The Development and Implementation of Business Simulations in Higher Education in the United Kingdom

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ABSTRACT

This thesis is a study of the development and implementation of business simulations/games in United Kingdom Higher Education institutions. The research takes an holistic approach and examines the topic from the perspective of developers of business simulations, academics who choose to implement simulations in their teaching, and students who are the end users of business simulations.

The research is based on an empirical instructivist research paradigm and takes an holistic approach to consideration of the key issues in design, development and use of business simulations/games from the perspective of developers, academics, and learners. The research takes a pragmatic approach to the application of research methods. It relies mainly on the use of qualitative methods to examine in detail the perceptions of learners.

A typology of business simulation/games was established and a set of six educational objectives associated with use of business simulations was derived from a study of the literature. Surveys of developers and academics were conducted in order to determine the extent to which both groups shared a common perception of key features which should be exhibited by a business simulation and the pedagogical objectives which business simulations could support.

A wide range of literature in the field of educational technology was analysed to determine the manner in which business simulations supported current views on pedagogic theories and also models of learning. The manner in which the pedagogical objectives of simulations were evaluated was then considered and, through a critical review of the literature, a framework for evaluation of business simulations was developed.

The framework for evaluation was used in a case study evaluation of Masters students at the Robert Gordon University, the United Kingdom. The evaluation drew on illuminative and integrative evaluation approaches. Drawing on the literature and the findings of the surveys of academics and developers the evaluation explored the key question of whether or not the use of the business simulation achieved the pedagogical objectives which it was intended to achieve, examined the process by which students learn using a business simulation, and did this in the authentic context in which the business simulation was used.

The results of the literature analysis and empirical surveys were used to summarize the critical success factors in developing and implementing business simulations in the Higher Education curriculum in the UK. Issues which arose as barriers to adoption of the use of business simulation were explored and recommendations on how to address the key barriers associated with adoption of business simulations are discussed.

KEYWORDS – BUSINESS GAMES/SIMULATIONS – BUSINESS SIMULATIONS EVALUATION – BUSINESS SIMULATIONS MARKET – BUSINESS SIMULATIONS USE – ILLUMINATIVE EVALUATION – EDUCATIONAL TECHNOLOGY

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Chapter One

Introduction

jyotisam api taj jyotis
tamasah param ucyate
jnanam jneyam jnana-gamyam
hridi sarvasya visthitam

"He is the source of light in all luminous objects. He is beyond the darkness of matter and is unmanifested. He is knowledge, He is the object of knowledge, and He is the goal of knowledge. He is situated in everyone's heart."

Bhagavad Gita 13:18

1.0 Introduction

The use of computer based simulations in teaching has been almost universally assumed to be beneficial for student learning. The reason for this is not a general acceptance of the value of using technology in teaching. Indeed, much research into use of computer in learning has demonstrated that the benefits of technology based learning interventions has not been generally clearly proven on the basis of some of the claims made for its effectiveness. (Bates, 1981; Biggs, 1991; Duchastel, 1987; Mason, 1995; Reeves, 1997) However, specifically with respect to use of simulations there is a body of literature which is relatively uncritical in the assumption of their value in teaching and learning. (Aldrich, 2009; Fripp, 1997, Gopinath and Sawyer, 1999; Ritterfeld, 2009; Crookall, 2010) Thiagarajan, for example, notes that computer based simulations for groups of participants may prove to be one of the main contributions that this technology makes to education. (Thiagarajan, 1998) and Liu, Bruce and Tan (2009) claim that ‘There has been no doubt that simulation games have become the key factor in management teaching’ (Liu, Bruce and Tan, 2009 p. 397). The literature on the subject has certainly been increasing and in particular reports of research into the use of simulation and gaming is increasing. Rutter and Bryce (2006) compared the five year periods from 1995-1999 and 2000-2004 and noted that there were nearly twice as many peer reviewed articles on simulations and games in the latter period. Similarly Bragge, Thavikulwat and Toyli (2010) analyzed 2,096 articles in the peer reviewed journal Simulation and Gaming and reported that the percentage of research to non research published articles increased from 38% in 1970 to 71% in 2008. However, despite this evidence of research activity, it is still frequently the case that the literature on use of simulations and games tends to be descriptive, anecdotal or judgmental. In addition, as many researchers have pointed out, often the literature is not based on rigorous research methods and in some cases not supported by theory (Gredler, 2004; Kirriemuir and McFarlane, 2004; Leemkuil et al., 2000; Wideman et al., 2007).

The reason for an assumption that simulations are effective in teaching and learning is that simulations appear to offer the type of learning opportunities which sit very comfortably with many educational theories which emphasize approaches to engaging students in their learning and developing their skills in critical analysis through provision of ‘real life’ learning scenarios. However, in common with other learning technologies there is often a tendency to focus over much on the technology itself and not give sufficient attention to evaluating the outcomes associated with its use. An increasing number of authors are now contributing to a more critical debate around the value of digital simulation/gaming software in teaching and learning. (Gee, 2005; Gee, 2009; Jenkins, 2007; Prensky, 2001; Sawyer, 2009). However, while this has enhanced the discussion of issues at a conceptual level there is still only a relatively small body of research work which attempts to empirically test the educational impact of the use of business simulations.

This research examines in detail the way in which educational simulations for use in business and management courses have been developed and used by academics and the rationale behind their use. Through a case study it also examines the way in which students learn using simulations and their perceptions of the value and effectiveness which they place on this type of educational situation. The benefits which students perceive when using simulations has been compared with claims made in the literature for the way in which both the developers of business simulations and the academics who integrate them into their teaching believe simulations support learning in higher education. The research deals with use of simulations in higher education and therefore it examines the effectiveness of business simulations to develop higher order learning skills and the evaluation methods which have been used in order to determine whether these claims can be justified. Specifically the research was based around use of simulations in business and management but where appropriate examples of use of business and gaming simulations in other cognate subject areas were included.

1.1 Background

Summers (2004) in his article on the business simulation industry notes that simulations are used to support 3 types of educational programs-

- learning to use technology
- learning to control equipment, and
- soft skills training

He notes that in using the term soft skills he covers a much broader range of subjects than those skills usually implied in using this term and this encompasses a whole range of business and management skills.

However, there is in fact a fourth category which he does not list which is the use of simulations to provide specific knowledge of the business environment and skills to operate effectively in this environment. Such simulations can be used to allow learners to apply decision making skills and gain feedback on how these decisions have an impact on a ‘real life’ competitive business environment. It is this fourth category which is of particular relevance to this research

The literature provides 3 general classifications of educational games which are:-

- computer based games
- board games, and
- role playing games

In the context of the research presented here the main category being considered is the first of these i.e. computer-based simulation games. These simulations typically aim to support learning by using a simulated firm or area of commercial activity and put learners in the role of managers in a competitive environment and involves some form of competitive or gaming element. Learners may interact with competitors which are computer simulated (providing single player learning environments), or, more commonly they may interact as teams. Each team controls an organization or company and the team decisions are influenced by the decisions taken by other teams providing a realistic competitive environment. Most such simulations require players to integrate various business functions which involve players within teams, role playing, assuming the leading role as HR manager, marketing manager, production manager or finance manager. These types of simulations, when used along with tutor supported learning activities, can also therefore be seen to act to an extent as using role playing elements to enhance or reinforce behaviours as well as develop knowledge and skills of the subject. While within the business simulation itself players do not focus exclusively on behavioural issues such as leadership, team work, negotiation skills or ethical or intercultural behaviours the teacher can use the simulation as a vehicle to observe and encourage learners to demonstrate these behaviours (e.g. Bachen et al. 2012 discuss intercultural skills and Lisk et al., 2012 provide an extensive review of development of leadership skills). In a similar way they do not in general specifically seek to emulate board games which typically involve elements of chance or risk. However, they can incorporate elements of risk in a business context and may incorporate elements which introduce risk or changes in the environment which the player may not be able to accurately predict.

The research focuses on the use of simulations in higher education. General observations on the use and evaluation of simulations are also drawn from the way in which they are used in corporate training environments.

The business simulation industry is now mature and with the unprecedented advances in computing technology over the last 20 years it has seen phenomenal growth. This growth is both in the volume of products and suppliers in the marketplace and also in the level of sophistication of the products which often apply complex computational techniques (such as artificial intelligence and decision support systems) to supplement the system's capacity to support user interaction and feedback. There is an increasing trend of replacing formula based models with computational models which provide more realistic reactions or feedback to user interactions in simulation scenarios.

A number of surveys have been conducted which clearly show trends of growth in the market for simulations and the increasing growth in use of simulations by academic institutions as opposed to use in training applications. Growth is accounted for by several developments:

- better technology to deliver networked learning using user-controlled simulations
- more intuitive interfaces for using these systems,
- lowering of prices (relatively) which has made purchase of sophisticated customizable simulations more attractive,
- growth in the variety of products available and the range of subjects covered,

In addition growth has been associated with changes in the environment in which both business and higher education currently operate, notably:

- changes in business practices which have resulted in business engaging in much more training activity,
- changes in business practice which typically involve less hierarchical structure and a growing emphasis on the need for employees to work in a flatter organizational structure which places more importance on team working across different business functions and the need for collective decision making and strategic management skills.
- a growing emphasis within higher education on the importance of development of key employability skills;
- and, finally and probably most important in terms of use in a higher education context, the expansion of e-learning which has quickly become a very important part of the way in which academic institutions interact with large numbers of learners.

1.2 Use of business simulations

Simulations are a simplified method of understanding complex systems which are used to represent the behaviour of a physical or abstract system using computer technology. Simulations in the social sciences have for a long time been an important tool for understanding social phenomena. They allow researchers to identify causal effects of complex systems and identify the critical parameters which help to understand how processes evolve over time (Garson, 2009). These systems, however, are not designed specifically to support learning although such models may be integrated into business simulations to provide a realistic reflection of how the business environment changes in reaction to external factors. Business simulations designed for the purpose of teaching need to provide much more support for learners to understand and manipulate different parameters and to examine the impact of specific decisions on the overall business environment. The actual development of computer systems to do this can be extremely complex. Along with Interactive Tutorial Systems (which some simulations systems attempt to integrate) they are generally viewed as being the most difficult types of educational ‘courseware’ to create and use. Unlike earlier developments in educational technology in which educators themselves have been closely involved in the detailed design and/or customization of the learning materials, the cost and complexity of developing simulations software has meant that this task has largely devolved on companies (such as TATA Interactive Systems) who specialize in providing educational software. It is important to note in this respect that the developments in simulations are very much being driven by corporate suppliers of training materials rather than within the higher education sector itself. The ‘cottage industry’ approach to development of teaching materials, which by many commentators was seen as characteristic of previous technological interventions in education; do not appear to be a factor when examining the development of simulations. The eLearning Guild (www.elearningguild.com) published a report, titled “Future Directions in e-Learning Research Report 2006.” (Pulchino, 2006) and its survey of users of e-training confirmed that the technology for delivery is generally seen as robust and well developed. In terms of changes and developments in technology the study found that the following emerging e-learning modalities are clearly on the rise in many organizations - blogging, podcasting, mobile learning (m-learning), and games. In addition, at the TATA Interactive Systems forum in London on April 6th 2006, presenters forecast more extensive use of other new technologies e.g. wikis, podcasting, social networking, games and stories and many such systems were demonstrated at the conference. Other technologies which have been noted as having the potential to contribute to learning include experience based training with cyber games, edutainment, docu-stories, blended simulations, e-consulting in virtual environments, instant messaging and pedagogical agents (such as avatars). Of these perhaps the most well developed and demonstrably having an impact are computer based simulations in e-training. Bob Little quotes Sambrit Mohapatra, Head of the UK and Europe division of Mumbai based TATA IS who argues that:

> *‘simulations are closely associated with a constructivist view of learning that emphasizes the need for individuals to create*

> *their own models of knowledge' Consequently simulations can be seen as cognitive tools because they help learners to organize, re-structure and re-present their knowledge. Simulations provide learners with new ways to explore concepts and apply them in 'real life' but in a non-critical context' (Mohapatra, quoted in Little, 2005))*

Thus educational computer games and simulations are increasingly being seen as a novel way to facilitate student interaction and engagement. However it is often unclear exactly which aspects of simulation and game-based courses students are motivated by or how they interact with each other on such courses. This is an issue which is of importance not only to academics who have to implement the technology in an appropriate manner to ensure that claimed educational benefits are being achieved but also for developers who require such research in order to better inform the development process.

There is a significant body of literature which looks at specific aspects of use of simulations from a purely theoretical perspective. For example, Standen examines use of simulations from the perspective of the value of realism in learning environments (Standen, 1996). Others, such as Jacobs, have looked at the topic considering in particular of use of narrative in development of simulations arguing that well designed stories are one of the crucial factors in the engagement of the learner and this applies particularly to the design of interactive computer simulations, which historically have been thin on rich narrative. (Jacobs, 2003)

The literature also provides numerous practical examples of how in many business courses, computer-based simulations are becoming a popular choice of pedagogical technique. (Anderson, 2005) Much of this work has been conducted in the area of economics and accounting (Davies, 1994; Saunders, 1995; Fripp, 1997; Graham, 1998). There are some useful studies in other areas. Tonks, for example, has examined the use of simulations in marketing and concludes that the benefits were of use by students were significant and argues for more development and research into the area (Tonks, 1994). More recently Whitton and Hynes, for example, describe the implementation and evaluation of a collaborative game-based course for final-year marketing students and discuss student expectations, motivations, and attitudes toward the game and group working patterns. (Whitton and Hynes, 2006)

There is also growing literature around the use of simulations in the development of transferable skills. It is often stated that there is a need for students to develop good literacy and research skills, critical thinking and problem solving abilities, and strong interpersonal communication skills as well as independence as learners. These are all areas in which use of simulations is seen as being potentially a powerful teaching aid (Biggs, 1993; Anderson. 2005; McEwan, 1994; Groth, 2001). Similarly, and increasingly being seen in the literature as a key transferable skill is the area of inter and cross cultural skills development. (McGraw, 1999; Robinson, 2000; Crookall, 2003; Fowler and Pusch, 2010; Wiggins, 2012).

