The future of project management simulation exercises

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ABSTRACT

Project management remains as one of the most popular post graduate management courses for international students at UK Universities. Students perceive or are advised that the skill set is highly transferable to a wide range of management opportunities and can be built upon almost any undergraduate discipline. However, many practitioners claim that the interconnectedness of the real life of projects can only ever be fully understood through on-the-job real life work experience. Hence the student dilemma, how to gain experience without experience? Project management simulation exercises attempt to bridge this gap.

This research considers the effectiveness of a well proven simulation at a UK university comparing the applied knowledge of 17 different skill sets before and after the exercise through the lens of the student perspective. Furthermore, in depth semi-structured interviews with experienced tutors aim to decipher the mechanisms of learning so transferable principles can be prioritised for future exercise design.

The study carried out during the 2020/21 academic year demonstrates that from a student perspective such educational approaches are highly effective with all the skill set analysed (a broad set of hard and soft skills) showing notable deltas before and after. In addition, students engage deeply with this method and find it fun and memorable which is important for future knowledge retrieval. The knowledge and experience of the tutors highlighted that game design was only 1 of 3 important elements crucial for learning to take place. Game management and the skill and motivation of the tutor have equal bearing on success. This research offers a conceptual framework to synthesis the findings and recommends that

educationalists and employers collaborate and invest in future game development together rather than seek off the shelf solutions.

INTRODUCTION

Project management is a popular subject particularly for post graduate education where students perceive the transferable skill set as highly desirable for employability for a wide range of management or leadership roles (Clark, 2008). Its emergence as the recognised best way to manage change has made it attractive to employers. At the heart of many project management courses is some sort of simulation exercise or game seeking to come close to a real-life project where students can develop and acquire the required skill set. This research seeks to evaluate the effectiveness of a well proven project management simulation at a UK University and understand the mechanisms of learning to enable development of the next generation of project management simulation.

LITERATURE REVIEW / RATIONALE

The classic approach of project management education has been challenged since the early 2000's where EPSRC funded research uncovered the limited effectiveness of the typical university approaches relying on traditional lectures to deliver one way communication (Crawford et al, 2006, Cannon & Newbie, 2000). In parallel the project management profession was extending the required competencies for project managers recognising the importance of the soft or people skills alongside the hard or technical skills in successful project delivery (Thomas & Mengel, 2008, Dulewicz & Higgs, 2000, Christenson & Walker, 2004).

In USA at the turn of the millennium leading academics and practitioners took stock of how people learn in the modern world including studies relating to the differences between experts and novices and focusing on how experts acquired their expertise (National Research Council, 2000). Drawing on this research and other foundational work (John Dewey – Experience and Education 1938) Kolb developed the Experiential Learning Theory (ELT) establishing a theoretical ink between experience and learning and then "reliable" or knowledge that can be applied (Kolb, 2014). Kolb attempted to pull together the worlds of education, industry or business and individual development.

Furthermore, Kolb attempted to identify where the different skills or competencies required for certain professions could be acquired and identified that some skills were typically acquired in professional education, some through work experience and some a combination of both.

Project management simulation sits between the two typical areas of learning denoting the skills acquired via education and work experience, potentially extending the education area towards that skill profile representing the job requirements.

Other studies on simulations or serious games have attempted to consider their effectiveness as a learning tool by pairing skills acquired with those most sought after by employers sometimes known as the 21st. Century skills (Romero et al, 2015). Such skills include soft skills such as collaboration, teamwork and communication and managing and solving conflicts, taking risk, self-direction and learning to learn (Romero et al, 2015).

Finally, the literature does provide useful insights concerning the role of the tutor or educator in facilitating the holistic learning experience (Kolb, 2014). The role is multifaceted covering subject expert, standard setter and evaluator and implies it has its own set of acquired skills.

The literature above provides some theoretical and scholarly basis for this research.

AIM AND OBJECTIVES / RESEARCH QUESTION(S)

The aim of this research is to explore the effectiveness of a particular project management simulation exercise in acquiring the skill set relevant to modern project management which in turn prepares the student to make a faster contribution in the workplace and society.

The fundamental and overarching research question is within the current time: How do students best acquire the skill set required for project management?

