

# Skills for Managing Virtual Projects: Are they Gained Through Graduate Project Management Programs?

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## CONTEXT

Many organisations are increasingly developing virtual teams to work on their global projects. By definition, a virtual team is a group of geographically scattered persons collaborating to accomplish a project or an organisational task. Managing virtual project teams is more complex than managing traditional projects. Many engineers seeking successful managerial and leadership positions in their career opt for postgraduate degrees in engineering management to update their knowledge and skills and foster their managerial skills.

## PURPOSE

This paper examines whether current curriculum and learning strategies in a postgraduate engineering management program provides students with the necessary skills to operate in virtual teams.

## APPROACH

The research identifies the skills required for managing virtual teams working on engineering projects. By way of an exploratory example only, this research also analyses subject outlines and claimed outcomes of a postgraduate engineering management program to detect whether the program provides students with knowledge and skills needed for working and managing virtual teams. This paper is only a preliminary study of an ongoing research that is being designed to answer this research question in a more rigorous and scholarly manner.

## RESULTS

It was found that the program equips engineers with updated necessary knowledge, skills, methodologies, techniques, and tools to effectively manage engineering projects across a wide range of industries. Students of the program would also develop soft skills including communication which is of particular importance for virtual projects. The program included practice based strategies such as discussions, role-plays, presentations, and teamwork activities where students are heavily exposed to the "online" world to share and exchange information. The assignments are designed to ensure that student's clear and concise writing and presentation skills are developed, which is highly desired in virtual settings given the high probability of misinterpretation of messages.

## CONCLUSIONS

The program was found to recognise the changing nature of project management, and has adopted adequate learning strategies that provide students with the opportunity to develop the skills required to overcome the communication, technology and leadership issues arising from working in virtual teams. The research has highlighted the importance of adopting innovative learning strategies in universities in order to develop successful learning outcomes for individuals.

## KEYWORDS

Virtual Project teams, Engineering Management Education, Skills

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# Introduction

Organisations, in the twenty-first century, are increasingly developing virtual teams to carry out their global projects. A virtual team, by definition, is a group of geographically scattered persons who rely completely on information and communication technology to collaborate in order to achieve a common purpose (Piccoli & Ives 2000). In fact, virtual teams offer many benefits to organisations including greater ability to compete internationally, and provide faster responsiveness to local and global market needs (McDonough, Kahn & Barczaka 2001). However, issues such as differing time zones, difficulty in communication, different locations and cultures were reported to have an adverse impact on the performance in virtual projects (Mukherjee, Lahiri & Billing 2012). Studies and previous experiences have noted that managing virtual teams requires a more varied sets of skills compared to managing co-located traditional project teams. Many engineers, who seek the position of a project manager, proceed with postgraduate studies in engineering/project management to foster their managerial skills (Mukherjee, Lahiri & Billing 2012). This research examines whether the skills needed to effectively manage virtual projects are gained through a project management graduate program.

This paper presents a review of the literature establishing the key characteristics deemed essential in virtual teams. It then posits that research into whether or not courses at universities in Australia prepare students to participate in such teams. By way of a preliminary example only, the paper considers one program from one university and, on the basis of the program's claimed graduate outcomes, attempts to answer the question without any claim to research rigour. The findings from this research, of a current masters program, indicate that students are indeed offered the opportunity to learn about and participate in virtual teams management activities. More importantly, this paper foreshadows the research currently being designed to answer this question in a more rigorous and scholarly manner. The findings of that research will form the basis of another paper.

The paper will proceed as follows. First, the current literature on managing project teams in virtual settings is presented. The challenges that impede the progress and performance of virtual teams are also discussed. This is followed by section 2 that describes the methodology used to answer the research question. A postgraduate project management program offered in an Australian university is examined in section 3. Based on the gathered information, section 4 provides analysis of the program's subjects to identify if any gaps or weaknesses exist in the topics covered or in the learning strategies used in the program. Finally, the paper will conclude with recommendations for future developments of such programs to address changing project management requirements.

## 1. Virtual Projects Teams

### 1.1 Definitions

There is no universally shared definition of the term 'virtual teams'; definitions vary with the interpretations of different authors (Szewc 2013). A commonly used definition of a virtual team is 'a group of geographically scattered persons brought together by information technologies and collaborating with no or minimal face-to-face interactions to accomplish one or more organisational tasks' (Ebrahim, Ahmed & Taha 2009; Malhotra, Majchrzak & Rosen 2007; Stough, Eom & Buckenmyer 2000). Organisations today are developing virtual teams to tackle global projects. The major factor that supports the proliferation of such teams is the technological advancement (Townsend, DeMarie & Hendrickson 1998).