The most widely reported use of simulations in business schools (and the main focus of this research) is the use of business simulations which cover the entire spectrum of business activity (Total Enterprise Simulations) and these are frequently cited as being the most important area in which simulations can be used. This is because they allow students to integrate a whole range of skills and knowledge which they have gained over the course of their studies and apply these to manage the complex decisions which involve careful consideration of the way in which many business functions interact and require more complex decision making skills which take into account the integrated nature of different functional areas of business.

1.3 Evaluation of simulations

Development and evaluation of simulations for teaching business students is often seen as an extension of other developments in use of multimedia resources. Graphics, sound and video are used to create semi- realistic ' microworlds' which students explore in order to solve a relatively unstructured problem, a process quite different to learning from textbooks, lectures or videos. One advantage of microworlds is that students construct meaning by actively and selectively working through a variety of information sources, a process which mimics real-world learning and enhances higher- order learning outcomes. The theoretical principles used in designing the simulation, particularly situated learning theory which claims a number of advantages for teaching that is 'situated' in the context of real world problems is touched upon in some of the general literature. There are also examples in the literature of claims that the 'immersive' quality of microworlds may be more motivating than other teaching/ learning modes, at least to some students. (Vaidyanathan, 1998; Leroux-Demier, 1992). Some literature is more critical and attempts to provide more in depth analysis of potential benefits. (Tonks, 1997; Goosen, 2001).

However, there is not as much literature which reports objectively on how simulation and games impact specifically on achievement of student learning outcomes and how such outcome measures can be accurately determined. The literature on evaluation is very fragmented and generally lacks focus. In particular it can be criticized for frequently being too much concerned with the evaluation of the technology itself without a clear focus on the intended objectives or learning outcomes from using the technology.

Dean and Webster have attempted to develop an instrument for evaluation of simulations as a learning resource. The instrument includes dimensions to examine factors such as learner support and engagement, measures to incorporate elements of motivation and measures to attempt to assess transfer of learning. The three key areas for evaluation are seen as: features of the computer package, the effect on students' motivation, and the impact on their ability to transfer knowledge to the workplace (Dean and Webster, 2000). The approach taken by the authors is based largely around the application of statistical tests using factor analysis to determine the key factors which contribute to providing a positive learning experience. More recently Stainton et al. have proposed a model for evaluation which focuses on the quality of the simulation model design and implementation. (Stainton, 2010). A number of other studies have looked more narrowly at how use of a business simulation enhances specific skills or acquisition of knowledge. However, none of the work to date has proposed a general model to explain how business simulations should be evaluated against the acquisition of the key learning outcomes which use of the business simulation claims to develop. In general there is a need to focus more on student learning experience and in particular learners' perceptions of how the use of the business simulation contributed positively or negatively to the learning experience to provide an objective evaluation of effectiveness and also explain why the simulation has been effective.

The research conducted here extends the work done on evaluation in other areas of use of educational technology drawing on experience of this from a wider literature on evaluation of student learning using new technology.

1.4 Research Problem

The research, therefore, is set in the broad context of examining the development and application of new technologies in the delivery of higher education. The use of simulations is considered by many to provide significant support to learners. In particular examples of benefits often cited are that simulations:

- Improve understanding of learners by allowing them work with systems which allow them to experiment with changing variables in a complex system and examining the results;
- Make the subject more interesting to learners;

- Provide learners with key employability skills;
- Encourage students to expand their own knowledge by learning from mistakes;
- Develop complex higher order thinking and critical thinking skills;
- Assist in a understanding the application of theory to practice by allowing learners to work in an environment in which they can use their theoretical knowledge and examine the impact of its application on the performance of a particular function or on the overall system.

As such simulations can be seen to support a constructivist theory of education which emphasizes the importance of problem solving and use of case studies and scenarios to allow the learner to relate their learning to their personal experience and understanding of the implications of theory in real life situations.

In addition authors have also argued that simulations help to cross cultural and geographic boundaries although there is no solid evidence to support this claim. Also for systems which can accommodate multiple users it is argued that simulations provide the basis for building strong team working skills specifically encouraging reflective discussions and collaborative decision making amongst students.

However, again, there has been little empirical investigation of many of the claims which have been made for the benefits of using simulations. In addition much of the literature tends to focus on use of simulations at a conceptual level. It does not focus specifically on evaluation of the outcomes of use of simulations from the perspective of achieving specific learning outcomes (or indeed specify exactly what these learning outcomes are). The research will therefore examine:

1. What are the specific learning objectives set by academics when taking the decision to integrate business simulations into teaching
2. How effective do learners perceive simulations to be?
3. Do students learn better?
4. Do simulations work better for certain kinds of learner?

5. What sort of support or help do students need when using simulations?
6. What methods are used by instructors to evaluate the usefulness of simulations in learning?
7. How appropriate and effective are the evaluation methodologies used to establish effectiveness?

Prior to doing this it is also important to look at the general environment in which simulations are developed and to examine specifically how the developers of the products perceive that the simulations will be used. In order to examine the development and use of simulations holistically it is important to look at three different perspectives – the developer, the instructor and the learner – and to be clear about the objectives, expectations and constraints which may be influencing each of these different groups. Thus the research questions stated from the perspective of these 3 groups of 'stakeholders' needs to address the questions:

8. What is the context in which educational software is being produced and what constraints are placed on the development of simulation software as a result of this?
9. What specific educational goals and objectives are being pursued by instructors who wish to integrate such materials into their teaching programme?
10. How is the success of these objectives (i.e. improvement in student learning) measured?

The research problem, therefore, is centrally concerned with the need to synthesize a whole range of issues to give an holistic model to facilitate the effective development and application of simulations designed to improve the quality of teaching and learning in business and management education.

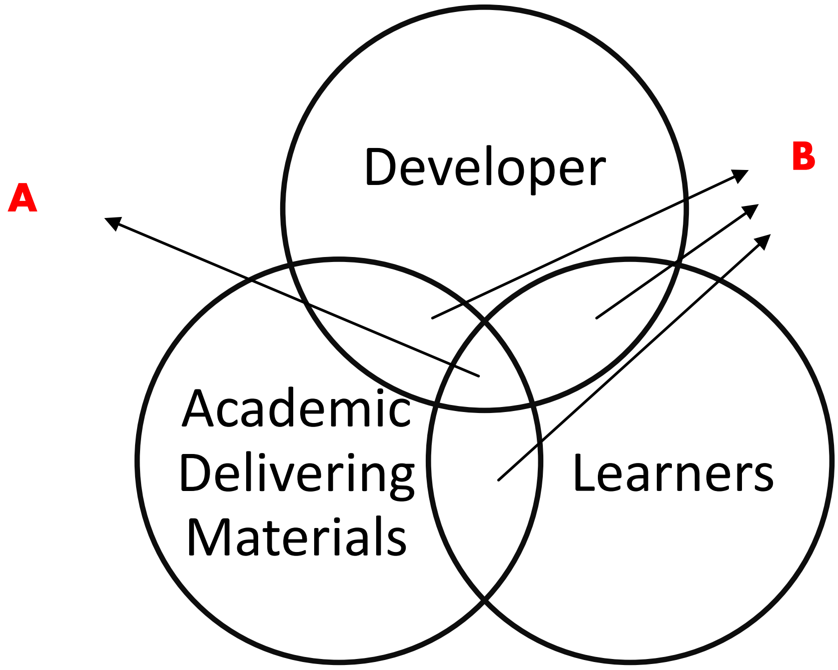
1.5 Rationale for holistic approach to research

The ideal model for development and application of an educational intervention would be to have direct interaction between all stakeholders i.e. as demonstrated in Figure 1.1. This type of interaction would allow a complete sharing of information and feedback in order to ensure that the products being developed were fit for purpose and ultimately achieved the learning goals which they claim to promote. It should ensure that broadly the various factors which may potentially influence the manner in which the impact of technology based teaching on learners are all considered. These factors can be summarised broadly as a set of separate issues which are based on:

- the design of the system itself;
- the content of the package and context in which it is used, and;
- the pedagogic approaches adopted.

However, with respect to the discussion of the definition of systems provided above there are a number of issues which need to be considered within each of the above factors. Furthermore the overall evaluation of these different factors in the case of development and implementation of business simulations is complicated because of the fact that, unlike other educational interventions, it is generally the case that simulation packages are developed externally from higher education institutions who purchase and use them to support learning., Thus the consumers of the educational materials are not necessarily closely involved in the specification and design of the learning materials (unless they specifically commission fully customised simulations packages which as will be noted later are prohibitively expensive for most academic institutions).

Figure 1.1: Developer/Academic/Learner Interaction (Ideal)



The ideal model for development and use of teaching materials assumes that we can bring all of the players involved together (in the intersection in the middle of the Venn diagram above –labelled A). It was apparent even in the initial stages of the research that this is generally not the case except in situations where the producer and supplier of the materials is also the academic (or academic learning support department) responsible for integrating the materials into the curriculum. The parts of the diagram which show an intersection between two of players involved in development and use of simulations (labelled B in the Venn diagram above) provide some limited communication or collaboration which supports the objective of ensuring that the teaching methods are being validated and changes in response to the interactions between the players will contribute to enhancing the quality of the teaching material. However, again the research conducted and presented in this thesis shows that generally there is very little interaction even between two of the key players in development and use of simulations.

The use of simulations in higher education tends to demonstrate a more ‘compartmentalized’ approach where primary responsibility for the learning materials is vested in the developers, contextualisation and implementation is supported by academic staff (which as the literature demonstrates is done to varying degree by academics) and students engaging in using the simulation. (See below. Figure 1.2)

Thus a more fragmented model of development and deployment of simulations as teaching resources has to be considered when attempting to evaluate their use. Within this framework there are a number of key issues which impact on development, application and use and in order to fully understand the context of use of simulations in higher education it is important to consider all of these. For effective development and implementation there must as a minimum be a clear line of feedback from students to academics to suppliers/product developers but the literature generally deals distinctly with evaluation from the perspective of the different stakeholders. The approach taken in this research has therefore been to holistically examine the evaluation of simulations by synthesising the key issues which are critical to successful deployment and use of simulations.

Figure 1.2: Developer/Academic/Learner Roles (Actual)

Developer

Clearly stated and appropriate pedagogical objectives of simulation
Inclusion of appropriate content at an appropriate level
Design of interface and learner control features

Academic

Matching pedagogical objectives to course learning outcomes
Ensure that the content provided in the simulation is appropriate
in terms of background knowledge and experience of learners
Clearly communicate to learners how to use simulation effectively
Integration with overall course aims
Determining context of use by learners (groups/individuals)
Customisation and supplementing simulation content

Learner

Understanding objectives of the simulation;
Learning to use the simulation effectively
Acquiring appropriate background knowledge and skills;
Integrating skills and knowledge to engage effectively with simulation
Engage with the learning material and other learning support provided
Critically reflect on self learning when using the simulation
Apply knowledge gained from using the simulation to 'real life' contexts

Another important reason for taking an holistic approach to the research is evident when considering existing approaches which have taken to evaluation of business simulations. As Stainton et al. note:

> *The existing educational validity literature does not provide an adequate research methodology for business gaming simulation. Instead, past studies have tended to focus on the reporting of findings rather than to propose a basis for conducting validity investigations. (Stainton et al. 2010, p. 706)*

There is in fact no generally accepted terminology surrounding evaluation and a number of terms must be clarified and consistently applied to develop a consistent vocabulary to clearly identify exactly what various authors understand by evaluation.

Such terms as ‘construct validity’, ‘internal validity’, ‘external validity’,’ realism’, ‘algorithmic validity’, ‘representational validity’ and ‘theory based evaluation’ are used to describe a range of different types of evaluation. Some of these are appropriate in terms of discussing the role of the developer in ensuring that the product is ‘fit for purpose’, the role of the academic in ensuring that the content and presentation is appropriate as a tool for achieving the learning objectives they set for learners, and some of which apply directly to the student experience of using the simulation itself.

This, therefore, makes the evaluation of simulations more complex than that of other technology based interventions in teaching and learning and it is important as a first step to examine carefully the products which are available and any constraints which are imposed on academics (and ultimately learners) in their ability to access and customize the design and content of the simulations which are being used. Thus whilst the main focus of the research will be on evaluating learner experiences when using business simulations the first sections of the thesis will look at the background to the development of simulations and the main factors which impact on its growth.

1.6 Aims and Objectives

1.6.1 Aim

The aim of the research is to provide a critical appraisal of the effective development and application of simulations in business and management in UK Higher Education

1.6.2 Objectives

Section 1.4 of the chapter of the thesis examined a number of questions which the research is trying to address to achieve the stated aim of the research (arising from a consideration of the literature on how student learning is supported and evaluated using simulations (Questions 1-7) and more generally from the perspective of the 3 groups of stakeholders involved in development implementation and use of business simulations (Questions 8-10). Reflection on these questions were used to formulate the following set of objectives (which as noted by Dolin are statements rather than questions, and which collectively demonstrate how the aim of the research is to be met. (Dolin, 2013).

