology (IT Faculty), the International School of DTU and other engineering faculties.

B. CDIO Project Structures and Timeframes:

At DTU, there are three CDIO projects for students majoring in Software Engineering, Information Systems and Network Security. These courses are usually held in the second semester of each academic year, starting from the sophomore year. Since the CDIO projects of the sophomore and junior years mostly provide some introductory hands-on experience of IT projects, we will focus on the CDIO project for the senior year. For this final-year CDIO project, students in each team will have to work with a real-world client to design, develop, and implement an IT product or solution, for a period of 6 to 8 months. Communication is usually a big issue here because many students do not have experience working with real-world clients before. Finding the right communication channel for in-time and regular contact with clients may take time and effort. As a result, mentors are assigned to each CDIO team project to ensure smooth communication with business clients and to support the students whenever needed (Todd & Magleby, 2005).

For the final-year CDIO project, students are assigned into teams of 3 to 5 members. Following the guidelines of ACM/IEEE, team member assignment is done by the Faculty of Information Technology of DTU so as to ensure that the skills and capabilities of any one team member will supplement for those of others (ACM, 2001). Because of the many "soft-skill" courses at DTU, students usually have no problem getting along with each other in the beginning even though they were not allowed to choose their friends for their projects. Problems actually emerge when the team has to bid for one of the real-world projects from several IT-business clients of Duy Tan University. Disagreement over role assignment, project selection and idea development is usually the source for conflict between team members. The role of assigned mentors for each project team at this point is to help maintain the relationship with the business clients. Most IT-business clients of DTU are software and IT companies from Da Nang, Hanoi, and Ho Chi Minh City.

Out of the 6 to 8-month time period of the final CDIO project, there are two stages with each lasting for a period of 3 to 4 months. For Stage 1, each student will need to spend a minimum of 16 hours per week for team interaction, regulation formulation, conflict resolution, software process selection, and proposal write-up. It is expected that Stage 1 will take up to 192 hours (i.e., 16 hours x 12 weeks) per student in every team, not including extra interpersonal interaction. However, as soon as the project proposal is approved by the IT-business client, the team will move on the next stage, which means teams with excellent communication skills may cut down Stage 1 to three months or even less. In Stage 2, students will have to spend time on requirement engineering, product architecture, system design, coding, testing, product implementation and maintenance. At least 40 hours of work per week or a total of around 480 hours will be expected from every student for this stage. In short, students will experience every step of the complete software development life cycle. As a result, a well-structured communication channel that goes along with each software development process is essential to the success of the project within the allowed timeframe. On the other hand, there may be

deviations from the projected schedules depending on the software development methodology the team selects, for example, the actual schedules will be quite different between an AGILE approach (i.e., small software development team format) and a plan-driven structure (i.e., well-organized, enterprise-wide software-development approach) (Sliger & Broderick, 2008).

C. Detailed Implementation Tasks in the IT CDIO Project:

Team Formulation:

One of the first activities in the final CDIO project is the skills-review session in which each team member will identify how he or she may best contribute to the project. Together, the team must define the roles and responsibilities of each team member (IEEE Computing Society and Association for Computing Machinery, 2004). All kinds of communication conflict may arise during this session depending on the approach and personality of team members: some may try to dominate the team, some only want to focus on what they are good at, and yet some may just want to get a free ride. Faculty members from the Faculty of Information Technology will attend the role identification meeting, and may give direction or guidance as well as mediation when needed.

It is important to remind team members that the CDIO project helps them learn and no one member is "the Boss" of the project, but it is also essential for them to recognize that the project management/leadership role is needed to help coordinate, plan, and track the team's activities and efforts. The Project Manager (PM) role is to keep the team focused and makes sure that various tasks get done on time. The PM will also review each member's work contributions to make sure that they meet the proposed technical and quality requirements. The PM is the most important role in any IT CDIO project, as a result, the team needs to select the best member for this role. Communication skills should be the top requirement for the PM position.

Beside the PM roles, there are other roles that team members must also identify and assign such as Software Configuration Manager, Software Quality-Assurance Manager, Testing Manager, etc. Since there are several development phases in an IT product life cycle, team members can take turn switching roles with each other in each phase (Moe, Dingsøyr & Røyrvik, 2009). Role switching can be sometimes damaging to the team's performance if the communication structure is not effective and clear-cut.