The advantages of forming virtual teams include reducing travel cost and time, responding quickly to needs and goals (Paré & Dubé 1999), recruiting experts with various skills from around the globe (Drouin, Bourgault & Gervais 2010), working around the clock (Grimshaw &

Kwok 1998), and competing internationally with the increasing globalisation of trade, economies and corporate activities (Townsend, DeMarie & Hendrickson 1998).

Similar to co-located teams, the success of virtual teams can only be achieved with the presence of effective management (Maznevski & Chudoba 2000). However, managing virtual projects was found to be more challenging and complex than managing traditional projects. Virtual teams are often struggling from less efficiency and productivity mainly due to the dispersion of the members. As Donker and Blumberg (2008) said “Literally spoken, people are not sitting at the same table at the same time. Therefore, they cannot achieve their maximum work effectiveness” ( Donker & Blumberg, 2008, p. 41).

## **1.2 Project Management in Virtual Environment**

Literature points out that success criteria for virtual teams are not the same as those for co-located teams. Fuller, Valacich and George (2010) observed that like all projects, factors leading to failure in virtual projects include lack of involvement, blurred vision and goals, ineffective communication and lack of attention to human factors (Fuller, Valacich & George 2010). Successful project management is highly dependent on the ability of the project manager to facilitate communication and build healthy relationships among team members (Huemann 2010). In virtual projects, the project manager has to perform these tasks through electronic means where the project progress is distracted by communication difficulties, trust building, and leadership issues (Hertel, Geister & Konradt 2005). These inherent challenges in dispersed settings have large impacts on the communication, human resources matters, planning, integration & change management, and other project elements such as measurement and control as outlined below.

### **1.2.1 Communication**

Virtual teams mainly rely on information and communication technology to communicate and share information. Buxbaum (2001) found that the most reported factor leading to failure in virtual projects is poor communication. And one of the major problems observed when communicating is the misinterpretation and misrepresentation of messages (Pokharel 2011). Therefore, the level of performance is associated with the interpersonal skills of the project manager including his/her ability to use multiple communication channels adequately for various purposes. This is vital to ensure messages are adequately transmitted and understood, in order to create a shared vision, which is the key to successful collaboration.

Other social context factors such as building relationships and trust have also been reported as disturbing the communication process. For example, members missing the benefits of face-to-face interactions, which can delay the building of good relationships among members, especially that some members never get to meet in person. Moreover, trust is a significant aspect of successful teams because it encourages pooling of information and transfer of knowledge (Thomas, Bostrom & Gouge 2007). However, building trust among members of virtual teams is one of the toughest tasks faced by project managers (El-Sofany, Alwadani & Alwadani 2014), because of the lack of social context. Therefore, in dispersed settings, particular attention is needed for communication. On balance, the success of virtual teams is directly linked to effective communication (Johnston & Rosin 2011).

### **1.2.2 Human Resources**

The responsibilities of the project manager include acquiring and developing the project team. Within this process, the project manager needs to ensure the presence of the right personnel with the adequate skills to deliver the project successfully. In virtual projects, higher skills are required for individuals than in traditional projects as members are expected to work with minimal or even no direct supervision.

Even though virtual teams are staffed with skilled individuals, human factors must be considered carefully. Pokharel (2011) observed that virtual teams often witness high turnovers of members. The main reason is that members do not feel involved and contributing to the development of the project leading to generally lower morale. During their study, Kayworth and Leidner (2000) found that this low morale usually results from the incompetence of the project manager and the lack of providing continuous feedback throughout the project lifecycle. Consequently, strong leadership skills are particularly needed for project managers to be able to lead, influence, and motivate geographically scattered members. Ultimately, losing key members can lead to loss of control on projects (Kumar & Snavely 2004).

### **1.2.3 Planning**

Time management in global virtual projects can be very complex and needs critical attention. Initially, the project manager has to manage stakeholders and team members across different time zones. In some situations, there may not be a convenient meeting time that satisfies parties in various locations. Roeder (2012) found that the factors that pose risks and difficulties on the planning and scheduling include different public holidays, different local laws and regulations, and in rare circumstances weather characteristics. However, good time management with clear goals and effective coordination among team members can help save time as the project may progress following the sun. A study was done on twelve virtual teams and concluded that effective project managers are those who were able to articulate project goals and to allocate tasks with specific schedules and deadlines (Kayworth & Leidner 2000).