The objectives of the proposed research are to:

- critically review the literature related to the development and application of simulation based training/educational software (All RQs)
- critically review the pedagogical basis for claims which are made for simulations being effective in supporting learning in higher education (RQ1, RQ9)
- conduct an empirical survey to examine the development of simulations products particularly in the context of developing products to support teaching and learning in higher education (RQ8)
- examine the use of simulations across a sample of business schools in higher education institutions to determine the manner in which academics are implementing simulations in teaching and learning and the manner in which they are evaluating the impact of use of simulations on learning, (RQ5, RQ9)
- conduct an empirical investigation of the use of simulations using sample groups of students who will be involved in using simulation software as an integral part of their programme of study (this will be a case study based on students enrolled on the MSc Management and MSc International Business courses at the Robert Gordon University, Scotland, who use the MikesBikes™ simulation as an integral part of a taught module on Performance, Planning and Decision Making) (RQ2, RQ3, RQ4,RQ6,RQ10)
- Determine and apply appropriate evaluation techniques to provide an analysis of perceived and actual benefits of the use of simulations in business education; (RQ2, RQ3, RQ4, RQ6,RQ7)

- Analyse all data collected to provide a model which clearly outlines the current situation with respect to development and application of simulations in business and management education (All RQs)
- Use the results of the analysis to explain the critical success factors which impact on the development and application of simulations in business and management education. (All RQs)

1.7 Overview of the Thesis

1.7.1 Chapter 1 Introduction and Background

The main objective of chapter one is to define the research problem, describe the scope and limitations of the research being undertaken and to introduce the main themes that characterise the manner in which the research has been conducted. It also presents an overview of how the thesis is organised.

1.7.2 Chapter 2 Methodology.

There are many issues which surround methodologies concerning assessment or evaluation of any educational intervention in order to establish clearly the impact of such interventions on the learning experience. This chapter provides an overview of the methodological approach that was used in undertaking the analysis of the literature and a discussion of the research methodology and the methods used when conducting the survey work with developers and academics and the empirical work with learners which formed an important part of the research. In particular this involves a discussion and justification for adopting an empirical interpretivist approach. In evaluating student learning the general methodological approach in this research is a qualitative examination of the way in which the end users i.e. the students learn using simulations perceive the value of the experience. The chapter also describes the manner in which the researcher has used a mix of qualitative and quantitative approaches in surveys of suppliers and academic staff. The rationale for the use of a case study approach as also provided.

1.7.3 Chapter 3 Literature Review 1 – Background to the development of simulations for use in higher education.

In this chapter the context of development and application of simulations in higher education is discussed. The chapter gives a brief historical overview of the development of educational games and simulations. To inform the discussion a typology of simulation and games is also provided as the literature on business simulations often fails to distinguish clearly between different types of simulation – particularly in terms of the educational objectives which different types of simulations aim to achieve. The focus of the chapter is mainly to examine reasons which are given for the growth of the business simulations – particularly in higher education - and to critically examine which of these are of particular importance in terms of examining the issues which contribute to effectively evaluating business simulations software. Issues relating to current developments in the business simulations game industry are discussed and a brief survey giving an overview of business simulations which are currently available is presented.

1.7.4 Chapter 4 Literature Review 2 – Application of Simulations

This chapter reviews current use of simulations in business education in order to provide an overview of the key factors relating to their application which academic staff are seeking to achieve when deploying simulations within taught programmes in business studies and the theoretical underpinning for this. Specifically it examines the learning objectives which business simulations are designed to deliver in terms of enhancing the student learning experience. Consideration is also given to the manner in which simulations are introduced and the impact of this on student perception of the value of using simulations.

1.7.5 Chapter 5 Literature Review 3 – Student evaluation of simulations

This chapter examines how previous and current research on use of simulations has been evaluated with respect to achieving intended learning outcomes. The chapter will set the discussion of the pedagogical benefits of using business simulation in the context of pedagogical theories and the literature related to evaluation of teaching using technology. Specific pedagogic theories (notably constructivism) and educational models (mainly Kolb's Learning Cycle and Dale's Cone of Learning) will be discussed in relation to how business simulations can support learning. The chapter then examines the literature on evaluation of student learning and identifies the important variables which need to be considered when explaining how learners interact with simulations and the perceptions which learners have of the benefits of the experience. An evaluation framework is constructed which examines all types of evaluation which should be conducted and how and when they should be conducted. From the evidence presented in the literature the key factors are identified which then form the basis of the empirical tests conducted with students and described in Chapter 8 of the thesis.

1.7.6 Chapter 6 Empirical Work - Survey of context in which simulations are developed

This chapter reports on survey work undertaken with suppliers of business simulations software intended for application in higher education. The chapter reviews the manner in which the development of simulations software meets the needs of the higher education market. From the perspective of the developers of simulation software it also examines factors which are important when designing simulations and conditions which relate to the manner in which they should be used which will influence their effective deployment.

1.7.7 Chapter 7 Empirical Work – Survey of academics using simulations in Higher Education

This chapter reports on survey work undertaken with academics in business schools who have implemented simulations as part of teaching core business skills. The empirical work presented highlights both the intentions of academic staff with respect to implementation of simulations, the manner in which simulations are used, and also the mechanism by which they seek to evaluate the impact of using the software. A comparison between the academic and developer perspectives on benefits of use of simulations is provided.

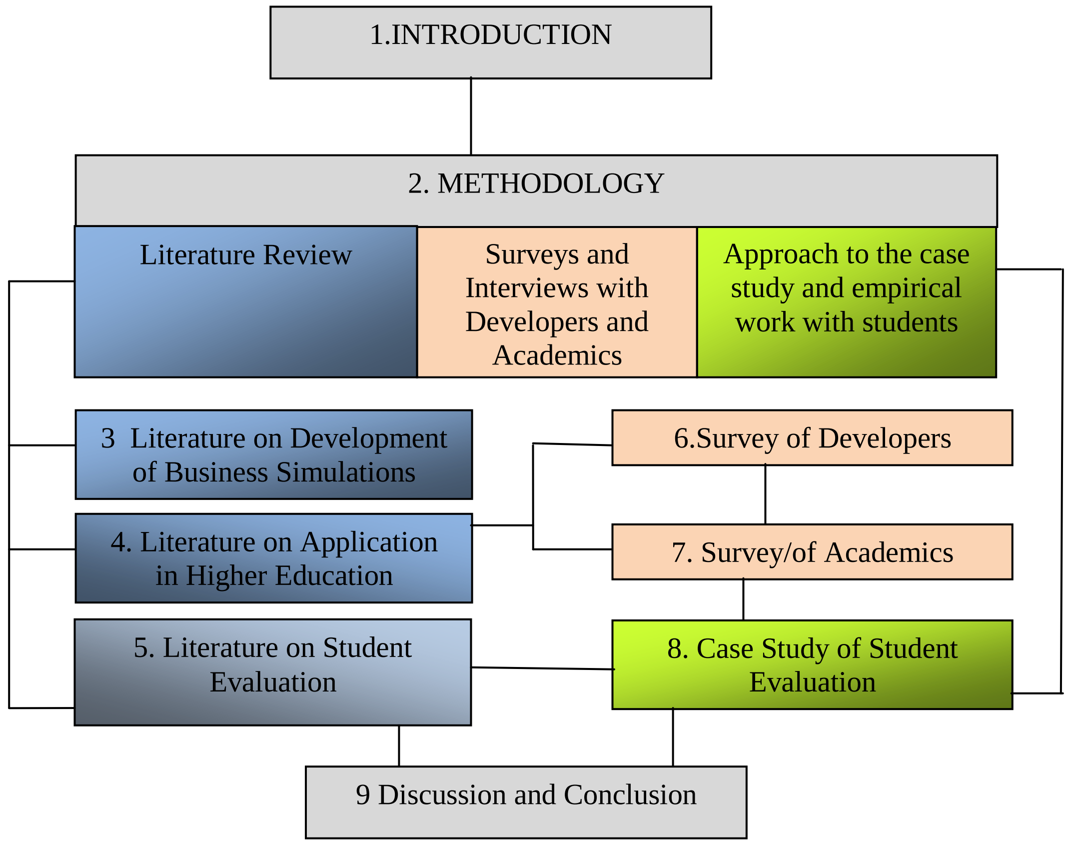
1.7.8 Chapter 8 Empirical Work – Student perceptions of the value of simulations

This chapter reports on a case study at Aberdeen Business School, the Robert Gordon University, Scotland which was used as a vehicle to undertake an examination of the learning experience of Masters students using a business simulation as a key component of their studies. The case study examines in detail the context in which the simulation was used and the intended learning outcomes which the simulation was designed to address. In particular the case study incorporated a very detailed investigation of the value of the use of the simulation software from the perspective of the students and describes how the important issues on implementation of business simulations/games which were identified in literature review can influence that perception.

1.7.9 Chapter 9 Discussion and Conclusions

This chapter summarises the results of the literature review and empirical work and relates it to the model for implementation and use of simulations which has been derived from the literature. The discussion focuses on an examination of the critical success factors in selection, use and evaluation of simulation packages to teach business skills. The chapter draws together the findings from the research and discusses what has been learnt from the work that has been undertaken. It also points to what might be discovered from further investigation and suggests some possible avenues for future research. Finally the chapter notes the contribution to knowledge made by this research.

Figure 1.3 – Diagrammatic Representation of the Structure of the Thesis.



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Chapter Two

Methodology

The objectives of this chapter of the thesis are:

- To discuss the overall methodological approach which has been taken when conducting the research with specific reference to how this impacts on achieving the aim of the research
- To review a range of problems which are associated with a methodological framework for conducting research on the use and evaluation of learning technologies
- To discuss the specific research methods used in each of the three strands of the research

2.0 Introduction

The methodology adopted in pursuing any evaluation of education is generally very complex. The reasons for this are mainly related to the large number of variables associated with attempting to measure how successful an educational innovation has been. The situation is even more complex because as many commentators have pointed out the basis on which studies into the effectiveness or otherwise of educational interventions in many cases do not clearly justify the evaluation in terms of the ultimate goal of the educational intervention (Entwhistle and Marton, 1994; Reeves, 1993; Newton, 2001). In addition the methods used to derive conclusions are frequently not suited to proving the claims made for developing and using the particular educational technique, method or educational support software/ materials (frequently technology based teaching materials). For example, many studies make claims for the development of higher order learning skills using computer based games/simulations but the evaluation method tests gains in knowledge of the subject rather than being designed to measure the extent to which these higher order learning skills have been acquired (Newton, 2001). Ultimately, a considerable number of evaluations run up against what Russell termed the ‘no significant difference’ phenomenon (Russell, 1999; Laurillard, 2004). This means that when trying to provide a quantitative measure of what has been learned by students there is no statistically significant difference between students who took part in using the innovation and those who were taught and assessed using ‘traditional methods’. Gonen, Brill and Frank assert that:

> The best way to explore the effects of a certain learning strategy is to design and implement a controlled *experiment* in which the experimental group studies using the simulator (the ‘new strategy’) while the control group studies according to traditional learning methods’(Gone, Brill and Frank, 2009, p366)[1]

But it should be noted that this approach has in the past failed to achieve any significant results (and in fact, if done in an authentic setting also raises ethical issues in relation to the fact that if the belief is that one method is significantly better than another then some students will inevitably be disadvantaged by being denied access to what is seen to be the more effective approach).

It is thus important to set out clearly the fundamental research approach being taken and to ensure that this informs the research methodology and selection and use of appropriate methods. Frequently approaches to research do not pay sufficient attention to considering the fundamental basis on which the methods employed are appropriate and justifiable in terms of the overall context in which the research is being conducted. This may lead to conclusions which are not valid because the tools employed to undertake the research are not matched to answering the research question. Pickard and Dixon provides a useful summary of the research hierarchy which shows the dependencies of key issues which inform the research process and this is reproduced with annotations to describe the researcher’s own approach in terms of the different stages (Figure 2.1) to give an overview of how the research presented

[1] *In terms of the discussion provided below on research paradigms this is clearly a very positivist position and based on the application of a research tradition which is now mainly associated with the physical sciences*

here was designed and conducted. Further discussion of the research paradigm explaining why these approaches were adopted is provided in Section 2.1 of this chapter. The first row in Figure 2.1 sets out the considerations which Pickard asserts are the important steps in developing a hierarchy of research and she goes on to expand on what is meant by these in some detail in the textbook. The second row briefly summarises the researcher's interpretation and adoption of these stages and is expanded upon in the text which follows.

Figure 2.1 Pickard's Research Hierarchy (based on Pickard and Dixon, 2004)

Pickard Research Hierarchy	Research Paradigm	→	Research Methodology	→	Research Method	→	Research Technique	→	Research Instrument
Researcher Research Hierarchy	empirical interpretivist paradigm		A pragmatic approach taken to use qualitative methods with some use of quantitative methods where it is appropriate use of either descriptive statistics to present results or deductive statistics using appropriate statistical tests to interpret data[2]		Literature Review Surveys Case Study		Literature searching Questionnaires Interviews with suppliers and academics Interviews with learners(both individuals and teams) Focus groups		Library Bibliographic databases Web Online questionnaires Transcribed interviews and coded comments categorised appropriately Statistical tests where appropriate

[2] *Noe that use of statistics was very limited in the research – mainly descriptive statistics were used to illustrate surveys from academics/suppliers and in a very limited way deductive statistics were used to test for any significant differences which might influence responses of students in the interviews/focus group meetings conducted as part of the case study*

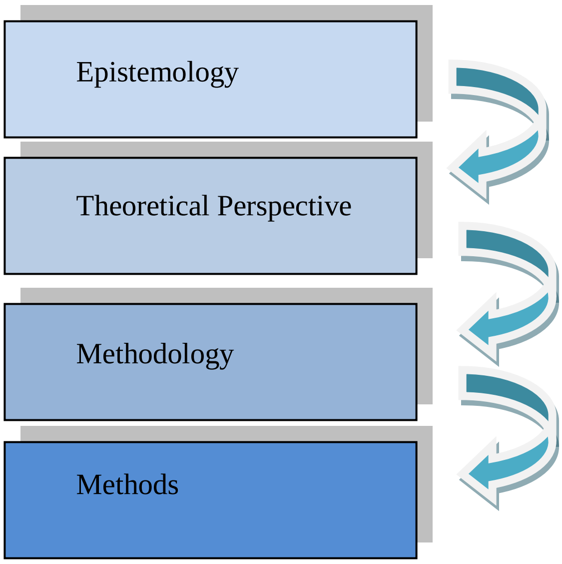
2.1 Overview of Research Paradigm

Determining the research paradigm is a critical starting point when undertaking research. It relates essentially to what claims can be made in the research to developing new knowledge or understanding of phenomena. However, determining clearly what the research paradigm is and how it is described can appear to be complicated. This largely is because – particularly in social sciences research - the literature gives a large number of definitions of what a research paradigm actually is. Reviewing a number of textbooks on research design or research methods demonstrates this point. Authors can vary considerably on how they define a research paradigm and it was considered important to examine this in detail in order to clarify the definition and purpose of the research paradigm and its relationship to development of an appropriate methodology and methods (Crotty, 2003; Creswell, 2003; Busha, 1980; Bouma and Ling, 2005; Bryman and Bell, 2007; Punch, 2005; Saunders, Lewis and Thornhill, 2006). In addition the manner in which this is further explored in terms of the relation to research methodology and research methods is not always consistently described. The research described here has been informed largely through considering Crotty's research model (Crotty, 2003).

