Stream 9. Management Education and Development

Interactive Session

It's all in the game: A review of digital games and simulations for management education

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Games and simulations are frequently used in management education to facilitate student learning but what exactly are they teaching students? This paper seeks to answer this question by reviewing the literature on currently available games and simulations and examining the nature of these games as well as the student learning outcomes they afford. The findings from this review indicate that there is little available to educators outside of strategy and operations management subjects. Furthermore within the existing games, there is a lack of attention paid to principles of responsible management education. However the extant literature shows that the games and simulations offer a variety of benefits to student learning as well as leading to higher student satisfaction ratings.

Keywords: e-learning, games, simulations, management education

Games and simulations have become common teaching tools for management educators. Interactive educational games have the ability to make people management issues more absorbing and relevant. Such learning technologies create a simulated virtual environment for active learning to take place. Participants can demonstrate and apply the theoretical and conceptual knowledge, achieving learning outcomes and enhancing employability skills. This is important as there are inherent difficulties teaching people management to those with little work experience, with students criticised by employers for lacking the skills to apply disciplinary knowledge (Jackson, 2009) as well as scholars arguing that management should only be taught to currently practicing managers (Mintzberg, 2004). Participatory and motivational activities using learning technologies thus need to be developed for management to remain a stimulating subject for students who have little to no work experience and may have difficulty relating to the challenges of managing people. Games and simulations are an ideal way to address this concern with such learning technologies having numerous benefits for learning (Nugent, 2014).

Despite the proliferation of literature on the topic, there has yet to be a recent review of the nature of these games specific to management. Given the increasing popularity of learning technologies in our discipline (Arbaugh, DeArmond & Rau, 2013; Redpath, 2012) there is a need to survey the landscape to see what is on

offer and how they may be useful for management educators. This review focuses on published articles that discuss digital games and/or simulations used in the broad discipline of management, including subjects such as strategy, operations management and leadership. Attention is given to the measures of success in the simulation or game, as well as the student learning outcomes examined by the paper. Identifying the measures of the success of the game is necessary to understand the objectives of the game. Considering the student learning outcomes is particularly important as it affords a discussion of the suitability of the various games and simulations for management education.

GAMES AND SIMULATIONS OVERVIEW

As noted by several scholars (Gredler, 1996; Jacob & Dempsey, 1993; O'Neil, Wainess & Baker, 2005) there is often a lot of conceptual confusion in academic publications when discussing online digital technologies such as games and simulations. Both games and simulations have goals, activities, constraints and consequences however there are key differences. These differences are important to understand so that educators can assess which is more suitable for achieving the learning outcomes in their subjects.

According to Gredler, 'games consist of rules that describe allowable player moves, game constraints and privileges (such as ways of earning extra turns) and penalties for illegal (non-permissible) actions. Further, the rules may be imaginative in that they need not relate to real-world events' (Gredler, 1996: 523). This definition is in contrast to that of a simulation, which Gredler defined as 'a dynamic set of relationships among several variables that a) change over time and b) reflect authentic causal processes' (1996: 523). In addition, she described games as having a goal of winning whereas simulations have a goal of discovering causal relationships but altering inputs and examining the subsequent different outputs. Blending the two is often called simulation games or gaming simulations (Gredler, 1996) however most tend to use the terms interchangeably (Greenblat & Greenblat, 1988).

Games and simulations as educational tools have a long history in business education, spanning at least 40 years (Faria, 1998). Their educational value is widely accepted despite some arguing that the vast majority of games are not based on learning theories (Wu, Hsiao, Wu & Lin, 2012). However the mere process of playing a game or simulation allows the student to take an active and responsible role in their learning with

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the simulated environment being a strong example of experiential, generative and situated learning (Domagk, Schwartz & Plass, 2010; Joshi, Davis, Kathuria & Weidner, 2005; Keys and Wolfe, 1990; Renkl and Atkinson, 2007; Zantow, Knowlton and Sharp, 2005). How we, in management, have approached this topic in recent history merits further examination.

