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Learning style and learning method preference in project management education: What happens when things get more complex?

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Abstract: The transformed goal of project management education is to prepare learners in coping with actual project complexity rather than to prepare ‘trained technicians’ who understand project management methods and techniques but struggle to adapt in the complex environment of a project. Games and simulation exercise are potential solutions as they enable learners to experience and solve complex project management problems with no requirement to commit resources to the actual project. This research empirically examines whether learning style affects students’ learning method preference when project management problems with different levels of complexity are presented. After playing more complex project management games and undertaking a less complex e-Learning simulation exercise, the learning style and learning method preference of 126 MSc Management of Projects students are assessed and analysed quantitatively. The result suggests a strong statistical significance to accept a hypothesis that the “intuitive vs sensing” learning style dimension (proposed by Felder and Soloman) affects the learning method preference of a learner. Intuitive learners (78% of them) prefer the games, whereas sensing learners (54% of them) prefer the e-Learning simulation exercise. A strong preference of intuitive learners towards the games can be explained by the higher level of complexity and surprises in the games which they tend to prefer over well-established methods and repetitions. Sensing learners tend to be patient with details and to favour predictable problems. This is consistent with the attributes of the e-Learning simulation exercise: less complex, more predictable, repetitive, and filled with detail-oriented activities. The findings not only suggest a correlation between learning styles and learning method preferences in a project management context, but also explain how project complexity plays a part in their relationship. This is crucial as projects are becoming more complex and complexity is one of the main reasons why projects fail.

Keywords: Project management, Complexity, Learning style, Game, Game-based learning, Simulation
1. Introduction

Current project management (PM) education struggles to educate project managers and team members in coping with complex scenarios (Thomas and Mengel, 2008). This is ironic as PM ‘is about making something complex happen (on time, within budget and to specification) through other people …’ (Martin, 2000b, Dh, 1987). The issue is that PM education tends to limit its scope to a standardised traditional PM method, while project issues are much more complex (Winter et al., 2006). In fact, Crawford (2005) suggests that there is little or no evidence showing that trained or certified project managers are better managers compared to ‘accidental’ project managers in coping with complexity. This corroborates a concern of many practitioners who have already questioned whether PM tools, techniques, qualifications and education have ever reflected the actuality of PM (Winter and Thomas, 2004).

There are three PM education challenges. First, the knowledge areas in PM are broad (McCreery, 2003). The Project Management Institute (PMI), for instance, identifies 10 knowledge areas (Stackpole, 2013), which consist of managing integration, scope, time, cost, quality, human resource, communications, risk, procurement and stakeholders. The second challenge is that PM is both theoretical and practical. The task is therefore to educate project managers and their team not only to ‘know what’ but also to ‘know how’ in order to apply their PM knowledge in complex situations (Thomas and Mengel, 2008). The third challenge is to educate project members with different backgrounds and learning preferences.

Games and simulation exercises are potential solutions to cope with the challenges as they have ‘the advantage of enabling participants to be put into complex, realistic project situations …’ (Al-Jibouri, 2005). Their application in PM education has yielded many successful results, particularly in addressing the first two challenges (i.e. variety of knowledge areas and practicality). For instance, the Incredible Manager game (Barros et al., 2006), a game of software project planning and control, has raised PM skills and interest in PM. The Project Execution Game (PEG) (Ofer and Amnon, 2007), a game that simulates decisions to cope with risk events occurring in project execution, is an effective tool to teach the unstructured area of executing projects. This game gives the students ‘a taste of real-life experience’ (Ofer and Amnon, 2007). Another game (Maratou et al., 2014), a game of team communication and collaboration to confront risk events occurring in project execution, had a positive impact on improving players’ collaboration.

Existing research on PM games and simulations, however, tends to ignore the third challenge (i.e. taking account of different learning preferences of project participants). As projects get more complex, the importance of this challenge becomes more significant since it involves more people with different backgrounds, learning styles and preferences. Therefore, this study aims to contribute to the existing research in PM games by investigating on the effect of learning style on students’ learning method preference when facing different levels of project complexity.

To achieve this aim, Section 2 of this paper examines the literature on project complexity, PM games and simulation, and learning styles. Specifically, it first discusses characteristics of a complex project, formats of PM games and simulations, learning style concepts, controversies and models. Section 3 proposes hypotheses of the effect of learning styles on learning method preference given different levels of project complexity. Section 4 describes the experimentation which conducted to test the hypotheses. Section 5 outlines the results. Finally, the paper concludes by discussing the findings and directions for future research.

2. Literature review

This section provides a brief explanation of the topics which are discussed. Key terms and concepts are defined and explained before proposing and testing research hypotheses.

2.1 Characteristics of a complex project

The term “project complexity” is a key theme in an extensive number of PM studies as projects are becoming more complex and complexity has become a main factor in project failure (Bakhshi et al., 2016). Several studies propose a definition of project complexity. Cicmil and Marshall (2005) highlight the element of ambiguity in complexity, which is aligned with Grisogono’s (2006) notion that complexity is determined by the ratio of the number of ways to achieve the wrong result to the number of ways to get the right one. Project
complexity is also determined by whether the goals and methods to deliver them are well-defined or not (Turner and Cochrane, 1993). Other research underlines interrelated parts as an element of project complexity (Bakhshi et al., 2016, Arita et al., 2009, Vidal and Marle, 2008). This is an important factor due to the fact that most projects are conducted in a multi-projects context (i.e. called program) in which projects are interrelated with other projects (Payne, 1995).