In any research study the researcher must make a number of decisions at both practical and philosophical levels. This decision making process is outlined in Crotty's model of research, in which he identifies the 'four basic elements' of the research process - epistemology, theoretical perspective, methodology and methods (Crotty, 2003). In order for the conclusions made from a research study to be considered valid and reliable, Crotty argues that these four elements of the research process must be closely interlinked so that each one informs the other (Crotty, 1998).

Figure 2.2 (below) demonstrates Crotty's model for research which proceeds from a consideration of epistemology (what is knowledge and how do we know) though to selection of appropriate research methods.

Figure 2.2: The Elements of Research (Source: Crotty (2003, p.4))



Creswell (2003) provides a similar model but combines ‘epistemology’ and ‘theoretical perspectives’ and refers to them collectively as ‘knowledge claims’ (assumptions about knowledge, how it is known and what constitutes acceptable knowledge). Creswell identifies four knowledge claims which can be summarized as follows in Table 2.1.:

Table 2.1 – Knowledge Claims (Cresswell, 2003)	
Positivism/Post-positivism	Positivism is based on the assumption of an objective reality that is external to the individual and is generally associated with the use of methods originally developed in the natural sciences for the study of the natural phenomena. Post-positivists endorse the scientific approach to studying the human sciences but refute the belief that it is possible to be absolute about knowledge claims in social sciences research, believing instead in the probability of cause and effect. Both positivist and post-positivists methodologies involve measurement and quantification to identify trends, consistencies and standardization for the purpose of establishing general laws.
Constructivism/ Interpretivism [3]	Constructivist research is based on the view that, in trying to understand the world around them, individuals assign meaning to objects, based on their social, cultural and historical experiences. Constructivist researchers acknowledge that they, themselves, may assign subjective interpretations to the data they collect in the course of their research.
Advocacy/Participatory	This knowledge paradigm reflects a view that inquiry takes place within a social and political context and researchers have a social and political agenda to act as advocates for the marginalized in society. The researcher collaborates with the participants who may, themselves, take an active part in the research processes.
Pragmatic	This type of research is not concerned with what constitutes 'truth' but is focused on finding effective solutions to research problems. Pragmatic researchers take a practical approach to research design, and methodologies and methods are chosen because they are deemed most appropriate to meeting the purpose of the research, rather than because of any underlying philosophical beliefs. Pragmatic research tends to be associated with a mixed methods approach.

The researcher, however, would argue that in fact only first two of these are really knowledge claims in terms of how research is conceptualized. The others are approaches to research which are based on the perspective of the researcher in terms of what is seen as the intended purpose (if any) of the research. Thus advocacy research has a clear agenda to change a social or political condition. Pragmatic

There is some confusion in the literature over the exact definition of constructivsm. Schwandt (2003) sees the terms constructivism and interpretivism as exactly synonymous while Pickard (2007) notes that constructivism is one of a number of approaches to interpretivism.

research is basically an approach which (in other writings on research design) is often referred to as 'applied research' to distinguish it from research which does not have an immediate application in terms of addressing particular problems or issues – sometimes referred to as 'pure research' or 'blue skies research'. However, it is also important to note that it is possible to develop a pragmatic approach to the research methodology and adopt the use of mixed methods as long as overall the methods used are relevant to achieving the overall aim of the research. This view is consistent with Pickard's approach (see above) in her more restricted definition of what constitutes the research paradigm (Pickard, 2012). In addition Pickard points out that the interpretivist approach can be further sub-divided into 'empirical interpretivism' and 'critical theory', noting that:

> The former deals with investigation in a natural setting of social phenomena; the latter engages in ideologically oriented investigation examining current thought and social structures. (Pickard, 2007 p.11)

The knowledge claims will have a direct bearing on how the researcher chooses a particular methodology for conducting the research. The methodology is the plan of action or strategy framing the research and ultimately it provides the practical design for carrying out the research and links methods used for data collection to the aims and objectives of the study.

Of the four of the knowledge claims noted above it can be seen that two of these (post positivism and interpretivism) are of particular relevance to the research conducted here and thus will have a significant influence on the methodological decisions which have been taken. The distinction between a positivist research paradigm, a post-positivist research paradigm and an interpretivist research paradigm is discussed further below in order to clarify the overall approach to formulating the research methodology. To determine which research paradigm should be selected as the basis for the research it is then useful to compare these with the researcher's own 'world view' and to do this involves a consideration of what Pickard notes are the 3 major questions that help the researcher to define the research paradigm i.e.

> What is the nature of reality? (This is the ontological question concerning the paradigm)

> What is the nature of the relationship between the knower and the known? This is the epistemological question
> How can we come to know it? This is the methodological question. (Pickard, 2007 p6)

2.1.1 Positivism

The earliest examples of positivism as an explicitly stated approach to research historically date back to the eighteenth century. At that time it was proposed as a philosophical approach to social sciences research which was based on the assumptions which formed the foundations of research in the physical and natural sciences with a heavy reliance on practical investigation and measurement and drawing conclusions from what was observed. Its focus, therefore, was on empiricism and logic. The term 'positivist philosophy' was first used by Auguste Comte who applied it to sociological investigation and firmly consolidated the methodological approach which was based on the premise that human and natural sciences share common logical and methodological principles (Appignanesi, 2007). Positivism seeks to adopt a form of observation which is ideally completely objective and this is a fundamental assumption on which the methodology is based. Observation methods which are used must not depend on a particular point of view or pre-conceptions and thus should provide conclusions which are independent of subjective interpretation. In terms of researching human subjects, for example, this means that the only important consideration is observing what is done rather than speculating on why it is done or the researcher making assumptions based on what he/she thinks why a particular decision or action is taken. This notion that we could achieve complete neutrality of the observation is based on an explicit distinction between 'the knower' and 'the knowable' as the reality of external phenomena cannot be dependent on the act of observation. Durkheim, writing in the nineteenth century, was very influential in developing the widespread adoption of positivism in social sciences research. Specifically in the field of psychology and education this view was reinforced by the work of authors such as Skinner (1969) and Watson (1919). Skinner's theory of operant conditioning viewed learning from a behavioural perspective and restricted investigation into learning as a function of simple observable behaviours around stimulus and response. Watson similarly summarizes the position of behaviourism in educational psychology stating that:

> *'Psychology as the behaviourist views it is a purely objective experimental branch of natural science. Its theoretical goal is the prediction and control of behaviour. Introspection forms no essential part of its methods'. (Watson, 1919)*

The work of these two authors was to have a fundamental impact on educational research and to the whole philosophy of teaching and learning. The positivist view of research in the social sciences was prevalent and was largely unchallenged from the eighteenth century until the middle of the 20th century.

2.1.2 Post – positivism

The development of post modernism theory in the 20th century had an enormous impact on all aspects of society – including the arts, architecture music and literature. It also challenged the philosophical basis of virtually all aspects of scientific thought. It thus had a considerable impact in challenging the basis of positivism as a methodology for framing and answering questions in the social sciences (Appignanesi, 2007). Post modernists challenged the view of science in general as the only valid way of representing reality.

The view that positivism was based around explanation of phenomena rather than understanding the phenomena being observed led many authors to conclude that many of the claims the approach supported were not warranted. In addition the basis on which the methodology was implemented through empirical surveys which tested a limited number of variables was called into question. Opponents of positivism also questioned the basis for selection of which variables should be tested and the ability of other researchers to be able to transfer these exactly to conduct parallel studies. Finally, and most importantly, in a very influential criticism of positivism Blumer noted that the basis for conducting surveys in terms of what variables would be measured was generally flawed and was of the opinion that valid sociological research methods are based in naturalistic observation and in-depth participant observation (Blumer, 1969).

Another important criticism of positivism which has been noted by several commentators concerned its claims for detachment and objectivity in observations (Outhwaite, 1975). While it is possible to achieve this in research investigations in the hard sciences where there is a clear distinction between the observer and the observed, when dealing with human phenomena the distinction becomes much more difficult to achieve. Thus although it is appropriate to strictly governed research investigations such as randomized control trials in medical research or 'black box' experiments in physics, positivism as a basis research into areas which involved human subjects and human responses cannot achieve the same degree of objectivity.

Thus to summarise the main features which characterize a post positivist approach are its assumptions are:

- that there is an 'objective reality' but this cannot be known because, as Pickard notes, 'this reality will always be inhibited by imperfections in detecting its nature. The imperfections are the result of human fallibility' (Pickard, 2007 p.7)
- that there is a need to ensure objectivity with reference, both with respect to the instruments used to gather responses from the sample population and the potential bias arising from the researcher's own views or opinions.
- that the context of the research is extremely important
- that there needs to be very careful consideration which justifies identification of appropriate variables and (more significantly) a demonstration that there is a clear causal relationship or correlation between the variables which are measured in order to establish valid conclusions.

2.1.3 Interpretivism

The limitations of positivism along with an alternative philosophical perspective which questioned the validity of positivist scientific method led a re-examination of the accepted view that positivist methodologies provided an appropriate approach in sociological research. The positivist scientific method was notably criticized by both Karl Popper (Popper, 1959) and Thomas Kuhn (Kuhn, 1962) who demonstrated that the development of scientific enquiry and scientific knowledge did not demonstrate the continuous progression based on the methodological principles which were central to a positivist approach to research. The critical work of the Frankfurt School was also influential in challenging the neutrality of the 'scientific' approach which it was argued was not a form of objective enquiry but was deeply embedded in entrenched views of a capitalist society (Donelly, 1979).

Recognizing the differences between human and natural phenomena was the starting point for developing a research methodology which provided an alternative to positivist methodologies. Two very important features of an interpretive approach, as described by Schwandt can be summarized as follows:

- Human actions are viewed as meaningful and it is important therefore to try to determine the factors which are responsible for observed actions
- There is an emphasis on a commitment to derive an accurate picture of the 'real world' which requires an accurate description of all aspects of the experience being examined as observed in the actions of individuals

(Adapted from Schwandt, 2003 p.298)

The main philosophies which profoundly influenced the development of an interpretivist approach to research in the social sciences were put forward by Kant and Husserl. The work of both these philosophers is extremely difficult – in particular the arguments put forward by Kant in his Critique of Pure Reason and they are generally interpreted (as in the case of this discussion) on more simplified interpretations provided by other authors (Harrison-Barbet, 1990). The fundamental question which both philosophers were attempting to answer concerned the separation of the realm of natural phenomena and the human mind which is the realm of beliefs, ideas and reason. According to Harrison-Barbet, Husserl proposed that humans could have no knowledge of the world independent of what was in their minds and could know things as they appear as phenomena and never as things as such. The consequences of such a philosophical position were explored by Weber who linked this to an interpretive methodology in the social sciences which pursued an understanding of the way in which people's actions were guided by their ideas and beliefs rather than accepting and pursuing research investigations which sought to find causal explanations. One of the fundamental differences between positivism, post-positivism and interpretivism is that the researcher rejects the idea that there is a single constructed reality. Again, as Pickard notes, an interpretivist view implies a 'belief in multiple, constructed realities that cannot exist outside the social contexts that create them. Realities vary in nature and are time and context bound' (Pickard, 2007 p.7)

2.1.4 Philosophical Approach to the Research

The researcher's world view is consistent with an ontological standpoint which is characteristic of an interpretivist approach i.e. that there is no single objective reality which exists outwith the context in which it is experienced by individuals. In fact in Chapter 5 of this thesis which examines a variety of pedagogical theories it can be seen that this is consistent with observations made in terms of pedagogical theories and the need to accept the view that any evaluation of learning cannot be done using behaviourist principles (which are closely bound up with a positivist approach, nor even by cognitivist principles (which are closely connected with a post-positivist philosophy). Evaluation of learning, and understanding how learning can best be supported, is by adopting what educational theorists term a 'constructivist' view which is based on the principle that in order to understand how, why (or even if) learning takes place we have to fully understand the context in which learning takes place. Constructivism is basically a theory about how people learn and contends that people construct their own understanding and knowledge of the world, through experiencing things and reflecting on those experiences. It assumes that, we are active creators of our own knowledge and this involves an individual constructing his or her own understanding of the world and this construction is unique to each learner.

Examining the issue from the perspective of the epistemological question of the relationship between the knower and the known, the researcher takes the philosophical view that the researcher is an integral part of the research. While acknowledging the post-positivist view that researcher should maintain as much objectivity as possible the researcher will have to engage in active participation in terms of interaction with the learners and ensuring that contextual issues are fully understood. The engagement of the researcher in the process is discussed in terms of the case study in Section 2.3.2.1 below. .Again the researcher's view on the epistemological viewpoint agrees with Pickard who notes that 'The results of the investigation are a product of interaction between the subject and the investigator. What can be known is a result of that interaction' (Pickard, 2007, p.7).

The methodological question will be discussed in detail in the next section of the thesis.

2.2 **Research Methodology**

Research is a process of collecting, analyzing and interpreting information to answer questions (Saunders, Lewis and Thornhill, 2007). A research methodology defines the basis on which the research will be conducted - how to proceed with the research, what type of data is required and how this will be analyzed, how to measure progress, and what constitutes success (Saunders, Lewis and Thornhill, 2007).