REVIEW OF GAMES AND SIMULATIONS IN MANAGEMENT

Library databases such as ScienceDirect were used to search for studies on management games and simulations using the terms, 'management', 'game' and/or 'simulation.' The initial search identified seventy-three separate games however many of these included non-digital games such as board games and face-to-face negotiation activities which were subsequently excluded. As the aim is to review what may be useful for management academics today, the review only considered games that were currently available or supported; ones that were not were removed from the list, for example REALGAME (Lainema & Lainema, 2007; Siewiorek, Saarinen, Lainema & Lehtinen, 2013) and Looking Glass, Inc (Chatman & Barsade, 1995). Games that used computers as technology support, such as spreadsheets in the ISM simulation (McKone & Bozewicz, 2003), were also excluded as the aim of the review is to examine games that have all activities online or use a computer at all times such as in the form of downloadable software. Simulations as part of a training package such as the LEADeR system but AON consulting were also struck from the list as they would not be available to management educators. This provided a list of twenty-five games that are the subject of a publication. Details of these games and simulations are in the table below.

Insert Table 1 about here

The first question is whether the list falls into the category of games or simulations. While all of them are referred to as simulations in the studies, they are also used in a gaming format. Using a simulation as an assessment where students compete against each other would make it a simulation game as the aim is to 'win' against the other teams of students. If it were not used as an assessment task and students were allowed to change input variables in order to see the different results, then they would be used in simulation format

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and not technically be gaming as the objective would not be to 'win.' Therefore when discussing the Table henceforth, the terms 'game' and 'simulation' will be used interchangeably.

As can be seen in the Table, the vast majority of the games deal primarily with strategy and strategic decision-making. They share common features whereby participants are in charge of a company producing consumer goods in a competitive industry environment. They must make decisions about finance, production, marketing and sometimes staffing in order to ensure their company receives the most profit and/or market share. There are also a significant number of games about operations management where they oversee the manufacturing of goods and supply chain. Success in these games are measured by typical business metrics such as profitability, share price, market share and as well as operational metrics such as machine-down time. These final figures are also influenced by other internal processes, e.g. staffing, however these internal processes are not the main feature of the majority of games.

There are a small number that have ventured outside of the strategy and operations management areas. KM Quest and the EIS Simulation are about knowledge management and organisational change respectively. In the latter, participants use their influence to convince a management team to adopt an important company-wide innovation by engaging in activities such as holding a meeting, seeking advice and covert lobbying (Angehrn, 2014). By contrast, KM Quest is designed to facilitate education in knowledge management, with a simulation mimicking the behaviour of business and knowledge process indicators specifically organisational effectiveness, quality of internal processes, knowledge-related variables of competence and knowledge process-related variables such as speed of knowledge transfer (Leemkuil, de Jong, de Hoog, & Christoph, 2003). A third simulation that addresses a different topic is VLeader (aka Virtual Leader). This simulation requires the player to perform a number of tasks in order to be an effective leader. For example, the player must exercise judgment on when to introduce new ideas, when to support a speaker, when to refocus on a key idea, when to bring in a quiet or disengaged person, and when to take an idea off the table. After completing the simulation, participant are given a leadership score based on power, tension and ideas, as well as a business score, derived from financial performance, customer satisfaction and employee morale (Knode and Knode, 2011).

A secondary interest was the measures of success used in the games in order to understand the games'

objectives and learning outcomes. Given that the majority of the games were designed to teach strategy and

operations management, financial and operational metrics as success measures is logical. Marketing

measures were also strongly present however in the games that were focused more on internal processes (e.g.

Virtual Leader and KM Quest) their final success measures were slightly different but still ultimately

emphasised financial outcomes.

In order to consider available games that were not in the literature, an internet search was also conducted for

management simulations. A list of these is provided below, noting the source, topic area and success

measures.