Conceiving of Product Ideas and Creation of Project Structures:

In this step, IT-business clients will hold a series of presentations to introduce their projects and related problems and/or solution suggestions with all the CDIO teams at DTU. Each team will then prepare initial proposals for at least three projects so as to bid for the most suitable one. This is usually the time when team members may run into significant communication conflict over their preferences for different projects, time allocation for proposal write-ups, lack of certain capabilities, etc. Based on the team's capacity and capability, DTU IT faculty members will work the IT-business clients to assign the right project to the right team. Together with the bidding result, each team will also be assigned one or two mentors for their project. There is a potential for conflict again here when role re-assignment may take place due to the

nature and requirements of the assigned project. Subsequently, the team needs to actively plan for meetings to design, develop and implement the selected project. Even though the project problem may not be original because it has been presented by the business clients from the first place, students are encouraged to discuss with each other to develop original solutions in their team formation and/or technology application for the project at hand.

Design & Implementation:

Before any actual design and implementation activities start, successful team formation and continuous maintenance of the team's communication and workflow are arguably the biggest challenge to most students in their CDIO projects. From the beginning, team members do not have the right to select one another. Then, they have to join force together for the most important project before graduation. Hence, team members need to put aside their differences, their interests, and their ego in the team communication so as to develop a successful solution for the project. It is important for students to understand that the CDIO team is "larger" than themselves and every team member must jointly contribute to the success of the project (ACM, 2001). It is at the same time important to have a communication channel for mentors and business clients to continuously provide students with inputs about the expectations and goals of project so that they may adjust themselves and their project, accordingly.

Once the team and its project structures are in place, team members need to actively assess their capabilities and the feasibility of the project in order to set up an effective project plan. Even though the project plan is usually put together by the PM, it is important that the plan be discussed and agreed upon by all the team members to ensure their commitment for the project (Lingard, 2010). Depending on the software development process methodology being selected, the PM will build a detailed plan which are consistent with all the criteria and requirements of that software development process. The choice of tools and systems for idea sharing and project management will be very important here for in-depth communication and discussion between team members. In addition, later on, especially before each development phase of the software development process, the PM will need to share all the information about the actual number of hours that each team member will have to put forth for their tasks. This will create a sense of equality and fairness, plus team members can also plan for their next tasks based on that.

As the project design work goes on, the team needs to discuss with its business clients from time to time about the desired scope of the project. When the project scope is finally approved upon, the team will need to revise its Software Requirements Specification (SRS) to fit with the approved scope. They may also have to revise the use cases and use-case diagrams and narratives designed previously as well as to fill in the missing details and to indicate all the preconditions, post-conditions and triggers for each use case. Project management tools and dashboard utilities to share information amongst team members and with business clients are essential here. Once all of the design details are put together, the Design phase is basically completed. Design work, however, does not stop here: depending on the problems and risks encountered later, the PM may decide to go back and revise the design accordingly later on.

In the following phase of project implementation, many tasks of coding, testing and redesigning will be carried out in sequence or at the same time in a complex arrangement. As a result, the team will need to foster clear communication, to identify dependencies among their tasks, and to jointly sort out any problem that they may run into so as to ensure the quality and success of the end product or prototype. Besides the end product or product prototype,

CDIO teams at DTU are also required to write up an overall report of their accomplishments, conclusions, recommendations and lessons from the CDIO project. This report must be clear, complete, well-written, and delivered on time. It will serve as the basis for the final assessment of the project outcomes.

USING FACEBOOK AS A SUPPLEMENTARY COMMUNICATION CHANNEL

Of all the communication requirements for the final CDIO project mentioned above, over the years, students and mentors from the Faculty of Information Technology (IT) as well as IT-business clients have referred to a number of different channels for their communication. Faculty members, like in other courses, tend to use email and e-learning platforms such as Moodle or SAKAI to communicate with students. However, while email continues to be an essential tool for private communication between students, project mentors and business clients, most e-learning platforms appear to be more of a one-way communication channel with the faculty members or mentors making announcements, focusing students' attention on certain topics, assigning tasks and tests, etc. Most features in the bulletin board or chat box of e-learning platforms are yet so limited that they usually do not attract students to join in and raise their questions or concerns. On the other hand, IT-business clients mostly use email and paper-based communication to deliver and exchange their materials with students and mentors of the IT Faculty. Paper-based communication is still utilized because it has legal implications between the sender and receiver. It is, however, very slow and does not foster discussion and participation.

With the exception of certain features like making quizzes and tests or maintaining a schoolwork drop-box, Facebook actually has almost all of the other features of a typical e-learning platform with much more attractive, easy-to-use interfaces and functions. Indeed, the fact that many students have already had Facebook accounts long before makes it easy for them to join in another Facebook site designed for their CDIO project. The very first benefit of using Facebook for CDIO projects is that students may learn about other team members' skills and background by accessing the Facebook site of those members. This actually helps save a great deal of time and effort for initial exchange and communication between the team members. The availability of personal information from each Facebook user, however, calls for professional behaviour and conduct on Facebook regarding the CDIO project. The administrator account of the CDIO Facebook site is assigned to the project mentor, and students are asked not to discuss personal or political issues.