To answer this question a series of sub-questions are derived:

1. What are the skills for project management that employers require?
2. How are these skills acquired through project management simulation exercises?
3. What key transferable principles can be learnt from current practice useful for future project management simulation design?

METHODOLOGICAL APPROACH

With the aim of this research being focused on contributing practical solutions for project management education and reliance on the research objectives pragmatism seems an appropriate research philosophical stance (Saunders & Lewis, 2012).

A mixed methods approach was adopted including both quantitative and qualitative primary data obtained from students studying project management at master's level and experienced tutors facilitating the learning. The data acquired during end of the 2020/21 academic year provides relevance in the post pandemic current world.

The quantitative data was acquired through a Qualtrics survey covering 17 different skill sets and asking students of their perception of skill level before and after the exercise. The description of the skill areas was adapted to use a straightforward terminology that could be easily and rapidly understood by the largely international students. Often a second word or phrase corresponding to the specific activity in the simulation exercise was given to avoid doubt and allow rapid comprehension. The 17 skills selected were drawn from the project management professional bodies list of competencies (APM & PMI), academic literature and industry academic collaboration bodies (CMI 21st century leaders) looking at skills for employability.

The skill set chosen to analyse with respect to the WMG project management simulation exercise is shown below.

1. Schedule management (planning and monitoring)
2. Cost management (setting budget and cost control)
3. Supplier management (supplier choice)
4. Time management (making timely decisions)
5. Risk management
6. Integration management (trade-offs in projects)
7. Conflict management
8. Decision making
9. Collaboration/teamwork
10. Communication
11. Social/cultural skills
12. Creativity/innovation
13. Problem solving
14. Learning to learn (lessons learnt & during the PME)
15. Self-direction (self-motivation)
16. Flexibility and adaptability
17. Sense of initiative/entrepreneurship

The scale chosen to position their level was one already used by the students in a study skill learning contract activity and was therefore familiar. The five levels of skill relate the student's self-assessment of their skill level. Level 1 is having no skills or previously encountered this skill set. Level 2 is very limited skills. Level 3 is and acceptable level of skill. Level 4 is an above average level of skill and level 5 being a very high level of skill. (Source: SPA study skills student contract, WMG, 2021).

Every effort was made to enable the students to complete the survey in a reasonable amount of time (around 7 minutes) at a time in their programme when they were finishing off later modules and engrossed with dissertation/final project writing. This survey was completed once post module in June 2021 but the time from module to survey could vary from student to student depending on when in the academic year they took the module which contained the simulation. Although a useful time in their MSc learning journey for such questioning their time poverty was acknowledged. 115 survey responses were received from 427 students who participated in the project management exercise that year representing a 27% response rate. The data was cleaned removing partial responses given a final data set of 94 considered representative of the cohort of that year.

Qualitative data acquired from experienced tutors involved semi-structured interviews which allow further probing when pertinent points are uncovered. The line of questioning drawn from the literature focused on their observations of where and how learning occurs to appreciate the current mechanisms for learning of this project management discipline with this generation for students. Questions did focus on the most memorable (or powerful) learning experiences and their view on the conditions for learning or the best environment for learning to occur along with their view on the role of the tutor in facilitating learning and ideas for future simulation development. 8 interviews were conducted with tutors with between 5 and 30 years of experience. Interviews were transcribed and thematic coding used to identify principal themes.

The project management discipline arguably lies in the intersection or tension between the applied sciences and social sciences often highlighted by the literature falling in different places in different universities. Pragmatism draws on a range of positivist and interpretivist approaches with bias towards finding practical solutions and is the approach adopted for this research.

Ethical approval following the University policy was obtained prior to research being undertaken.

THE ENGINEERING EDUCATION PROBLEM AND INTERVENTION

A key question occupying the minds of many project management educationalists is how best to teach the current generation of students choosing project management and put another way how best do they learn? Project management is considered by many to be a unique blend of hard or technical skills and soft or people orientated or interpersonal skills. Against this backdrop it must be noted the changing landscape of the project management profession and the changing characteristics of the student population choosing this subject.