It is very important that the methodology selected is appropriate to achieving the overall aim of the research and indeed the choice of research methodology will depend on the type of question which is implicit in the aim of the research. Thus the starting point in selecting a methodology is to examine carefully the aim of the research and ensure that the methodological approach adopted is consistent with being able to achieve the aim.

Having discussed the overall research paradigm it is important to look at how this impacts on the methodology and methods which were applied when conducting the research. Research in the social sciences encompasses a wide collection of disciplines or fields of study. The general trend in terms of application of methods in this field (and consistent with the methodological approaches discussed above) is the application of quantitative approaches to support positivist methodologies and qualitative methods when adopting an interpretivist methodology (Denzin and Lincoln, 2003).

The aim of the following research is as stated below:

> *To provide a critical appraisal of the effective development and application of simulations in business and management education in UK Higher Education*

Reflecting on the aim of the research it is clear that the research must be supported by qualitative methods. In order to achieve this aim it will be important to qualitatively survey the views and opinions of three distinct groups of 'stakeholders' i.e. the developers of simulations, the academics who deploy simulations in their teaching in higher education in the UK and the students who are the ultimate consumers of the products and whose views it could be argued are the most important factor in determining whether or not simulations are an effective mechanism for use in management education. The research takes an holistic perspective and acknowledges the fact that many factors which determine whether or not business management simulations can by judged to be 'effective' are inextricably interwoven in terms of the inputs of all of the stakeholders.

In terms of the application of appropriate methodologies the research can be conceptualized in two parts. The first part deals with the development and implementation of business simulations from the perspective of developers and academics and the second part is more centrally concerned with the views and opinions of learners who make use of the simulations.

2.2.1 Research methodology for the first part of the research (Survey of Developers and Academics)

It could be argued that a positivist or neo-positivist approach could be adopted in informing the first part of the research which is related to organizational strategies and processes which are not experienced directly by the learner but which clearly have an influence on structural aspects of their learning experience. Much of the data required in order to answer questions related to this aspect of the research can be gathered from a review of documentation which describes the development and implementation of business simulations/games. However, this needs to be supplemented by qualitative data to provide a deeper insight into the views of developers and academics with respect to the critical success factors which they regard as having a significant impact on the learning experience of the user of the software. The research aim required the researcher to determine critical factors in success of development and implementation of business simulations and central to this is an examination of perceptions and motives of those who seek to develop or implement business simulations. The approach was later found to be appropriate when reflecting on the results of surveys of developers of simulations and academics using simulations as the most important data from the surveys was derived from the open questions which were used to allow participants to give their views and opinions. The survey of both developers and suppliers was supplemented by using interviews with experts or practitioners who were active in the field and who had been identified in the literature review.

2.2.2 Research methodology for the second part of the research (Evaluation of Student Learning)

The second part of the research is related to the conceptions of a phenomenon (use of simulations/games to provide support for learning) by learners and relates to the direct experience of the participants.

Even more clearly in this case a qualitative methodology is appropriate. Creswell notes that:

> "One of the chief reasons for conducting a qualitative study is that the study is exploratory; not much has been written about the topic or population being studied, and the researcher seeks to listen to informants and to build a picture based on their ideas" (Creswell, 1998)

However, the researcher would argue that even when much has been written about the topic being studied there is still justification for conducting a qualitative study if (as in the case of the current research) the methods in conducting the research which is being reported do not support the conclusions which are made or result in reporting that the research was not conclusive.

More specifically the second part of the research (which involved a considerable working with learners) was conducted using a qualitative method – a case study which involved extensive interviews (with both individuals and teams of learners) and focus groups. As the researcher explored the topic additional interviews and focus groups were undertaken with purposively selected groups or individuals. The case study was also supported by informal interviews with the academics who were involved in teaching using the business simulation. In particular the researcher sought their view of how students should ideally approach using the simulation to enhance their learning, the specific learning outcomes which that use was designed to support and some of the contextual issues related, for example to allocation of teams and the additional support which they provided for learners. The case study also involved a review of documentation which related to the manner in which the teaching was delivered and assessed.

The above discussion has been mainly theoretical in scope. Its purpose was to clarify the overall methodological structure which characterizes the research undertaken. An examination of the main research 'traditions' has revealed that to accomplish the overall aim of the research a qualitative methodology should be adopted. A positivist approach supported by quantitative analysis of data is not appropriate – even in parts of the research which aim to survey the general context in which business simulations/games have been developed and implemented. When examining in detail the manner in which learners interact with simulations/games an interpretivist approach is required in order to capture the type of information which will not only describe the manner in which learners interact with the educational material but also explain the way in which they conceptualise and use the material in the context in which their own learning is situated.

2.3 Research Methods/Research Techniques and Research Instruments

In his discussion on a research framework to test the validity of business gaming simulation Stainton suggests that learning effectiveness (and hence he contends, educational validity) is influenced by two considerations –

1. the simulation design, and.
2. the manner in which the simulation is implemented (Stainton, 2010)

Drawing on Newton's earlier work, this thesis further subdivides the second point i.e. the manner in which the simulation is implemented, to examine specifically this issue from the perspective of both how academic staff introduce simulations including the general teaching context in which it is introduced and the educational experience of students who use the simulation. (Newton, 2001)

Thus, in order to accomplish the aim the research work has been conducted in 3 broad strands all of which are mutually dependent in developing and implementing business simulation packages in the Higher Education environment.[4]

- Literature based research and empirical survey work to determine the manner in which simulations are currently being developed and in particular the educational context in which they are designed to be used
- Literature based research and an empirical survey, including questionnaires and interviews with academic staff who use simulations, in order to establish the manner in which simulations are being used and the expectations of academic staff of the benefits of using this particular technology to support student learning
- a series of empirical studies with students of the Robert Gordon University, United Kingdom, to determine their perception of the value of using simulations and the extent to which this supports the benefits which are claimed by developers and academics

The research method used, therefore, revolved mainly around a case study of students using interviews, group (team) interviews and focus groups all of which were underpinned by literature reviews. The following section therefore examines in more detail these research methods and techniques and instruments used to support them.

To avoid confusion it is worth noting here that surveys and questionnaires can be used to support quantitative or qualitative research. As used in positivist or post-positivist research they are generally used to derive quantitative data. In these cases highly structured questionnaires and surveys are pre-planned in advance of the research and

[4] *The rationale for taking an holistic approach and considering the research from the perspective of developers of simulations, academics implementing simulations and students using simulations was discussed in detail in Chapter 1.*

are highly structured and very specific – generally focusing on deriving sets of data which can be statistically manipulated. In such cases statistical methods are also important in terms of establishing the reliability of the data which has been collected and also in providing the potential for correlation amongst variables.

> "A survey design provides a quantitative or numeric description of some fraction of the population- the sample- through the data collection process of asking questions of people (Flower, 1998).

This data collection, in turn, enables a researcher to generalize the findings from a sample of responses to a population." (Creswell, 2007).

It is also worth noting that historically, the two approaches (quantitative and qualitative) have been regarded in some of the literature diametrically opposed and incompatible. In recent years, however, social researchers have proposed that though the two approaches are fundamentally different, they are not mutually exclusive and mixed method approaches have evolved. Punch, for example, likens quantitative and qualitative methods to either end of a research continuum and argues that:

> '*in practice, there are many points along the continuum, and any study many combine* elements *of either strategy, the prescribed one or the unfolding one' (Punch, 2005 p.25)*

The purpose of surveys used in this research was not solely or even primarily to gather data which could be applied in making statistically significant statements on the basis of the datasets derived. The purpose of the surveys was to make it easy to collect qualitative data consisting of views and opinions of individuals in order to validate some of the findings which had been reported in the literature.

Used in support of qualitative research surveys and questionnaires are designed and used in a flexible manner in order to explore the perceptions or views of respondents or participants. The types of questions used in the questionnaire or asked in an interview are thus more open ended and in the case of interviews the format of the interview must allow flexibility to allow participants to explore freely some of the issues which they believe to be relevant rather than being constrained to discussing only what the facilitator has previously determined to be relevant.

2.3.1 Surveys of Simulation Developers and Academic Users

As noted above it is extremely important to clearly establish what the important issues are which should be investigated when using surveys/questionnaires and how these should be translated into an understanding of the aspects of phenomena which can be observed, measured and recorded . The issues selected were derived largely from an analysis of the literature and were selected in order to test hypotheses which arose from consideration of the literature. The areas selected for examination were mainly related to the themes detailed in Table 2.2 (below):

Table 2.2 – Main themes//variables explored in Questionnaire Surveys

Developers of Business Simulations	Academics using Business Simulations
Perceptions of: Main customers (education/corporate) Geography of markets Specific type of simulations Design for delivery Technical considerations Validation of content	Perceptions of: Availability of Business Simulations Subject coverage of simulations Skills/Knowledge to be developed Delivery context Evaluation of effectiveness of use
Both Developers and Academics Using Business Simulations	
Main factors influencing academics' decision to use simulation (cost, accuracy of content, quality of interface, ease of use, ability to customize interactivity) **Main benefits to learners from using simulations** (delivery of facts and theories, link of theory to practice, improved engagement, provision of immediate feedback to users, facilitating experimentation, employability skills development, encouragement for reflective learning, developing group working skills, developing decision making skills)	

An important issue which was explored with respect to the surveys of developers of simulations and academics opting to use simulations was the extent to which the two groups of respondents shared a common view of the critical success factors for developing and implementing simulations in a higher education learning context. Thus, within the survey of suppliers and academics the two final questions in both surveys were exactly comparable to allow accurate comparisons to be made. The researcher adopted a similar method for comparing the survey responses from both groups as had previously been successfully used in a comparison of on line training materials/learning packages providers and HR managers who made the decision to purchase and deploy e-learning material for staff development and the suppliers of e-training (see Newton and Doonga, 2007).

A number of open questions were included in both which required qualitative responses from participants and, these qualitative responses were further explored using interviews in order to gain a richer understanding of the issues being explored.

The questionnaire surveys for developers was complemented by 6 semi structured interview with developers (4 of which were by telephone). These interviews were conducted after all responses to the survey had been received. (A copy of the interview schedule is given as Appendix 3)

The questionnaire survey for the academics was complemented by 6 semi structured interviews Participants for the interviews were selected on the basis of contacting academics who from the literature review had been identified as being very active in using business simulation/games in teaching in higher education (.2 from English and 4 from Scottish Universities). The Scottish academics included 1 member of staff in the Aberdeen Business School who was involved in teaching business simulations. (A copy of the interview schedule is given as Appendix 6)

In terms of the research instruments themselves, originally it was envisaged that the questionnaires to suppliers and academics would be prepared and distributed using a paper based format. Ultimately it was decided to use a web based questionnaire. Overall, the main advantage of the web based survey was immediacy of response and the easy manner in which recipients of the questionnaire could be provided with a link to the survey, complete it online and despatch it to the researcher. The web survey tool selected was SurveyMonkey™ which provides very easy to use functions to design the questionnaire and excellent diagnostic tools to summarise and present results. Web based surveys often result in poor response rates. However, given the ease with which the survey could be administered it was decided that this could be compensated for by sending a very large volume of e-mail requests for participation

A detailed examination of the survey instruments which were used, issues which they sought to explore and the findings is provided in Chapters 6 and 7.

2.3.2 Survey of Student Learning Experience using business simulations

The research method for this part of the research is based firmly within the interpretivist approach. Specifically the researcher adopted the use of a case study of students at using a business simulation at the Robert Gordon University, Aberdeen, Scotland. The qualitative methods used in the research involved gathering 'deep' information and perceptions through qualitative methods such as individual interviews, discussions with teams of learners and focus groups and reporting the results from the perspective of the research participant(s).

The justification for using a qualitative approach is based on the following:

- The study of any educational intervention is complex and is a subjective phenomenon with different meanings for different individuals or groups of individuals
- Understanding the phenomenon needs to be defined in the context of understanding individual and group experience of the phenomenon in a particular setting and this can best be done by adopting a method which does not make a priori assumptions of what that experience is

2.3.2.1 The Case Study

A case study approach effectively supports an investigation of specific phenomena and provides the opportunity to observe and explore the phenomena in depth and in an easily managed environment in terms of the ability to describe the context accurately. Case studies allow the exploration of the contextual conditions of a phenomenon within its real-life context. It is important that the case study environment is sufficiently representative of other situations and contexts in which the observed phenomena relating to the student learning experience could be conducted. It is therefore important to carefully define the context of the case study and to ensure that it is sufficiently representative of other learning environments in which business simulations are used. A case study is designed specifically to provide a description of all the complexities of a particular case. As Stakes notes "Case study is the study of particularity and complexity of a single case, coming to understand its activity within important circumstances' (Stakes, 1995). Hewer, comments that 'the questions most often asked by academics contemplating implementing the use of learning technology are 'Does it work?' and 'How do you do it?' (Hewer, 1997). Case studies therefore have the potential to provide useful data on particular applications but they must also provide a clear body of evidence which allows generalization from the case being investigated to the broader issues concerning the use of business simulations. In terms of Stake's categorization of case studies a common feature of some case studies is that they are *intrinsic case studies* (in which the objective is to learn more about the particular case) rather than *instrumental case studies* (in which the case study is instrumental in providing a clearer understanding of more general issues). By carefully describing the context of the case study and in particular noting where any circumstances within the case study are not typical of the way in which business simulations are typically used in an academic environment the researcher can be confident that results are generalisable. As Yin notes:

> The case study method allows investigations to retain the holistic and meaningful characteristics of real-life events – such as managerial processes. (Yin, 2003 p.13).

Case studies can help to explore real-life causal links which are too complex to explore using experimental or survey type strategies. This is particularly appropriate when examining the very complex processes which are characteristic of using a business simulation where many of the processes are the ‘thinking processes’ of the participants which are not easily observable. The case study approach also allows multiple perspectives of the participants to be analyzed in depth and triangulated to corroborate findings. Using a business simulation involves complex decision making and the learning processes involved for individuals are impacted on by a range of contextual issues such as group dynamics, instructional support, and functionality of the simulation interface, ease of use of the learning materials, as well as the learner’s own perceptions of and approaches to problem solving. Thus the case study approach allows the researcher to focus on the rationale for actions to explain why decisions were taken, how they were implemented and the impact of these on the student learning experience.