In addition, Facebook appears to be very effective in the interaction between students and IT-business clients. Instead of spending time for some formal presentations of the business problems or system requirements of the project, companies and businesses may send in the e-copy of their formal materials through Facebook. Some businesses even come to the point where they make video presentations of their business problem so that students may watch those many times before making the bid for their project or for revising their codes and designs. The Facebook templates allow students to actively interact with business clients on any of their questions or concerns. One point that should be noted here is that the Faculty of Information Technology of DTU needs to require each IT-business client to assign at least one specific staff member to regularly observe the Facebook site and promptly answer any question raised by the students. Many times business clients may send in many staff members during the initial exchange for the setup of the project, but fail to participate throughout the whole process of project development with our students.

As for the use of Facebook amongst the project team members, it is important that clear-cut rules and regulations are established to set firm foundations for smooth and sustainable communication throughout the project development process. Specifically, the project mentor needs to closely monitor all the communication on the Facebook site for the project. Should there be any hostile or personal communication, he or she should ease off the tension or divert the communication to a different topic or put an end to a negative discussion in an outright disciplinary manner. At the same time, the project mentor needs to motivate constant contribution of ideas and suggestions from each team member by posting related readings, raising certain questions or problems, requesting comments on different feedbacks among the team members, etc. for at least a few times a day. On the other hand, students are encouraged to regularly express their opinions and be responsible for responding to questions and feedbacks on their opinions. This requires students' active involvement in the discussion through a series of push-and-pull tactics. For example, in a number of CDIO projects at DTU, the mentor usually requires the PM to lead the discussion on any immediate or current problems of their projects. If the problems put forth are relevant, the project will usually make visible progress over time. Some mentors even come to the point of replacing the PM of the project if he or she fails to lead the discussion in the right direction. Others switch the role of the discussion champion among the team members on the basis of every one or two weeks. In addition, besides the Facebook site for every CDIO project, three general Facebook sites for three respective aspects of design structures, coding tactics, and testing methodologies are also set up so that team members with their roles closely related to those fields may come together for Q&A on different problems and issues. At times, it is also important that the mentors post certain guidelines, experiences or lessons learned from each CDIO project on those general Facebook sites for teams to learn from each other. Another incentive mechanism established by our mentors is that at the end of each week, 5 top postings with the most number of Likes and responses will be awarded with bonus points toward their eventual project grades. Students are also ranked and graded based on their participation according to the number of (fruitful) postings they made throughout the project. Last but not least, students, mentors and business clients alike are free to discuss and revise on the rules and regulations for their interaction and communication over Facebook whenever needed.

In order to assess the effectiveness of using Facebook as the major communication channel for IT CDIO projects, a survey is carried out at the end of each CDIO project. The questionnaire used in the survey has two parts of (I) Personal Information and (II) Opinions on (using) Facebook for CDIO projects. A Likert scale of 1 to 5, with 1 as Strongly Disagree, 3 as Neutral and 5 as Strongly Agree, is used for the rating in the second part. The time amount allowed for students to finish the questionnaire is relatively short for only 10 minutes so as to ensure that students will provide their most immediate, direct and honest reflections on the use of Facebook for their CDIO projects. Additional details of the survey questionnaire can be found in the Appendix of this paper.

RESULTS & DISCUSSION

A total of 184 students have participated in the survey with their age ranging from 20 to 26 years old with the average age of 22.5, meaning that most of them are senior students. The percentage of males is 73% and that of females is 17%. Most of these students are very much familiar with Facebook, spending an average amount of 86 minutes on Facebook per day. As for the second part of the questionnaire, the mean value of feedbacks to each question, out of the Likert scale of 1 to 5 as mentioned in the previous section, is calculated to determine how much on average students agree about the benefit of Facebook for certain aspect of carrying the CDIO project. Respective standard deviations are also calculated: a low standard deviation

will indicate a firm level of agreement around the mean value while a high standard deviation presents a loose level of agreement.