To synthesise, a project becomes more complex when it is ambiguous in a way that methods (or even goals) are unclear and there are significantly more “wrong answers” than “right answers” to its problems. Project complexity is also characterised by interrelatedness between its parts (e.g. teams, stakeholders, schedule, goals, and other resources) which makes it more difficult to manage.

2.2 Project management games and simulations

To provide a PM education which takes account of complexities that occur in a project, many studies (Al-Jibouri and Mawdesley, 2003, Ofer and Amnon, 2007, Vanhoucke et al., 2005) propose a game-based learning approach (i.e. simulation and games). This approach attempts to simulate the actual problems which often occur in a complex project. If conducted appropriately, the use of games and simulations can also contribute in developing intangible skills, such as communication and leadership (Khenissi et al., 2016).

Most PM games are computer-based. However, in recent years, more mediums are emerging (e.g. m-learning). The application of m-learning (Ayk, 2012) which allows user to play PM games using tablets and touch-screen phones is positive as it provides an alternative to the other mediums. The only downside with this (and also with computer-based games) is that they may not be as effective as paper-based games or board games in terms of triggering face-to-face interactions between players (Martin, 2000a). This is an important aspect in PM as ‘about 90% of the time in a project is spent on communication by the project manager’ (Rajkumar, 2010). It is also an important feature in simulation and games since ‘the magic ingredient is that simulations provoke talk’ (Jones, 1998).

2.3 Learning style concepts, controversies and models

Learning style is preferred way of an individual to acquire, retain and process information (Felder, 1988). It is also defined as the preferred method of a person in order to gather, process and put data for later use with regards to ‘concrete experience, reflective observation, abstract conceptualization and active experimentation’ (Kolb, 1976). The two definitions suggest similarities between learning style and learning method preference. In this study, however, the terms are used separately, as the first is used when referring to the subject (i.e. learners) whereas the latter refers more to the object (i.e. games and simulation).

The usefulness of learning styles is questioned, as research suggests that there is a lack of evidence of their contribution towards learning effectiveness (Rogowsky et al., 2015, Kirschner, 2017). Kirschner (2017) argues that learning style tends to be a bad predictor of the way a person learns most effectively. This is because an individual’s preferred learning method may not be his/her most effective way to learn. In Kirschner’s words: “while most people prefer sweet, salty, and/or fatty foods, I think we can all agree that this is not the most effective diet to follow, except if the goal is to become unhealthy and overweight.” However, the work of Khenissi et al. (2016) in game-based learning suggests that providing the right method for the right person could lead to a better learning experience and enhance learners’ motivation to learn. Learning style also affects individuals’ impressions towards gamification (Buckley and Doyle, 2017). While learning style may not contribute directly towards learning effectiveness, it is arguably an important factor in driving learners’ motivation to learn, which is a key principle in game design (Chua and Balkunje, 2012).

Coffield et al. (2004) listed 71 different learning styles and tested 13 models of learning style where each was examined for both construct and predictive validity, and internal consistency and test-retest reliability. Only three of them came close to meeting the criteria. Among numerous proposed learning style models, there are only a few that have been applied in technology-enhanced learning applications and which have been tested for reliability and validity (Khenissi et al., 2016). The Felder-Silverman Index of Learning Style (ILS) is one of them and is considered as a generalised model as it is synthesised from many studies and represents elements of most models (Soflano et al., 2015).
3. Research hypotheses

As complex projects involve more people with different backgrounds and learning preferences, a one-size-fits-all approach may not be effective. The work conducted by Khenissi et al. (2016) suggests that learning styles do affect learners’ learning method preference (i.e. game genres). This research attempts to build on their finding by adding a complexity dimension and putting it in the PM context.

- **Hypothesis 1:** The active vs reflective dimension affects learners’ learning method preference (i.e. either toward less or more complex PM games or simulations).
- **Hypothesis 2:** The intuitive vs sensing dimension affects learners’ learning method preference (i.e. either toward less or more complex PM games or simulations).
- **Hypothesis 3:** The global vs sequential dimension affects learners’ learning method preference (i.e. either toward less or more complex PM games or simulations).
- **Hypothesis 4:** The visual vs verbal dimension affects learners’ learning method preference (i.e. either toward less or more complex PM games or simulations).