Ideally a case study includes observation of participants but in an educational context there are both practical and theoretical issues around being able to do this. Originally to support observation it was proposed to use software (Camtasia©) to record screenshots of the business simulation to effectively provide a video recording of the learners’ actions when using the simulation. However, after conducting some trials using this method it was discovered that the technology was effective in giving a detailed picture of what the learner had done but this did not give access to the important information regarding why decisions were arrived at. In addition, because students were free to make use of the simulation in their own time and pace it was logistically impossible to implement using the software (which had to be set up on specific computers and set to record at specific times). Consideration was also given to making use of think aloud protocols within the case study. The think aloud protocol is a technique in which participants verbalize their thinking process (Hong and Liu, 2003) and thus was seen to be potentially very effective in understanding situated cognition and decision making which are central aspects of student engagement with business simulations. It also would allow the researcher to map the growth of expertise of learners and unpack misconceptions which learners had during the process. It has been employed successfully in some studies which have examined usability assessment and formative evaluation of simulations (Norgard and Hornbaek, 2006). However, the method was rejected on the basis of both practical and theoretical considerations. On a practical level, unless the sample size was very small, it would have been impossible to administer a detailed study – particularly as it would have required observation over a relatively long period of time and with planned co-operation from groups of learners on when they would work on the simulation. From a theoretical perspective the methodology was considered potentially very obtrusive because of the requirement for the researcher to be present in the classroom or laboratory setting and substitution by using video recording or cameras (which was also rejected) can reduce the naturalism of the setting and impact on student behaviour in unpredictable ways. Thus the research technique used to capture student interactions with the business simulation took the form of unstructured individual interviews, semi-structured group interviews and focus groups from which the researcher could record in detail the learners' perceptions as they articulated their thought processes and discussed their approach to learning through using the simulation. The case study was also supported by informal interviews with academic staff in order to establish their perception of how students were introduced to the simulation, the learning outcomes which they expected to achieve and the support which they provided to students engaged in learning using the business simulation. In addition a review of all documentation concerning the simulation was conducted. This involved in particular a careful examination of the module learning descriptor to verify the expected learning outcomes and any supporting documentation which students were provided with. The following sections provide more detail on the manner in which the interviews and focus groups were conducted. Prior to discussing this it is worth noting the role of the researcher within the case study research. The researcher was a PhD candidate who had previously used the business simulation used in the case study as part of his studies for the MSc International Business at the Aberdeen Business School, the Robert Gordon University. The researcher is an international student (from India) and, as the majority of the students who were participants in the research were international students had prior knowledge and experience of some of the issues facing international students – in particular in the different context in which education is delivered and assessed in the UK. As Pickard comments when discussing case studies,

> The participants in a study can become involved in the research process to an extent that may be beyond the past experience of the researcher. The rapport necessary to carry out in-depth case studies places a great deal of responsibility

> on the researcher to develop a strong rapport with the participants while remaining removed from the situation. (Pickard, 2007 p.92)

The researcher would contend that such a rapport was established and further note that he was also careful not to allow this, or his preconceptions on what students views and opinions might be, influence his role in objectively and accurately reporting their views. This was assisted by engaging in processes to allow interviewees to check a brief record of statements they had made in the interview (these took the form of short quotations from the student which the researcher noted and fed back to the student) and providing members of focus study groups with a brief record of the discussion for comment and if necessary amendment.

2.3.2.2 Case study- individual interviews

The manner in which business simulations/games are 'meant' to be used to support student learning was initially focussed on by a pre-understanding of the issue through evidence from an extensive literature review which centred on gaining an understanding of how business simulations/games should be implemented in higher education and the manner in which they supported student learning. The claims made in the literature were tested by an approach which involved gathering personal opinions through surveys of individual opinions, personal interviews or focus group interviews. The interviews with individuals were deliberately designed to be un-structured as their purpose was not to guide the attention of participants to aspects of their experience of the phenomenon being investigated but to gain an understanding of the issues from their own perspective. Whilst not claiming an overall phenomenographic approach to the research it should be noted that the method of conducting the interviews was based very much on the phenomenographic approach which was proposed by Marton (1986). As Marton explains, the approach requires gathering and sifting through a huge amount of qualitative data. The approach also requires the researcher to undertake a very large number of interviews in order to ensure that the data accurately captures all of the important factors which influence learner perceptions. Effectively this means undertaking interviews until the researcher is satisfied that the data being collected is not new and when the interviews fail to result in any new perspectives being voiced the data collection can be said to have reached saturation point (Marton, 1986). Only if the interview is clearly not addressing any relevant issues should the interviewer provide ‘prompts’ but care has to taken to ensure that the researcher does not ‘set the agenda’ for the discussion. This helps to minimize the pre-conceptions of the researcher affecting the process of gaining a true picture of the interviewee’s perceptions of the phenomenon being studied.

The data for this approach was initially recorded by hand by the researcher and brief notes retained to in order to allow the researcher to reflect on the data and to identify themes which were emerging. Like other qualitative methodologies such as ethnography, the phenomenographic approach is usually less structured at the beginning of the study, the more general approach allowing for structure and data to emerge as the study progresses and thus it was important to maintain an accurate record of participants’ views in order to support this process of reflection and analysis. The accounts of perceptions or understandings of the phenomenon are then analyzed and represented by the researcher as a limited number of distinct conceptions emerging from the collective analysis of the interviews.
The researcher took careful notes during the interviews/group interviews. Initially some of the interviews were recorded using an audio recorder but experience of this was that it inhibited some of the discussion and some students were reluctant to air their views frankly. The researcher, therefore, switched to using notes only and to facilitate this Livescribe® software was used to allow notes to be quickly converted to Microsoft Word format. Immediately at the end of the interview the notes were condensed into a series of short ‘quotations’ which the interviewer believed accurately reflected exactly the points made by the interviewee. He interverviewee was subsequently asked to verify that these were accurate reflections of what he/she had said. This assisted the researcher in subsequently reviewing comments and then the researcher used a coding method to categorise important recurrent themes and views of the students. It also allowed the researcher to engage in the process of analysis and reflect on the findings as the extensive schedule of interviews was being completed.

Again, typical of an interpretivist approach to case study design, the researcher used emerging data to refine the sample of students to be interviewed. This led to specific sets of interviews being conducted with students who had been identified as having little prior learning which they could bring to bear when using the simulation. It also on reflection led to separate sets of interviews being conducted later in the research with students who had failed the module in which the business simulation was used and those who had passed the module. The process of interviewing was conducted exhaustively until the researcher believed that there was no new data emerging and thus having reached ‘saturation point’ determined that it was not necessary to arrange further interviews. In total over the 3 year period in which the practical work was being conducted 87 students were interviewed (the schedule is presented in Table 2.3 below).

2.3.2.3 Case study – group (team) meetings

Students using the simulation were assigned to small teams (typically of 4 or 5 students per team). The researcher undertook group meetings with 20 of these teams over the course of the 3 years in which the practical research was undertaken. The purpose of the team interviews was specifically to look at how learners viewed group working. Team working was clearly a very important feature of the context of student use of the simulation and the fact that of the pedagogical objectives which were set by academic staff in terms of learning outcomes involved collective decision making was also important. The literature review notes that group working has a significant impact on how students view the overall learning experience when using simulations. The interviews with the teams was thus primarily to explore in more detail this aspect of using the business simulation which could then be compared and contrasted with the views expressed by individuals. Data was collected in the form of brief notes from the meetings which were written up by the researcher immediately on conclusion of each meeting.

2.3.2.4 Case Study Focus Groups

It was also decided that focus groups would be a good instrument to collect data on student perceptions. The main disadvantage of using interviews as the only instrument to gain student opinion is that the researcher cannot quickly corroborate comments taking into account the views of others. Following on from the interviews it was decided therefore that to gain richer data of student perceptions the researcher would arrange a focus groups at which students would be given the chance to respond more broadly to issues which they felt were important. Thomas et al. define a focus group as

> 'a technique involving the use of in depth group interviews in which participants are selected because they are a *purposive*, although not necessarily representative, sampling of a specific population, this group being focused on a given topic.'
> (Thomas et al. 1995)

A range of publications were consulted to ensure that the focus groups were conducted in a way in which they were used to best advantage and also to understand the limitations of the approach. (Evmorfopoulou, 1997; Catterall and Maclaran, 1997; Rabiee, 2004)

The schedule of student interviews, group discussions and focus groups is provided in Table 2.3 below and this is also provided in Chapter Eight of the thesis where a detailed analysis of the empirical work is provided. It should be noted from this that the researcher had originally planned on conducting interviews and focus groups in the first year of the practical work to support the research. However, as the case study developed it was found that it was necessary to purposively sample in more detail particular groups of learners and these groups are also identified in the following table.

Finally, it should be further noted that as part of the case study the researcher used a simple questionnaire to gather demographic data on the students who had participated in using the business simulation during the first year of undertaking the practical work for the research. This would appear to be at odds with the use of qualitative approaches to support the research generally. However it should be emphasized that the purpose of the questionnaire survey was not to provide hard statistical data on which definitive conclusions about the effectiveness of the use of simulations as a teaching method (which as has already been pointed out is a flawed basis on which to derive meaningful conclusions to support or refute the effectiveness of simulations). Its purpose rather was to provide a high level overview of the extent to which the simulation had achieved the objectives which are frequently cited claims for the benefits to be gained from using simulations which were previously identified in the literature review and survey work conducted with developers and academics.

Table 2.3 Schedule of interviews/group meetings/ focus groups with students

Individual Interviews	N	Simulation Group Meetings	N	N	N	N	N	Focus Groups	N
March 2009	18	March 2009	4	5	3	3	4	March 2009	15
April 2009	12	April 2009	3	4	4	2	3		
February 2010*	15	February 2010	3	4	3	3	4	March 2010	12
		April 2010	3	3	3	4	3	March 2010**	11
July 2011***	12							July 2011***	10
August 2011****	30								
Total Interview	87 student interviewed -								
Total Group Interviews			20 group interviews (involving in total 68 students)						
Total Focus Groups								4 focus group meetings (involving 48 students)	

*The participants in these interviews were students who had enrolled on their course in January

**The participants in this focus group were restricted to UK or European students in order to investigate what appeared to be a difference in perception of some of the issues discussed in relation to use of the business simulation

***The participants in these interviews and in the focus were students who had failed the course at first attempt and were therefore engaged in resubmitting their assessment. It is important to note that these students engaged with the simulation as individuals (using the product's single player option) rather than as a group.
****The participants in these interviews had successfully completed the course and were asked to reflect on the value of the simulation to their overall understanding of business management and the skills they had gained across the whole course

A questionnaire survey of all students enrolled on the programme was conducted in 2009. It is important to note that the purpose of the questionnaire was not to attempt to gain statistical data on the student learning experience which could then be analyzed to give firm conclusions on the value of simulations in teaching. Its purpose was to support the investigation of the learning space and provide confirmation that the issues which were surfacing in the research were ones which were broadly of concern to the learners and to allow the researcher to focus in on more detail on issues where student opinion appeared to be divided.

2.4 Literature search

The starting point for surveying any field of research is to conduct an evaluative study of the literature. A wide range of topics are encompassed in the literature under the general heading of business simulations and thus (as discussed in the next chapter) it was important to carefully define the topic in terms of a general typology of simulation and gaming research in order to specifically focus on identifying and reviewing material which was designed for use in higher education. Also because the research took an holistic approach to determining the pedagogical and practical benefits of simulations it was deemed important to conduct an extensive examination of literature which dealt with learning theory and instructional design. In this context it was necessary to examine the specific claims made concerning the mechanisms by which business simulations can support the delivery of 'rich learning environments' linked to specific theories of learning. This involved an analysis of the literature related to educational theories – particularly experiential learning, active learning and constructivism to critically review the claims that simulation software provides enhanced interactivity and engagement to support these educational approaches. (Moon, 2004)

To provide purpose and direction to the literature search and ensure retrieval of relevant material a range of issues arising out of the research problem were identified and from those the following questions were derived:

- *what specifically are the design considerations which inform the development of simulation software for use in higher education and what are the constraints on ensuring that the products being developed and marketed are fit for purpose*
- *what is the pedagogical basis for claims which are being made for using business simulations*
- *what evidence is being presented in the literature to support claims for learning gains, efficiency gains or effectiveness gains resultant from implementing business simulations in the curriculum in higher education*
- *how has the evaluation of business simulations been undertaken in higher education*
- *what are the current methodologies which have been proposed for evaluating use of business simulations interventions in higher education and how well do these methodologies provide an accurate measurement of the benefits which have been claimed for these interventions?*

2.4.1 Methodology employed in literature search

Literature was identified by keyword searching of databases and e-journals. In addition, relevant books, and journal articles which are found from the initial literature search will be used to extend the search using forward citation searching. Web based information was identified using popular search engines - mainly Google (including Google Scholar), AltaVista, and Yahoo. The main databases for useful articles were found to be ERIC (the Educational Resources Information Centre), BEI (the British Education Index), and Business Source Premier and Science Direct. The key themes around which searches were conducted were: - design and implementation of business simulations and games; educational benefits of new learning technologies; the contribution of theories derived from educational psychology to the design of instructional media – notably active learning and constructivism. These were all developed in order to provide a robust body of evidence upon which to base the critical review of use of business simulations. The aim was to derive an holistic model of evaluation which is firmly rooted in the claims made relating to the educational benefits of such systems within higher education.

As search strategies were developed it became clear that it was important to clearly separate the literature which dealt with developing specific skills in particular areas such as accounting, marketing and human resources and those which described the application and evaluation of 'whole enterprise' simulations which are designed for use by groups and allow learners to develop a more detailed understanding of how various business functions interact.