### **1.2.4 Integration and Change**

In virtual projects, integration management is one of the hardest tasks to accomplish; the project manager has to link deliverables between project teams and other geographically dispersed stakeholders (Kleinsmann, Buijs & Valkenburg 2010). Without full engagement, proper coordination, and effective communication, the integration process may face higher probability of failure and can lead to unwanted results. In addition, changes may affect whole processes and outputs, therefore, whenever they occur, changes must be communicated effectively to all parties with an adequate explanation of their effect on the integration with other activities. Once again, overcoming these barriers depends on the ability of the project manager to facilitate coordination through sophisticated means such as multiple computer-mediated communications system (Kayworth & Leidner 2000).

### **1.2.5 Measurement and Control**

When managing virtual teams, the project manager may miss the tools required for measuring the performance of the team. The absence or lack of supervision may result in informal scope changes, especially that members may neglect or misunderstand certain features or techniques (Kurupparachchi 2006). Therefore, the project manager need to be able to establish a system to monitor and control non-reported changes and non-conformities with plans and specifications. Furthermore, different quality standards and measurement units are adopted by different stakeholders in different countries, which may impede achieving shared vision and norms.

Consequently, the qualifications of a good leader in virtual projects are not the same as a good leader in traditional projects (Chen & Messner 2010). Thus, managing virtual teams requires higher capabilities and an appropriate leadership skills and style to maximise the productivity and effectiveness of team members. In fact, most project management challenges in virtual teams are focused around three main areas: communication, technology, and leadership.

The next section examines a postgraduate engineering management academic program offered in an Australian university to investigate whether learning outcomes include skills needed to work in a virtual settings.

## 2. Postgraduate Engineering Management Program

### 2.1 Overview

New realities are introduced to project management as organisations increasingly shift their focus to the formation of virtual teams to carry out global projects. The skills required by team members and managers differ to what they were ten or fifteen years ago.

Academic institutions preparing students for their future careers need to equip them with updated skills and knowledge. The Master of Engineering Management (MEM) is a postgraduate program offered in an Australian university. It is mainly designed for engineers who want to foster their managerial skills and integrate their business and technical knowledge (UTS 2016). According to University Handbook, the program “provides an opportunity for those who seek excellence and want to gain a competitive edge in the industry”. In other words, MEM is dedicated to professional engineers who want to take managerial positions or leadership roles in their career. Similar postgraduate courses are offered in many other universities, but might be named differently like Master of Project Management for example.

To fulfil its primary objective, the university develops in MEM graduates the skills needed to hold a favourable managerial position in engineering. These skills can be divided into two broad categories: (1) hard skills, referred to as technical skills, consisting of a body of knowledge appropriate to the field of practice, and (2) soft skills which consist of interpersonal-driven skills such as leadership, communication, negotiation, teamwork, and relationship building. Generally speaking, the content of the subjects offered in MEM is what forms the students’ knowledge, whereas the soft skills are formed and nourished through the learning strategies used. The curriculum of the course and the learning strategies adopted are discussed in the following sections.

### 2.2 Subjects Content and Hard Skills

Upon completion of the degree, MEM students will have completed an independent project in the area of engineering management and the following subjects:

- Advanced Project Management
- Applied Financial Management
- Economic Evaluation
- Judgment and Decision Making
- Value Chain Engineering Systems
- Leadership and Responsibility
- Quality Planning and Analysis
- Risk Management in Engineering
- Systems Engineering for Managers

Through scanning the subject contents, it was found that the above-listed subjects cover a wide range of topics relevant to project management. A summary of the technical skills developed in MEM students as indicated in the published subject outlines for each subject is as follows:

Subject “Advanced Project Management” aims to *“introduce students to the changing nature of project management in the global environment including the vast proliferation of virtual, global, large and mega projects. The dimensions of these new settings are discussed and explained, and adequate management techniques are provided as guidance for practical use. The subject also considers the human aspect of projects and highlights the importance of leadership in delivering a successful project”*.

Subject “Risk Management in Engineering” is *“intended to reinforce students with relevant risk management concepts, tools, and techniques”*. Risk management, after all, is considered one of the project management knowledge areas (PMI 2004) and is a pre-requisite for delivering successful projects. Project managers are expected to apply risk management processes in their job. This task gets more complicated in virtual projects because of the inherent challenges in this environment as the literature indicates. Moreover, it has been noted that most of the MEM subjects focus on raising students’ awareness of the need to identify and manage uncertainties at all levels.