Project management is a relatively recent or emerging discipline when compared to well established disciplines like engineering, medicine, law or even accountancy. The Institute of Engineering & Technology (IET) have celebrated within the last few years 150 years as a national body. By contrast the birth of modern project management is often linked to the American Apollo moon landings or Manhattan project of the 1950's & 60's (Morris, 1997) and the UK Association of Project Management (APM) only have just obtained the right to offer chartered status or registered professional project managers since 2018. However, project management is now considered to be entering a golden age and is particularly popular with international students looking to add a management MSc to their undergraduate discipline and then secure the most sought-after fast track leadership programmes in the top companies.

Furthermore, as business and technology move further from the industrial age and deeper into the digital future methodologies, approaches, tools, and techniques need to be reappraised and developed for the future.

It is within this context and that the effectiveness of current teaching and learning of project management and in particular the use of a proven project management simulation exercise at a leading UK University is assessed. How good is it from a student perspective and how does it work from a tutor perspective. Such information is vital for educationists as they seek to renew and refresh their teaching approaches.

KEY FINDINGS

The findings are separated first considering the student perspective and then considering the tutor perspective. The student perspective provides insight to their thoughts on how

effective the simulation exercise was as a learning tool. The tutor perspective delves more into how the learning takes place and what makes this possible.

The student perspective

Figure 1 below gives a graphical representation of the delta before and after for one of the 17 skill sets assessed, in this case schedule management which included the construction of a plan using a Gantt chat or network plan and its use during project execution in monitoring and controlling the progress to keep the project on track. As can be seen the majority of students considered to having limited or no skill prior to the learning experience and then assessing themselves to have above average or acceptable level with some claiming to have "a very high level of skill". Very few considered themselves to have "very limited skills" after the exercise.

Figure 1. Example of the delta before and after the simulation from the student self-assessment (source: author)

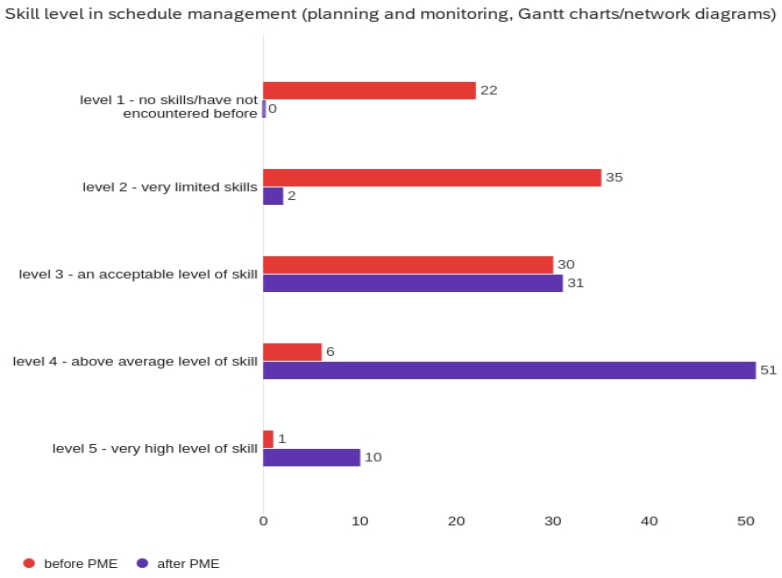


Table 2 below presents this data in numeric form and pulls out the average before and after. All areas show a marked improvement which is significant because many in project management would claim the need to master this broad range of skills due to their interconnectedness in practice. Furthermore, the data supports the claim that for the majority of the students the subject material is new and few (>25%) have any prior work experience. However, after the exercise they have found a new confidence and now consider themselves to be above average suggesting a belief that they have now secured a competitive advantage. The problem and challenges of student self-assessment is covered later in the discussion section, but the data acquired does argue that from a student perspective this approach is effective.

Table 1. Summary of student perception before and after PME with average levels per knowledge area (Source: author)