A search was also made to identify major projects or initiatives which involved promotion of business simulations. Whilst the use of simulations was part of the more general funded initiatives in the United Kingdom – notably the TLTP programmes (Teaching and Learning with Technology Programme) and the CTI (Computers in Teaching Initiative) – neither of these dealt centrally with the development and use of business simulations. These projects were particularly concerned with the development and assessment of technology based interventions in teaching and learning in the UK but the outputs of the projects could not be said to have contributed significantly to the adoption of simulation technologies and only had a tangential impact in terms of developing small scale simulations used for modelling processes and systems in the sciences. A European Project (IST-1999-13078) led by the KITS consortium (Knowledge Management Interactive Training Systems was found to have been more focused specifically on games and simulations and provides a useful overview of developments in the field from a European perspective which was useful in balancing other published research which tended to have a North American bias (Leemkuil, de Jong and Ootes, 2000). More significantly the outputs from ABSEL (the Association for Business Simulations and Experiential Learning) and ISAGA (the International Simulation and Gaming Association) and SAGSET (Society for the Advancement of Games and Simulations in Education and Training) provided a valuable source of information. A particularly useful resource was the Bernie Keys Library. This online library of research on simulations, games and experiential learning was created in honour of J. Bernard Keys, co-founder and first president of the Association for Business Simulation and Experiential Learning. (Bernie Keys Library, http://sbaweb.wayne.edu/~absel/bkl/Splash..htm)

The journals *Simulation and Gaming* and the International Journal of Gaming and Computer-Mediated Simulations were the main sources for detailed analysis of application of business simulations. In addition useful papers discussing issues related to educational psychology and educational theory – *Active Learning in Higher Education,* the *British Journal of Education Technology, the British Journal of Educational Psychology, the International Journal of Management Education and Educational Technology, Research and Development* provided important background material on the general context of using technology in teaching.

Academic conferences are often a good source of information, not only in terms of papers which are presented but also in providing the opportunity to discuss key issues with theorists and practitioners. In this respect the Annual ABSEL conferences and the ED-MEDIA World Conference on Educational Multimedia, Hypermedia and Telecommunications were identified as the most important conferences in the field in which this research was being undertaken. (Because of practical difficulties – the conferences being international - the researcher made use of published proceedings rather than attending the conferences). In addition TATA Interactive Systems holds an annual conference to publicize major developments in their own simulation/gaming products and to discuss and debate more general issues related to the topics. The researcher was invited to attend these conferences and found it to be a useful source of information and contacts. Finally, the International Simulation and Gaming Yearbook (from SAGSET) also provide a source of scholarly articles which comprehensively discuss the topic.

The literature review also identified individuals who were prominent in research in the field. There are of course a number of academics who publish extensively in the field of instructional design but only a few of these individuals are concerned primarily with issues related to gaming and simulations. Seminal work by Ellington and Earl, and Boocock and Shild, were found to be dated but still relevant to researching the field (Ellington et al., 1998; Ellington and Earl, 1998; Boocock and Shild, 1968). Textbooks by Aldrich, Klabbers, and Jones discuss the educational context in which simulations are developed and used (Aldrich, 2005, 2009a, 2009b; Jones, 1995; Klabbers, 2006) but tended to lack detail and were not research based.

Using Social Sciences Citation Index, citation searches on these authors were conducted and this also provided a very good source of references.

The other major author whose views have been very influential in shaping the direction for this research is Professor Diana Laurillard, previously pro-Vice Chancellor of the Open University in the United Kingdom. Laurillard's work '*Rethinking University Teaching: a framework for the effective use of educational technology'* is widely cited by others working in the higher education sector and is particularly important in expounding the context and objectives of teaching in higher education (Laurillard, 1993).. The model she provides for teaching and learning is a tool that can be used to define more rigorously the scope of technology based interventions and for defining the considerations which should be used when evaluating what she terms 'educational interventions' in general.

The Internet was an important tool for identification of developments of commercially produced simulations and this was useful providing the basis for conducting a general assessment of the simulation and gaming industry although clearly the published claims had to be dealt with cautiously as primarily the Internet is used as a promotional tool to advertise specific products and there is little solid research which underpins some of the assertions of the overall educational benefits derived from use of the products.

2.5 Summary

The choice of methodological approaches within the social sciences involves taking a decision on use of a positivist or an interpretive methodology. As noted on the Teaching and Learning Research Progamme web site:

> There is no single, all-purpose way of drawing distinctions among the various approaches that can now be found within the field of educational research. Rather, different typologies, operating at different levels of abstraction and focusing on various lines of distinction, will need to be adopted on different occasions for different purposes. Furthermore, great care needs to be exercised in thinking about different types of work in the field, not only to avoid mis-description and significant omission but also the danger of presenting the differences as clearer and more fixed than they actually are. (Teaching and Learning Research Programme: http://www.tlrp.org/capacity/rm/wt/hammersley/hammersley3.html. Last Accessed January 2013)

It is important to be explicit about the methodological framework in which the research is conducted as this has an impact on what can be legitimately claimed in terms of the contribution of the research to the production of knowledge in the social sciences. The basic epistemological distinctions arise out of different philosophies and social theories and some authors assert that this requires the use of different methods. In particular the research methods used to underpin an interpretivist research paradigm must involve gathering qualitative data rather than purely quantitative data. Although the same research techniques can be adopted in either approach the manner in which they are designed and implemented must be different. In this research as noted above surveys and questionnaires were used to gather information to allow the researcher to fulfil the distinctive objectives which were identified as being necessary to achieve the overall aim of the research. More detail on the manner in which these methods have been used is provided in Chapters 6, 7 and 8 where the conduct and findings of the different parts of the empirical research is described. A comprehensive literature review has been conducted and this has been used to inform the various strands of the research as discussed in Chapters 3, 4 and 5. It should be noted that some of the literature dealings specifically with the evaluation and use of simulations in higher education is now dated. However, where this has been found to be the case the use of empirical surveys of both developers of business simulations and the academics who use them (discussed in Chapters 6 and 7 of this thesis) has addressed this by providing empirical evidence which either supports or challenges the assumptions in the earlier literature.

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Chapter Three

Background to Development of Simulations

The objectives of this chapter are:

- to provide a typology and definition of business simulations
- to review the context in which business simulations have been developed and used (in terms of general developments in the business simulations industry and with specific reference to application in the context of use in higher education in the United Kingdom). Where appropriate this is contrasted with the development and application of other educational technologies
- with reference to a review of the simulation/gaming industry, to examine the key drivers within the contemporary computer based simulations industry for growth. The implications of these on the manner in which this may have an impact on their effective use in teaching within Higher Education will be considered. This is done particularly with respect to practical considerations such as cost of products, complexity of their application and the extent to which applications can be customized to support achievement of the desired learning outcomes of a course or component of a course of study in which the simulation is used.

3.0 Introduction

This research uses a review of the literature and a range of empirical studies to objectively examine the general area of instructional use of business simulations. A review of the literature, however, demonstrates that the term itself is subject to a wide variety of interpretations and it is important firstly to clarify a definition of business simulations as used in this thesis. Thus Clarke for example notes that:

> Authors use different terminologies to define business simulation technologies that range from top management, flight simulators, business simulators, simulation games, macro-worlds/micro worlds to learning laboratories' (Clarke, 2009 p. 448)

This view is also stated by Sauvé et al. (2007) who note that:

> 'it is clear that the lack of consensus on the terminology used with regards to games and simulations results in contradictory findings about learning. (Sauvé et al., 2007 p.247)

Thomas (2003) notes that a simulation must meet at least two criteria i.e.

1. There is a computer model of a real or theoretical system that contains information on how the system behaves.
2. Experimentation can take place. i.e. changing the input to the model affects the output.

There is a range of software described as simulations that are not simulations with respect to this definition... The educational benefits of using simulation come from the ability to learn by doing and exploration. It is only possible to conduct an experiment within a simulation if the model has a defined behaviour. Thomas further notes Laurillard's observation that from an educational perspective it is also important that useful experimentation can take place i.e. there needs to be a level of complexity involved in modelling the system. Thus, for example, she (Laurillard) notes that:

> *Simulations are useful in* representing *complex relations. There would be little point for example, in simulating a model of an aspect of the economy, such as `increasing inflation leads to increasing unemployment` as the relationship is simple enough to understand from the description alone*'. *(Thomas. 2003. p. 2*)

The definition is important as a lack of a rigorous definition or even lack of a shared understanding of what is meant by business simulations makes the process of reviewing their development complex if not impossible. Very frequently this is apparent when attempting to make sense of the literature which deals with the ‘simulations industry’ as such literature does not often clarify the scope or purpose of what are referred to as simulations nor the audience for which these products are targeted. It is thus important to begin any study of business simulations by carefully examining the typology of simulations and clearly setting out the context in which business simulations contribute to learning.

It is also important to consider the context in which business simulations have been developed, and to distinguish clearly between simulations for learning (in higher education context) and simulations for training. Riley provides a crude distinction between learning and training as being concerned with ‘why’ and ‘how to’ respectively (Riley, 1995). There is doubtless much more to the issue than this, but the points he makes on the distinction of approach to be adopted in terms of development of educational business simulations is valid. From the perspective of the knowledge and understanding which the simulation is designed to develop there are clearly differences between the level of skills or knowledge which simulations must support. In addition a clear distinction has to be made between application of simulations to deliver corporate training and their application to develop higher order learning skills within the higher education environment. This is certainly the case where simulations are developed and delivered to corporate clients where they are highly customized to support the procedures or processes used by the client organization which may not be transferable to other learning or professional contexts. It can be argued that there is a potential overlap in application from the perspective of using simulations designed to enhance ‘soft skills, such as communication skills, interviewing skills or interpersonal skills. Such simulation packages may be used in the Higher Education curriculum in many Business Schools because it is recognized that such skills are an integral part of developing graduates who are fit for employment in the business sector. Thus it is important to define business simulations in terms of the content and learning goals which they seek to achieve as the focus of this research is on use of simulations which specifically aim to provide learners with appropriate knowledge and understanding of the business environment as part of the Higher Education curriculum.

3.1 Typology of business simulations

It is also important, to clearly distinguish the terminology surrounding business simulations and business games. Games as learning environments are closely related to simulations, microworlds, adventures and case studies and the definition can be blurred – so much so that it is not unusual to find that many articles on the subject conflate the terms and discuss 'simulation games'. This issue can be clarified by looking at general typology of simulations.

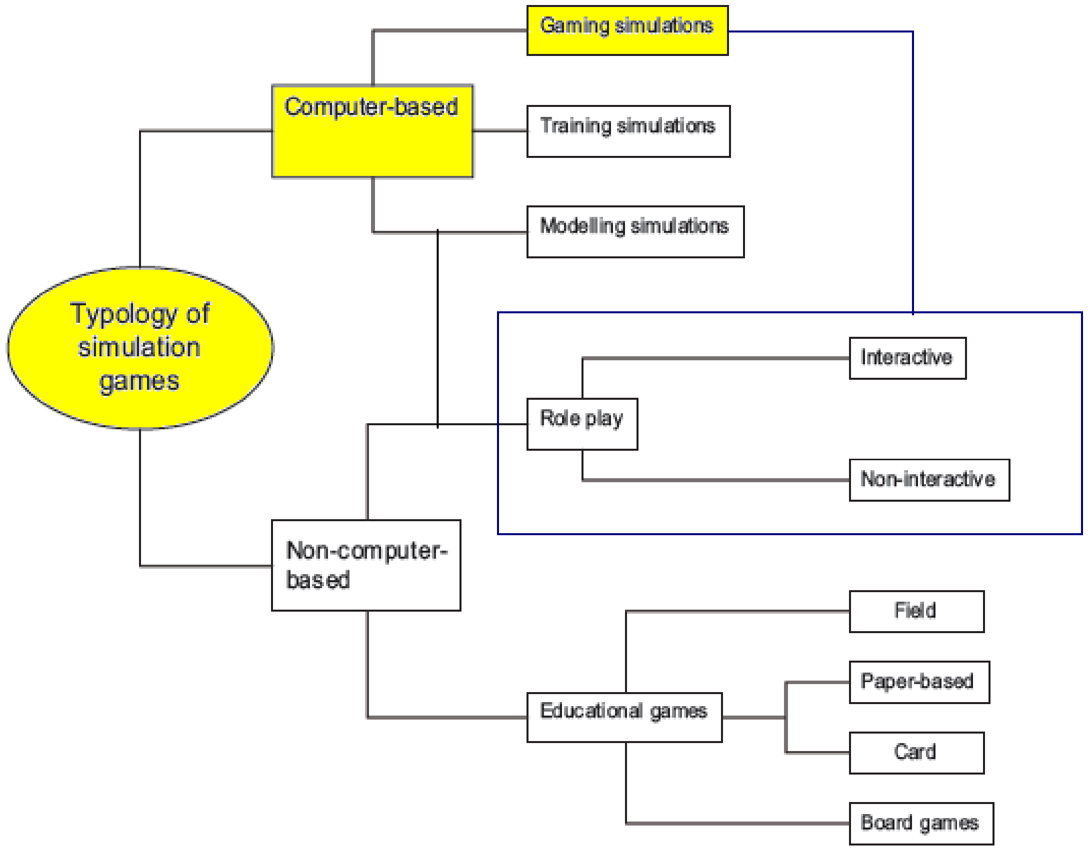
Ellington and Earl (1998) put forward the following typology of simulations/games (Figure 3.1).[5] The highlighted parts of the diagram illustrate the key areas in which simulations have been defined in terms of the current research (and it should also be noted that the original typology in which role play was defined specifically in terms of non-computer based simulations has been expanded to illustrate the importance of this activity in defining and describing the typology. Role playing is an important feature of many business simulations (in particular those which are designed for group use). It should also be noted that the type of business simulation being examined in this thesis may more correctly be termed an 'operational simulation' which includes sequences of cognitive operations that can be applied to a simulated system to achieve a particular goal or goals to optimize the outcomes which are deemed to be key factors in business success. This is in contrast to a conceptual system where the objective of using the simulation is to manipulate one or more variables in order to examine the impact of changes to the system itself and hence gain a greater conceptual understanding of the system. Thomas refers to these more precisely as 'Situational simulations' which typically include role-playing and case-based scenarios, which are developed to assist learners in problem solving, usually in the business and soft skills area, noting that:

> Learners *are* typically members of the environment in these simulations rather than being some external force that manipulates variables at will. Feedback in the form of a costs incurred or time elapsed may be provided.