Quality management is another area of knowledge in the PMBoK. In fact, management of quality has been proven to be a major success factor for projects across all industries. And recent project management literature has placed quality as a component of a quadruple constraint: time, cost, scope and quality (Kenneth 2014). In the MEM program, the subject “Quality Planning and Analysis” is offered *“to equip students with various tools and techniques needed for designing, implementing, monitoring, and improving effective quality management systems that are applicable to all industries”*.

Subject “Systems Engineering for Managers” *“introduces students to the importance of systems thinking to engineering management”*. Companies in the twenty-first century are increasingly relying on systems engineering methodologies to deal with the increased complexity of projects and systems (Xue et al. 2014). Further, recent research considered integrating systems engineering with project management. Throughout this subject, *“students acquire the technical skills required for applying systems engineering processes in engineering practice and management, and consequently improving their ability to deal with complexities by deploying appropriate tools and techniques”*.

In addition to engineering, a firm grasp of economics and finance is also needed for project managers as it guides most of the decisions they make. Obviously, finance is the language of business. MEM students are required to undertake the two following core subjects: “Economic Evaluation” and “Applied Financial Management”. The former *“introduces macro- and microeconomic concepts, issues, and policies needed to conduct a thorough analysis of economic situations, and thus arriving at an informed decision”*. The second subject is *“intended to load students with accounting basics, hence enabling them to read, produce and analyse financial statements, which is essential in examining a company’s or a project’s health”*. In these two subjects, students are exposed to different project costing methods and taught how to use different software for budgeting purposes. Since all decisions involve economic and financial evaluations, project managers must have a background in these areas.

The duties of a project manager largely involve decisional roles. Managers spend much of their time on ad hoc troubleshooting and conflict resolution. And since the human cognitive process is influenced by biases and heuristics that might block rational decisions, “Judgment and Decision Making” has been designed to *“equip students with decision-making methodologies to increase the efficiency of the evaluation process”*. The subject highlights different models and techniques to guide a rational decision-making process at all levels: individual, group, business and strategic.

The content of the MEM subjects were found to offer a rich body of knowledge that can improve the ability of engineers to use relevant project management tools and techniques in various disciplines to get the work done.

### **2.3 Learning Strategies and Soft Skills**

Learning strategies employed in academic institutions contribute to the development of students’ soft skills as well as influence the transfer of knowledge to students. Except for distance mode studies, the learning activities in the MEM program mainly consist of face-to-face lectures and tutorials. This approach supports the practice-oriented learning adopted in the university, with the purpose of preparing students for professional activities. The lectures

aim to convey and discuss the body of knowledge while tutorials, provide opportunities to apply what has been learned to various life scenarios. By allowing interaction with fellow students, experienced lecturers and tutors, the tutorials' activities promote the ability of students to appropriately communicate and develop presentation skills among other skills. For example, students in most subjects are required to present in front of an audience. Presentation skills have been proven to enable clearer communication and sharing of knowledge (Foulkes 2015) as well as contribute to increased self confidence in various workplace scenarios.

The MEM program emphasises the value of leadership skills. Students are required to undertake the subject "Leadership and Responsibility" that aims to develop an understanding of various leadership theories. Nevertheless, there is a challenge in developing leadership skills because these cannot be taught or learned merely from books and other learning sources; they are developed through practice in real experiences and human interactions. For this reason, a different learning approach is used in this subject, where learning takes place through a *"set of activities that require engagement, motivation, critical thinking, verbal communication, group participation, perseverance and performance under time pressure"* (UTS 2016). The activities undertaken include participating in group talks and role plays reflecting real life scenarios, where students practice and experience both leader and follower roles.

In addition, the university adopts a learning approach that helps students improve their relationship building and teamwork abilities. Most subjects require students to engage in working collectively to achieve some tasks. It is worth noting that with the present diversity in the university, the intercultural communication taking place among students strengthens their multicultural skills and awareness. In fact, these have become major success attributes for managers in this changing world.

### **3. Analysis and Discussion**

Based on the discussion above, the MEM program equips engineers with necessary knowledge, skills, methodologies, techniques, and tools to effectively manage engineering projects across a wide range of industries. The content and references indicated in the subject outlines were found to be up-to-date, encompassing the latest developments and recent theories in the field. Therefore, upon completion of the course, graduates would have acquired updated knowledge and technical skills required for managing the different elements of a given project including stakeholders, scope, time, cost, quality, human resources, communication, risk, procurement, and integration. These are the knowledge areas of project management set by PMI (2014). In addition, students would have also learnt tools and techniques to leadership, problem solving and decision making.