	Level before					**Average**	**Level after**					**Average**
Knowledge area	1	2	3	4	5		1	2	3	4	5	
Schedule Management	22	35	30	6	1	**2.2**	0	2	31	51	10	**3.7**
Cost Management	22	40	27	4	1	**2.1**	1	8	45	36	4	**3.4**
Supplier Management	30	36	17	9	2	**2.0**	2	6	40	36	10	**3.5**
Risk Management	23	43	23	3	2	**2.0**	0	8	38	40	8	**3.5**
Integration Management	35	36	16	5	2	**1.9**	2	14	44	30	4	**3.2**
Time Management (making timely decisions)	13	31	39	8	3	**2.4**	0	6	28	45	15	**3.7**
Decision Making	7	30	45	8	4	**2.5**	1	2	32	46	13	**3.7**
Conflict Management	19	39	29	6	1	**2.2**	2	5	45	37	5	**3.4**
Communication	3	20	43	20	8	**2.7**	0	1	21	49	23	**4.0**
Social/cultural skills	6	25	35	23	5	**2.7**	0	1	35	41	17	**3.8**
Collaboration/teamwork	3	18	50	17	6	**2.7**	0	0	21	47	26	**4.1**
Creativity/innovation	7	37	34	11	5	**2.4**	0	8	38	36	12	**3.6**
Problem solving	4	24	46	15	5	**2.7**	0	2	28	49	15	**3.8**
Learning to learn (lessons learnt and not making same mistakes)	3	29	45	13	4	**2.6**	0	1	23	55	15	**3.9**
Self-direction (self-motivation)	4	32	33	21	4	**2.7**	0	6	32	43	13	**3.7**
Flexibility and adaptability	3	30	40	16	5	**2.6**	0	3	35	45	11	**3.7**
Initiative/entrepreneurship	10	35	32	13	4	**2.4**	1	6	41	38	8	**3.5**

Table 2. Summary of general questions to students (Source: author)

General Questions (n=94)	% Yes	% No
Were you actively engaged	**100%**	**0%**
Was the exercise enjoyable or fun?	**99%**	**1%**
Have you previously participated in such activities?	**34%**	**66%**
Was it memorable, do you still remember it?	**97%**	**3%**
Would you recommend this type of learning to a friend or colleague?	**97 %**	**3%**

The results in table 2 above presents a compelling story. In short, the students were actively engaged, found the experience fun, still remembering it and would recommend it. For the majority this was also a new way of learning.

The tutor perspective

Tutors were asked about their most memorable learning experiences they had observed, what they thought were the most requirements to allow learning to take place and what are most important attribute for the tutor to facilitate the learning to take place.

In terms of creating a learning space they said:

"*There is a lot written about creating an authentic learning environment, links to practice etc. The more you can do that, information setting, surprises, then a better learning vehicle".*

Concerning the value of simulations, they argued:

"You cannot put the same messages in a series of lectures, you can present the parts, but you cannot explain how they fit together".

On the time commitment they said:

"Learning is not an instantaneous process, it is about assimilating and when something has gone wrong, not according to plan, then they learn something."

and:

"Time related to complexity but also time for the students to get it, if you force the learning, you sacrifice the power of the learning".

The key findings from the semi-structured interviews with experienced tutors (> 5 years and up to 30 years) is synthesised in the proposed conceptual framework shown in Figure 1 below.

DISCUSSION

The student perspective

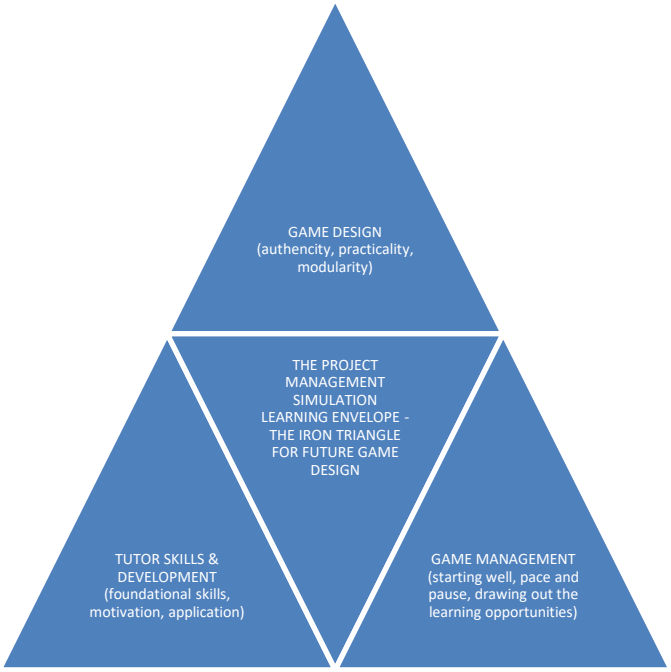
The quantitative data acquired is convincing and argues that this type of learning experience is highly valued by the student. The results do agree with the literature, and particularly the work of Kolb & Driscoll, some of the standard bearers for experiential learning. As is stated learning "occurs in context, is active, is social and reflective" (Driscoll, 2002). Furthermore, quoting the Chinese proverb Driscoll says "tell me, I forget. Show me, I remember. Involve me, I understand." (Driscoll, 2002). There is an almost exact correlation between this data and this learning theory.