4. Experimentation

4.1 Participants and learning methods description

The experimentation involved 126 MSc Management of Projects students in the University of Manchester who participated and submitted valid responses to a survey after they participated in 2 types of learning methods:

- **Crashing games** (i.e. Project Crashing Game / PCG and Program Crashing Game / PgCG) – the games simulate a more complex problem as they involve multiple small projects (i.e. in PCG) which are interrelated with each other within a larger program (i.e. in PgCG). In this method, learners are not required to repetitively calculate cost and schedule details after each decision. The objective of the games is to achieve a target budget and schedule by crashing (i.e. accelerating) the program. Learners learn the basic concept of project crashing by playing PCG where they crash a single project. They then work with other project teams within the program (PgCG) to achieve the overall program objective. They need to analyse how their decision affects the schedule and budget of their own project and the larger groups’ program.
- **E-Learning simulation exercise** – this exercise requires learners to complete each step of the project crashing process (i.e. including repetitive calculation steps). The objective is similar as in the first method. However, instead of completing a large program, learners work individually to complete the smaller project. They receive direct and detailed feedback after completing each step.
4.2 Instruments and data analysis method

There are two instruments which were used to collect data. The first one was the Index of Learning Style (ILS) proposed by Soloman and Felder (2005). This questionnaire was used to identify learners’ learning styles. It consists of 44 questions (Soloman and Felder, 2005). ILS is selected as it is based on a generalised model as explained in Section 2.3. The second instrument was a questionnaire that consists of multiple-choice questions that ask learners to reflect on which learning method they prefer the most (i.e. crashing games or simulation exercise).

A chi square test was performed to test the hypotheses and to make sure that the tendency of data is not due to chance.

4.3 Results

Tables 1-4 indicate that only the ‘intuitive vs sensing’ and ‘global vs sequential’ learning style dimensions affect learners’ learning method preference. The majority (i.e. 78%) of intuitive learners prefer the more complex crashing games, while 54% of the sensing learners prefer the less complex e-learning simulation exercise. On the global vs sequential dimension, 59% of global learners prefer the crashing games, while 54% of the sequential learners prefer the e-learning simulation exercise.

Table 1: Active vs reflective learning styles and learning method preference

<table>
<thead>
<tr>
<th>Active</th>
<th>Reflective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crashing Games</td>
<td>Simulation (e-Learning)</td>
</tr>
<tr>
<td>35</td>
<td>34</td>
</tr>
<tr>
<td>51%</td>
<td>49%</td>
</tr>
</tbody>
</table>

Table 2: Intuitive vs sensing learning styles and learning method preference

<table>
<thead>
<tr>
<th>Intuitive</th>
<th>Sensing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crashing Games</td>
<td>Simulation (e-Learning)</td>
</tr>
<tr>
<td>18</td>
<td>5</td>
</tr>
<tr>
<td>78%</td>
<td>22%</td>
</tr>
</tbody>
</table>

Table 3: Global vs sequential learning styles and learning method preference

<table>
<thead>
<tr>
<th>Global</th>
<th>Sequential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crashing Games</td>
<td>Simulation (e-Learning)</td>
</tr>
<tr>
<td>32</td>
<td>22</td>
</tr>
<tr>
<td>59%</td>
<td>41%</td>
</tr>
</tbody>
</table>

Table 4: Verbal vs visual learning styles and learning method preference

<table>
<thead>
<tr>
<th>Verbal</th>
<th>Visual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crashing Games</td>
<td>Simulation (e-Learning)</td>
</tr>
<tr>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>53%</td>
<td>47%</td>
</tr>
</tbody>
</table>
To ensure that the tendency of data is not due to chance, a chi-square test was performed. Table 5 outlines the result of this test. With 95% level of confidence, only Hypothesis 2 is accepted (i.e. the intuitive vs sensing dimension affects learning method preference either toward less or more complex games or simulation).

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>P-value</th>
<th>Reject/Accept</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypothesis 1</td>
<td>0.831</td>
<td>Reject</td>
</tr>
<tr>
<td>Hypothesis 2</td>
<td>0.005</td>
<td>Accept</td>
</tr>
<tr>
<td>Hypothesis 3</td>
<td>0.136</td>
<td>Reject</td>
</tr>
<tr>
<td>Hypothesis 4</td>
<td>0.921</td>
<td>Reject</td>
</tr>
</tbody>
</table>

5. Discussion and conclusion

The findings suggest that intuitive learners tend to prefer a learning method with a higher level of project complexity (i.e. more teams and projects, uncertainty of method, interaction between teams, and interrelatedness between projects), which are the main attributes in the crashing games (PCG and PgCG). This is consistent with characterisation of intuitive learners, who tend to prefer complex and uncertain scenarios. They tend to dislike dealing with details (i.e. repetitive calculations) which are the main characteristics of the simulation exercise. The sensors, on the other hand, tend to prefer the simulation exercise as it fits their style of learning (i.e. working with details, less complex problems, and well-established methods). This does not only suggest an interrelatedness between learning styles and learning method preferences in a PM context, but it also explains how project complexity plays a part in their relationship.

This study is limited in examining how learning style affects learning method preference given different levels of project complexity. The controversies around the effect of learning styles on learning effectiveness necessitates further research on how learning effectiveness may or may not be affected by both PM learning methods and students’ learning styles.

The research can also be expanded by inserting other factors of project complexity into the games (e.g. unexpected delays, change requests from stakeholders). This could provide more insights on the effect of learning styles on learning method preference with different types, not just levels, of project complexity.
6. References