Not only are the technical skills, but students' soft skills are also developed in MEM. Soft skills, including communication which is of particular importance for virtual projects is practiced widely across all subjects of the MEM program. For example, topics of, "Stakeholders" and "Communication", are covered in "Advanced Project Management" where students are exposed to strategies for establishing and controlling effective management plans for both areas. Moreover, almost all subjects were found to focus on the need for identifying, prioritising, and addressing stakeholders' needs for success to be achieved. In fact, most organisational theorists agree that "successful businesses must consider and create value for their many stakeholders" (Luhman & Cunliffe 2013). The subjects' assignments are designed to ensure that student's clear and concise writing and presentation skills are developed, which is highly desired in virtual settings given the high probability of misinterpretation of messages. And as discussed earlier, many learning activities are undertaken in the subjects, with the goal of improving students' verbal communication through discussions, role plays, presentations, and teamwork activities. Moreover, UTS is putting additional efforts to ensure proper development of students' communication skills; HELPS (Higher Education Language and Presentation Support) is a

department in UTS that offers free services for students to enhance their presentation, writing and speaking skills.

It is established that communication in virtual projects mainly requires the ability to effectively use information technology for various purposes. And since the university is increasingly utilising technology in its learning approaches, this ability is enhanced in the MEM program. In fact, students are heavily exposed to the “online” world, and learning strategies in the university require the use of various online means to share and exchange information. Some subjects use the social media to promote collaborative learning. Such approach improves student’s proficiency to efficiently use the “online” world. In addition, when working in groups, students usually use various online tools and groupware such as Google Drive, Skype, and Blackboard, to communicate among themselves and collaborate to accomplish a task, which reflects the working environment of virtual teams. Moreover, there is a subject called “Managing Information Technology in Engineering” which can be undertaken by MEM students as an elective. The subject aims to develop students’ ability to use information technologies effectively and productively when working in a team environment. This subject is delivered electronically, with no face-to-face meetings, thus providing students the opportunity to experience the virtual setting.

Human resource is another critical and sensitive area in virtual projects. Project managers need strong leadership skills to make effective use of people in virtual teams because, as mentioned earlier, members do not feel involved in the project development. It is the duty of the project manager to motivate the project team and ensure full engagement. And since the lack of involvement, which is a major problem in virtual teams, poses potential risks on integration management, it can seriously harm the progress of any project. According to many studies, “user involvement” is among the top three project success factors (Brown & Hyer 2010; Hallman 2011; Manifesto 2013). The development of leadership skills in students is one of the major objectives of the MEM program. The university recognises that building such skills through traditional learning is out-dated. Hence different strategies are used where students are provided with the opportunity to experience leadership and stewardship roles through a set of collaborative activities. And due to the culturally diverse setting of the MEM cohorts, engineers can develop their multicultural awareness that became an extremely important attribute for project managers, especially in the case of global virtual projects. In the twenty-first century, multicultural competency became a pre-requisite for effective leadership.

## **4. Conclusion**

This research investigates whether the skills required for participating in virtual teams are gained through project management graduate programs. This paper presented preliminary findings that will form part of a comprehensive research currently being designed to answer this question in a more rigorous and scholarly manner. The design and findings of that research will form the basis of another research output.

When put to the test, the MEM program in one Australian university was found to recognise the changing nature of project management, and has adopted adequate learning strategies that provide students with the opportunity to develop the skills required to overcome the communication, technology and leadership issues arising from working in virtual teams. The drawback of this study is that the extent to which these skills are being developed and strengthened could not be quantitatively measured, because knowledge and self-development is highly dependent on students’ approach to learning.

Another important issue that the research has highlighted is the importance of adopting innovative learning strategies in universities in order to develop successful learning outcomes for individuals. Based on the discussion, an up-to-date curriculum alone is not sufficient for developing all the skills needed to excel in project management, especially the soft skills that can only be developed through the practice-based learning strategies. As a

matter of fact, soft skills are no less essential than hard skills, particularly when working in virtual environments. In his study, Krahn (2006) has noticed that the most important competencies for project managers are people skills, leadership, listening, integrity, strong at building teams and trust, verbal communication and conflict management, all of which are swirling around the individual's soft or personality-driven skills.

It is to be noted that this study was carried out only on the project management program in one Australian university, as a snap shot, with the intention of recognising and improving the soft skills in engineering education on a broader scale. Therefore, this research raises questions for further rigorous and scholarly investigations into this program and other similar academic programs in other Australian universities.

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