Kolb's work stressed the importance of how any new knowledge is stored by the brain. Memory is crucial to knowledge retrieval and therefore the usefulness of this new knowledge (Kolb, 2014). The charts displaying the student's reflection on those memorable moments is encouraging suggesting that the new knowledge is stored in a safe place and can be found and applied in the future.

However, the problem of student self-assessment needs to be considered. How accurate of their actual level is this? Are they best placed to make such assessments? What is their bias? Some distortion may be present but even with this potential weakness their view does have value. They choose where to invest in higher education and the newfound confidence with project management skills and techniques can translate into increased potential at first interviews and then in the workplace as they are motivated to apply their new skills with belief and enthusiasm.

The tutor perspective

Figure 1. Proposed conceptual framework for project management simulation education (developed) (Source: author)



Game design is considered important/essential but limited in stretching the space for maximum learning envelope. Within game design tutors highlighted the need for the exercise to be true to real life but at the same time practical or able to be delivered within the other constraints of the classroom or module or course design. A modular simulation design approach can help to flex the exercise to different cohorts or where groups or clients have a particular learning requirement or bias (e.g. stakeholder engagement, supplier relationships).

Building on a strong simulation design tutors emphasised the significance of the execution or management of the exercise. The importance of creating the most effective learning environment was stressed to start well, forming the teams and then the control of the flexibility to manage the time but also to dwell or pause or create space and be patient for learning to come. Recognising these learning opportunities which can arrive at different moments with every unique group of 5 individuals and then managing the pause and pace dynamics requires skill.

The skill of the tutor and how these skills can be acquired was the third significant theme highlighted by these experienced tutors. Foundational knowledge concerning project management is fundamental but also knowledge about learning theory and application and strong motivation or passion for learning also important factors.

A comparison between the proposed conceptual framework drawn from this qualitative research and Kolb's work on educator roles and the learning cycle is useful.

The skilled tutor needs to be able to move seamlessly between facilitator, subject expert, coach and standard bearer and evaluator with focus shifting from the experience of the learner to making the links and creating meaning from the action or experiential learning. A skill that is unlikely to be acquired easily or quickly but more likely be acquired through dedication, vision, strong motivation, and hard work. In this area there are notable links between the existing literature and these findings.

Elsewhere the findings extend the current literature proposing 3 dimensions to creating an effective learning space for future project management simulations. This challenges current thinking where higher education institutions prefer off the shelf game solutions from commercial simulation companies to investing and developing their own exercises. Recognising the current financial realities of the higher education sector this work nevertheless argues for collaboration between employers and educationalists to develop the next generation of project management simulations developed for the current and future generation and adapted to the needs of our new post pandemic world order.

CONCLUSIONS & RECOMMENDATIONS

In this research, we have addressed the effectiveness of project management simulations as a learning tool within the context of postgraduate education. Our findings indicate that these simulations provide a dynamic and engaging environment where students can develop and apply a wide range of skills relevant to contemporary project management. The study has demonstrated that through active participation in these simulations, students not only acquire theoretical knowledge but also gain practical insights into real-life project management scenarios.

Furthermore, our research has led to the development of a conceptual framework for future simulation design. This framework encompasses three key dimensions: the workings of game design, the strategies for effective game management, and the critical role of the lecturer in enhancing the learning experience. These elements together create a comprehensive approach to simulation-based learning in project management.

The significance of this research extends beyond its immediate findings, in that it contributes to the broader discourse in education engineering by offering practical evidence that supports the adoption of simulation-based learning approaches. This evidence affords the potential to encourages decision-makers in educational institutions to recognise the value of these methods and consider their integration into teaching strategies.

In light of our findings, it is recommended that professionals involved in teaching project management actively seek collaboration with industry partners. Such collaborations can lead to the development and refinement of the next generation of project management simulations**.**

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