Insert Table 2 about here

INSEAD have created additional simulations but do not fit the search criteria of a fully-computerised online

game or simulation and are instead offered as part of a one or multi-day workshop. Additionally, the

simulations offered by private companies such as Prendo and Stratxsimulations are designed to be offered to

executives during 1-2 day training and development workshops or a day activity rather than students over a

semester. This is not to suggest that these simulations are not worthwhile for management educators but

without appropriate testing, we cannot be certain of their utility for people outside of executive training and

MBA programs. Exploring the efficacy of these simulations would likely be a fruitful avenue of further

research.

DISCUSSION AND CONCLUSION

As stated in the introduction, there are benefits of games and simulations for student learning and Table 1

supports this view. The scholarship reviewed shows that students either perceived the game to be a more

effective form of learning (Farrell, 2005; Romme, 2004) leading to higher student evaluations (Chapman &

Sorge, 1999; Tompson & Tompson, 1995) and improved student performance in terms of leadership (Siewiorek & Lehtinen, 2011) decision-making capabilities (Pasin & Giroux, 2011) and overall academic performance (Gamlath, 2009; Wolfe & Leuthge, 2003). However there is also some variability in benefits for example, when looking at game usage been on and off-campus students, off-campus students were seen to be more engaged in the process (Arena-Marquez, Machucha & Medina Lopez, 2012) whereas for on-campus students the role of the instructor in game facilitation was far more important (Hernandez, Gorjup & Cascon, 2010). As such, further research is necessary to more deeply understand the efficacy of games and simulations for students of management and whether or not they are a more effective teaching and learning tool.

When considering whether the technologies in Tables 1 and 2 are games or simulations, it can be argued that they blend facets of the two *depending on how they are used.* They are simulations foremost as they seek to mimic the real world and casual processes in business and management e.g. lose market share, share price goes down. These relationships also change over time as students work through stages or events. However they also possess many rules of gaming such as allowable moves, game constraints and privileges. The most important identifier of games versus simulations is intent: is it designed for students to try to win or to learn. Arguably, educational games are designed for learning. But when academics use them for assessment whereby grades are assigned according to success measures students may view them as an opportunity to 'win' the best outputs and the highest grade rather than learn about the topic at hand. Indeed, having success measures at all can encourage such an approach. Therefore within the discipline of management, even if a technology is labelled 'simulation' it can be used as a game.

For those teaching strategy and operations management, there is a wealth of games available to facilitate learning. The proliferation of games on these topics is not surprising given that it would be simpler to design games that have objective measures of success, known variables and direct relationships between cause and effect. While many have been tested to assess student learning outcomes, a significant number have not undergone scientific inquiry. This is not to suggest that they would not afford students the same learning benefits but given the variability of learning processes and outcomes, particularly between on and off-campus student cohorts noted above, as well as undergraduates versus MBAs (Arbaugh, 2010), it would

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behoove the management community to incorporate the examination of games and simulations into their research agendas.

For management academics not teaching in strategy or operations management there is little available, which points to the need to develop games and simulations in areas such as organisational behaviour, human resource management and leadership. As students rate courses with simulations higher than those without such technologies (Chapman & Sorge, 1999; Farrell, 2005; Romme, 2004; Tompson & Tompson, 1995) those of us not in strategy and operations management are missing out. This is even more crucial given the sidelining of these topics within existing games. The management of people even in the Virtual Leader game is conspicuously absent. Leadership is scored on individual power rather than their relationship to followers. The business score is admittedly based partially on employee morale but it is a minor concern rather than a key feature with employees depersonalised as a business concern instead of the main responsibility of leaders.

Other important management issues are also neglected. Ethics, CSR and sustainability receive scant attention even within the majority of strategy and operations game, reflecting an all- too-common disconnect between responsible management theory and responsible management practice (Hibbert & Cunliffe, 2013). Financial metrics are the most common success measures which is to be expected for strategy games but ignoring important concepts such as triple bottom line reporting. Out of all of the games, only one is specifically focused on sustainability whereas ethical decision-making is not featured in any of the games reviewed. This does not help alleviate the 'stimgatization of goodness' as identified by Giacalone and Promislo (2013) whereby moral conduct is denounced for fear of hurting the bottom line. Thus, games and simulations should undergo a review of content to properly reflect the changing management curricula and the increasing emphasis on responsible management education (Hibbert & Cunliffe, 2013).