As the results shown in Table 1, except for responses to Question 10, all the mean values of responses to other questions are higher than 3 (i.e., above neutral) indicating that on average students agree about all the benefits of Facebook for CDIO projects to certain degree. With the mean value of 3.76 for answers to Question 1, it can be said that students strongly believe in the overall benefit of using Facebook for CDIO projects. Questions 2, 3 and 4 have to do with whether Facebook helps improve on the traditional skills used for CDIO projects. While a mean value of 3.22 for answers to Question 2 signifies that Facebook relatively helps improve on the design-thinking skills of students, most students are quite neutral about whether Facebook indeed improves their brainstorming and problem-solving skills with a mean value of only 3.12 with respect to Question 3. In addition, most students do not believe that their attitudes toward carrying out CDIO projects have been changed because of Facebook (with a mean of 3.04 with respect to Question 4). This is probably true not only in IT-related fields but also in other engineering fields, in which the change of the communication channel does necessarily change the ways of carrying out the projects. The high standard deviations for responses to Question 2 and 3, however, indicate that some students very much perceive the benefits of Facebook for their CDIO projects, and some others, on the contrary, do not at all.

Table 1. Means and Standard Deviations on Survey Results (part II)

Does Facebook Site help on:	Mean	Standard Deviation
1. Doing CDIO project	3.76	0.84
2. Improving design-thinking skills	3.22	0.88
3. Brainstorming and problem-solving skills	3.12	0.91
4. Attitudes toward carrying out CDIO projects	3.04	0.63
5. Getting class-related information	4.00	0.49
6. Expressing your opinions	3.68	0.55
7. Relationship with the project mentor	3.64	0.79
8. Relationship with other team members	3.50	0.70
9. Relationship with business clients	3.84	0.70
10. Posting more on Facebook	2.22	0.73

Question 5 and 6 is directly related to the effectiveness of Facebook as a communication channel. A mean value of up to 4.00 and a low standard deviation of 0.49 proves that Facebook helps students get access to project information and materials much easier. The same situation applies to students' ability to express their opinions through Facebook with a mean value of 3.68 together with the standard deviation of only 0.55 in Question 6. As a matter of fact, the number of responses and feedbacks from students, mentors and IT business clients on any one topic has significantly increased when using Facebook, compared to the use of tools from traditional e-learning platforms. Questions 7, 8 and 9 inquire on whether Facebook helps improve the relationship between students and their mentors, team members and business clients. With the mean values of 3.64, 3.50 and 3.84 respectively, it can be said

that Facebook very much helps improve the communication and relationship between students and all other stakeholders. The average standard deviations of around 0.70 for responses to Questions 7, 8 and 9, moreover, confirms this fact. As for the last question of whether the adoption of Facebook for the CDIO project helps promote additional use of Facebook on the part of the students, it appears that it has no actual influence with the mean value of only 2.22 and the standard deviation of 0.73. This probably has to do with the fact that our students already has been using Facebook a great deal on a daily basis, or that they do not see the additional use of Facebook for their CDIO projects as making any visible leap in their use of Facebook in general.

CONCLUSIONS

The purpose of this study is to validate the idea that social networking sites, as online social communication platforms, can be utilized to enhance various Active Learning tactics in CDIO projects such as teamwork collaboration, peer support, project management procedures, debates and Q&A, etc. Facebook as the top social networking site with all of its user-friendly features may help build up an informal but effective learning atmosphere amongst students, project mentors and business clients, which eventually will translate into academic performance improvement. Daily interaction on Facebook also brings all the participants closer together, and their improved interpersonal relationship will directly enrich the overall learning experience. The study also signifies the need for further studies including a detailed comparison between the benefits of specific Facebook features and those of traditional communication methods, or about the over-time increased willingness of students to communicate with the school's administrative personnel on Facebook, or about the different impacts of Facebook on students and other stakeholders under various cultures or geographical locations.

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BIOGRAPHICAL INFORMATION

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APPENDIX

Survey Questionnaire on Facebook for CDIO Projects

					
Personal Information:					
1. Your name:					
2. Your age					
3. Your gender					
MALE / FEMALE					
4. How many hours on average do you spend on Facebook per day?					
5. How many postings do you usually make on Facebook every week?					
6. How many responses do you usually get for each posting?					
<i>(5: Strongly Agree; 4: Agree; 3: Neutral; 2: Disagree; 1: Strongly Disagree)</i>					
Does Facebook help on:					
1. Doing CDIO project	1	2	3	4	5
2. Improving design-thinking skills	1	2	3	4	5
3. Brainstorming and problem-solving skills	1	2	3	4	5
4. Attitudes toward carrying out CDIO projects	1	2	3	4	5
5. Getting class-related information	1	2	3	4	5
6. Expressing your opinions	1	2	3	4	5
7. Relationship with the project mentor	1	2	3	4	5
8. Relationship with other team members	1	2	3	4	5
9. Relationship with business clients	1	2	3	4	5
10. Posting more on Facebook	1	2	3	4	5