The aim of this paper as articulated in the introduction was to survey the landscape of management games; as illustrated, this landscape is uneven. This fits with the findings of Arbaugh, Desai, Rau and Sridhar (2010) who reviewed research on online and blended learning in management education. What is problematic is that simulations and games strongly favour strategy and in doing so neglect important issues in management decision-making. The metrics for success in these games are by and large either financial, production or

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market-based. While these outcomes are critical for organisations they are not the only ones with which management should be concerned. There is therefore a need for management games and simulations to broaden their scope and include scenarios and measures that reflect today's business environment, one that has strong concerns for ethics, sustainability and effective management of people.

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Table 1: Literature on current management games and simulations

Game or Simulation Name	Source	Subject	Success measures	Student learning outcomes
Beer Game	Machucha & Barajas (1997)	Operations Management	Order fulfilment	Not examined
BizCafe	Washington, Kurthakoti, Halpin & Byrd (2014)	General management	Sixteen measures such as revenue and customer satisfaction	Students' systemic thinking increased during game. Systemic thinking was linked to game performance.
Build-a-lot	Siewiorek & Lehtinen (2011)	Strategy	Profit	Students exercised shared leadership if appointed a leadership role. Non-team leaders scored poorly on leadership ratings.
Cesim Global Challenge	Hernandez, Gorjup & Cascon (2010)	Strategic management and IB	Financial and operational measures	When comparing online versus on-campus students, on-campus students placed greater value on the role of the instructor.
Computer assisted distance learning (no official name)	Arena Marquez, Machucha & Medina Lopez (2012)	Operations management	Operational measures	Computer-assisted learning was just as effective as on-campus. Off-campus students using the software were more engaged than on-campus students.
CoSiMa	Wust & Kuppinger (2012)	Operations Management	Financial and operational measures	Not examined
GEO	Thavikulwat & Pillutla (2004)	Enterprise management	Finance, marketing and operations measures	Simulations can be segmented into separate events without compromising learning outcomes.
GlobalView	Farrell (2005)	International business	Market-share, net profitability and share prices	Compared to textbooks and cases, students perceived the simulation as a more effective learning tool
HECOpSim	Pasin & Giroux (2011)	Operations management	Cumulative profit, stock levels, detailed cost, and capacity utilization.	The game was more effective in developing decision-making abilities for managing complex and dynamic situations.
Intopia Inc	Thorelli (2001)	Strategy, Operations management, International business	Financial measures and market share	Not examined
KM Quest	Leemkuil, de Jong & de Hoog (2003); Leemkuil & de Jong (2012).	Knowledge management	Market share, profit, and the customer satisfaction index.	Adaptive advice in games has little value for student learning
Micromatic	Washbush & Gosenpud (1994)	Strategy	Financial measures e.g. after-tax earnings	No significant difference between students using simulation and traditional methods.
Microworld Simulation	Romme (2004)	Strategy	Profit	Students perceive significant learning benefits, particularly mature students.
Multinational Management Game	Keys, Wells & Edge (1994)	Strategy, international business	Financial, operating and industry results	Not examined
People Express Airlines	Graham Morecroft,	Strategy, organizational	Financial and operational measures	Not examined

	Senge & Sterman (1992)	behavior, operations		
Sales Management Simulation (SMS)	Chapman & Sorge (1999)	Sales management and marketing	Market share, profit, sales volume, and customer satisfaction.	Compared to textbook and supplementary papers, students consistently gave the simulation the highest ratings on several learning-related measures.
SIMBA (SIMulation in Business Administration)	Borrajo, Bueno, De Pablo, Santos, Fernandez, Garcia, Sagredo (2010)	Strategy and Enterprise	Economic, commercial, financial and management indicators	Not examined
SimVenture	Gamlath (2009)	Strategy and entrepreneurship	Ratio of net profit to starting capital	Game score was due to skill not 'luck' but did not impact on academic performance
The Business Policy Game: An International Simulation	Cotter & Fritzsche (1994)	Strategy	Finance, marketing and operations indicators	Not examined
The Business Strategy Game: A Global Industry Simulation	Tompson & Dass (2000); Tompson & Tompson (1995)	Strategy and operations management	A balanced scorecard that includes brand image, earnings per share, return on equity investment, stock price appreciation, and credit rating.	Students' self-efficacy was higher for the simulation than case studies (Tompson and Dass, 2000). Student evaluations are higher in courses that used the game (Tompson and Tompson, 1995)
The EIS Simulation	Manzoni & Angehrn (1997)	Organisational Change, innovation and people management.	Number of people who adopt a new organisational information system.	Not examined.
The Global Business Game: A Simulation in Strategic Management and International Business	Wolfe & Leuthge (2003)	Strategy and International Business	Profit and shareholder value	Engaged participants are more likely to perform better i.e. knowledge of appropriate content will enable participants to perform better.
Tri-Star Manufacturing	Shannon, Krumwiede & Street (2010)	Operations Management	Lean manufacturing indicators e.g. batch size	Not examined
Virtual Leader	Gurley & Wilson (2011)	Organizational behaviour, Communication, leadership	Formal authority, informal authority and political influence.	Affiliative style was the most effective to achieve game results. Students' results improved after playing the scenario multiple times.
ZOOM	Nugent (2014)	Strategy	Nineteen financial measures including ROE, Debt ratio etc.	Students who practice the scenario as individuals perform better when playing as a team. Individual practice score was a predictor of overall course grade.

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Table 2. Available games and simulations not in the literature

Source	Topic	Game name and success measures
CAPSIM http://www.capsim.com	General Management	Foundation: Unknown; Capstone: finance, marketing and operations measures
CESIM http://www.cesim.com	Project Management	Project Management Simulation: best quality, least time and cost and within budgetary constraints.
	Strategy	SimFirm: financial, marketing and operations measures
Harvard Business Publishing for Educators http://hbsp.harvard.edu/list/simulations	Entrepreneurship	The Startup Game: market valuation Managing Growth V2: capital valuation
	Negotiation	OPEQ: Profit maximisation
	Operations and Service Management	Global Supply Chain Management: company profits; Process Analytics: Efficiency and quality measure e.g. cycle time; Quality Analytics: Minimise total cost of quality; Benihana V2: Utilization, throughput and total profit; Scope, Resources, Schedule V2: Project execution on time and under budget; Root beer V2: Control of the bullwhip effect
	Organisational Behaviour	Change Management,Power and Influence V2: User adoption rate; Everest: Reaching summit.
	Strategy	Competitive Dynamics and Wintel: Profit and marketshare; Back Bay Battery V2: Innovative product success.
Industrymasters http://www.industrymasters.com	Sustainability	Sustainability: sales, profitability, shareholder value, total carbon emissions.
	Strategy	Car Dealer: profit; Airport Management: profit and market value; Telco: shareholder value; Fashion retail: shareholder value; Hotel Manager: share price
	Operations Management	Machinery Manufacturing: Cost controls and corporate 'value'; Computer Industry: shareholder value and profitability;
INSEAD http://www.insead.edu/facultyresearch/research/simulations.cfm	Sustainability	Sustainability Challenge: Metrics unknown
Interpretive Simulations http://www.interpretive.com	General Management	Entrepreneur: 12 measures including revenue and stock price;
	Strategy	StratSimManagement and StratSimChina: 45 measures including stock price and ROE; Corporation: 25 including EPS, average employee turnover.
	Human Resource Management	HR Management: 11 metrics including diversity and absenteeism.
PRENDO http://www.prendo.com	Stakeholder Management	Pactio: Stakeholder satisfaction
	Change Management	Mutari: Change acceptance

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	Project Management	Schola: Project control; Pensum: Team management; Spatium: Project leadership
SmartSims http://www.smartsims.com	Strategy	Mike's Bikes: Shareholder value
Stratxsimulations http://web.stratxsimulations.com/	Strategy	BOSS: profits, revenue growth and market share