[5] *It should be noted that whilst this typology may appear dated an examination of more recent literature demonstrates that it is still valid. (E.g. Lean et al. in their study in 2006 reproduce Ellington and Earl's typology as does Moizer in his presentation to a conference on Embedding Enterprise in the HE Curriculum 2009.)*

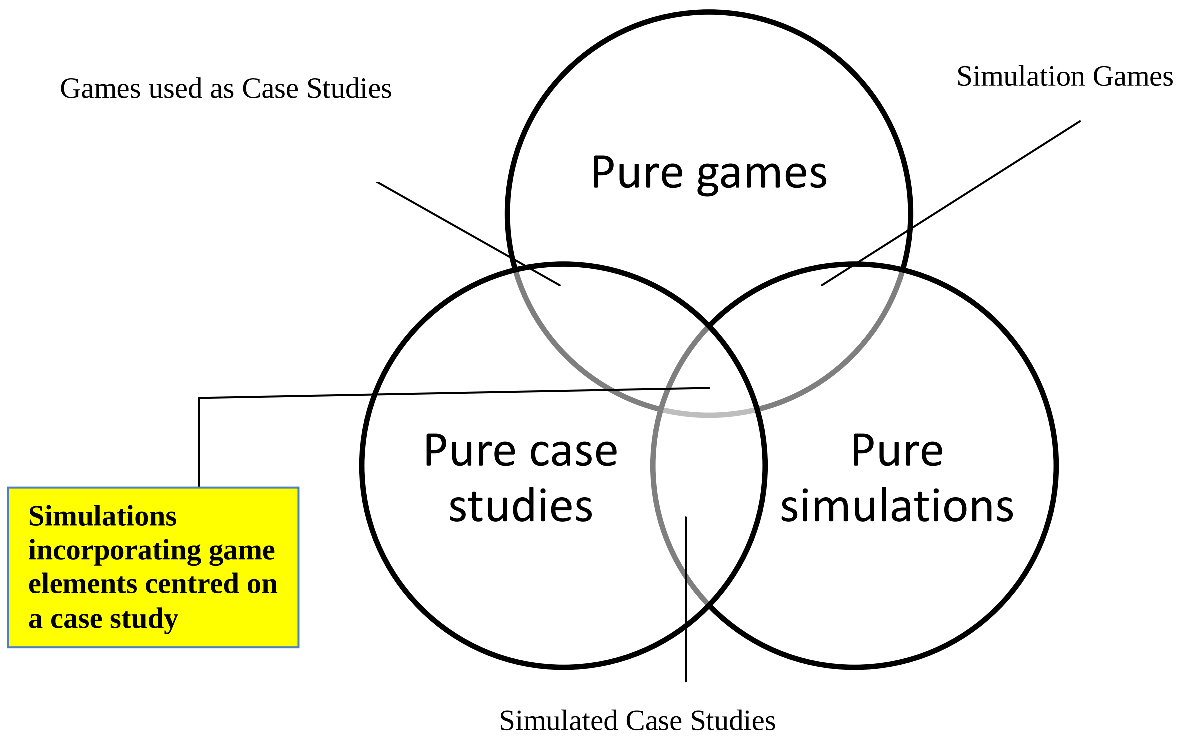
These types of simulations are often produced using standard authoring tools linked to "state tables" or flowcharts mapping different paths through the role-play scenario' Thomas (2003, p.12)

Figure 3.1 – Typology of Games/Simulations (Adapted from Ellington and Earl, 1998)



It can be further noted that as clarified in Figure 3.1 the type of business simulation being considered in the research may be more accurately described as business simulation games. These simulations can be defined as competitive, situated learning environments based on rules and an underpinning educational model which set out a central objective or objectives which the participant must achieve. This definition reinforces the interaction between the educational use of games, simulations and case studies which Percival and Ellington (1980) highlight. The incorporation of some form of game element into business simulations is generally acknowledged but the overall manner in which the game contributes to learning is not so clearly defined (See Figure 3.2 below).

Figure 3.2 – Relationship between games/simulations/case studies (Adapted from Percival and Ellington, 1980)



The specific context in which the business game is to be played is generally based around 'realistic' scenarios which the player must engage with. Although not exactly comparable to the manner in which paper based case studies are used in education, the scenario can be directly equated to a case study which provides the context and background to the competitive business environment in which the learning is situated. Generally the simulation must involve some form of competitive approach (though the extent to which the learner interacts in competition with others or against the computer will vary). Important elements of the simulation game may include risk, unexpected events (surprises), role play or discovery, but these may not all be an integral part of the business simulation itself and may be provided by the instructor to complement the educational interactions which the learner must engage in to successfully complete or win the game. Much work on evaluation of games or gaming aspects of simulations is anecdotal but there is clearly a consensus in the literature that, when elements of games are combined with clear instructional goals and measures, they become powerful elements in supporting student learning. Recent research has examined the educational benefits of games and significant claims are made for their benefits (Can and Cagiltay, 2006; Kumar and Lightner, 2007; Moizer et al. 2009; Sandford et al., 2006; Thomas, 2006). Games, it is argued can stimulate information assimilation and retention, help with aspects of coordination and concentration and in addition some research has argued strongly that gaming aspects in learning are powerful tools for social and emotional learning (Garris et al. 2002, Hromek and Roffey, 2009). Furthermore MacFarlane et al (2002) contend that games support a wide range of skills which are essential to the autonomous learner. Specifically with respect to business simulations Washbush and Gosen argue that material which is mastered in this way is also remembered longer but, while this is certainly desirable, the evidence they present for this is not convincing (Washbush and Gosen, 1998, 2001).

It would be impossible within the scope of the current research to undertake a full analysis of all of the competing claims for the use of game playing in education but it should be noted that in terms of business simulations the gaming elements are clearly recognized as being important – particularly with respect to development of motivation to learn and engagement with learning materials (Crookall, 2010). While there has been considerable argument in the literature around the use of 'pure games' in learning (Koh et al. 2012), the incorporation of gaming elements in business simulations is seen to be crucial and is generally recognized as beneficial.

A final important distinction which has a significant impact on how use of business simulations should be evaluated needs to be made in terms of the range and scope of the simulation. While there are a number of simulations (functional simulations) which look specifically at particular aspects of business/management – such as marketing, the HR function or finance, the most extensively used business simulations as reported in the literature are what are referred to as Total Enterprise Simulations. These simulations are designed to integrate many business functions and to engage learners in practising how to deal with balancing the complex challenges of making business decisions which impact on various functional units within an organization (Goosen, Jensen and Wells, 2001). Thompson et al. (1997) observe that simulations which focus on the total enterprise are most suitable for 'capstone' business policy or strategic management classes which require learners to integrate all their knowledge in the different functional areas of management. Good examples of such simulations are the ‘Business Strategy Game’ (Thompson and Stappenbeck, 1997) and ‘Corporation’ (Smith and Golden, 1994). Typically, such simulations involve learners in running the simulation over a series of ‘decision periods’ with each decision reflecting the impact of previous decisions with immediate feedback to the learner on how this influences the performance of the organization in terms of the changes in the business environment resulting from the accumulation of decisions taken. In more sophisticated simulations the simulation itself can also incorporate ‘random’ or unplanned changes in the external business environment (or allow the facilitator to do this). The learner must accommodate these changes in future decisions. Such simulations make specific claims with respect to developing problem solving and decision making skills (which are key aspects of higher cognitive learning with respect to leadership and strategic management) which are highly valued in business management education.

3.2 Historical Development of the Business Simulations Industry

The computer simulation industry is more than 50 years old. In common with other educational developments the emergence of the technology to support the development of business simulations and business games was pioneered by the American military during the 1940s and 1950s. Naylor reports that the first use of simulation games which exhibited many of the features which characterize modern business simulation was the development of the ‘Top Management Decision Game’ by the American Association of Management (Naylor, 1971). The basic scenario around which the simulation was developed is still a familiar one in which teams of players compete in a fictitious corporate environment to gain an advantage in developing and marketing a particular product, making decisions around research and development, budgets, volume of production, pricing and marketing. . This prompted the development of other simulations but initially the growth was slow. According to Faria (1990) there were only one or two new simulations developed in the mid 1950s but rapid growth followed and by the early 1960s Greenlaw reports almost 90 business games/simulations being available (Greenlaw, 1962). Throughout the decade the number of simulations available and the variety of disciplines which they covered - business operation, economics, organization theory, psychology, production management, finance, accounting, and marketing - had grown rapidly   In 1962, for example, McRaith and Goeldne (1962) listed 29 simulations specifically for marketing and, while exact figures vary slightly, other authors report that there were about 250 simulations available by 1969/70 (Graham and Gray, 1969; Faria, 1989). Development was supported by a range of commercial companies (though not specifically companies which specialised in this as a core activity), educational institutions and government.

In the 1970s and early 1980s the focus was very much on developing more complex simulations rather than developing completely new ones. Enhancements meant that business simulations were able to forecast the behaviour of a variety of sub-system level variables, ranging from the cash flow and financial performance of a company, to the inflation and unemployment rates of an economy (Larsen and Lomi, 1999). The focus of the simulations was to more accurately assist management teams to understand their company and industry’s problems and opportunities. As such simulations were becoming much more ‘realistic’ in terms of accurately reflecting the complexity of the business environment. Business simulations were able to incorporate more broadly the variety of possible strategies which a user may wish to adopt and incorporate emerging themes in business and management education which increasingly recognised a more holistic approach to decision making and the wide range of impacts which decisions may have on determining the future ‘success’ of an enterprise.

More recently there has been a major transformation in the industry because of a very rapid period of growth and sophistication of online simulations. By the 1990s growth was being reported as rapid both across corporate training and higher education (Graham et al. 1992) and specifically in industry (Bergin and Prusko, 1990).

It is important to take care when considering the literature reporting on the growth of use of business simulations. The most extensive studies have been conducted in the United States by Faria. The surveys by Faria were generally large scale surveys of AACSB (American Association for Collegiate Schools of Business) institutions. The first survey reported by Faria was completed in 1987 (Faria, 1989) and reported that 17.1% of all academics used business simulations. . In a replication of the survey undertaken in 1998 Faria reports that this percentage had grown to 27.1%. The breadth of use, particularly across business schools in the United States was confirmed by the study by Faria and Nulsen (1996) which reported that 97.5% of AACSB accredited business schools were using simulations. Extrapolating from these figures using the published data on the numbers of academic staff and making the assumption that academic staff taught 2 semesters per year with an average class size of 30 students and a cost per student of $30 for use of a simulation Faria concludes that the academic market was approximately $21 million. There is therefore a marked bias in the literature towards reporting on the situation with respect to use by institutions in the United States (which was where the vast majority of AACSB institutions reported in Faria's studies were located). In addition, in the United States in general there are fewer financial constraints on academic institutions (a reason which has been cited in studies of the UK Higher Education market as being a constraining factor). In fact it should be noted that some academics in the United Kingdom have reported that the costs associated with licensing some 'high end' simulations means that they can only justify their use in such contexts where the corporate client income is used to absorb the cost of the licensing agreements[6]. Importantly also there is a lack of detail in survey work with respect to the type of simulation being deployed by academics and whether or not the target audience are corporate clients or enrolled students, and in the latter case, the number of students who use the simulation as part of the curriculum. The surveys report broadly on the use of simulations by academics but do not examine whether these are used specifically for undergraduate or Masters students or for training programmes which are provided for corporate clients. In addition, the assumptions made by Faria, for example, to determine the extent of use of business simulations have not been rigorously tested and actual usage by students may thus vary significantly from estimates which have been provided. In common with Faria's exploration of the situation in the United States it is not always clear in the context of other reported surveys how the survey data is extrapolated to derive more general conclusions about the growth of the business simulation industry. In addition to reporting generally on 'use of computer based simulations', in the light of the discussion above when

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6 *Reported to the researcher by delegates from Cranfield Institute of Technology and Ashridge Business School in relation to their purchase of TATA IS© simulations (SIMBLS®) at the TATA IS© Conference on Simulations in April 2010.*

considering a typology of business simulations, it is necessary to be careful to define exactly what is meant by a business simulation to ensure clarity about what is actually being measured in surveys which seek to derive the extent of use of business simulations in supporting the Higher Education curriculum.

Despite the above reservations the literature does provide evidence from a number of other authors have quoted surveys which support this growth (e.g. Summers, 2004; Adobar and Daneshfar, 2006). Specific surveys of academic staff use and perception of the value of simulations are discussed in more detail Chapter 6 in this thesis. It should be noted at this point, however, that these studies which cover the UK, Australia, Taiwan and Thailand and Hong Kong (Burgess, 1991; Pongpanich, Krabuanrat, and Tan (2009); Liu, Ho and Tan 2009; Chang, 1997; Tan, Mulydermans and Sithole, 2005) generally report a relatively high rate of use in the UK and Australia but less uptake in the Asian countries surveyed (Taiwan, Hong Kong and Thailand. (The actual percentages, however, are difficult to compare because of the different ways in which the sample population of users was constructed). Burgess for example quotes a 92% uptake in business simulations but his study is restricted to UK polytechnics (which at the time of the study were the main institutions which taught business studies).

The focus of the next part of this chapter is to examine external drivers for growth and the specific claims made by developers of business simulation software. It is important to do this as it is necessary to understand the markets and products for business simulations as this may directly impact on their use.

3.3 Reasons for Growth in use of Business Simulations.

A review of the literature demonstrates that there are several reasons which have been given for growth in use of business simulations.

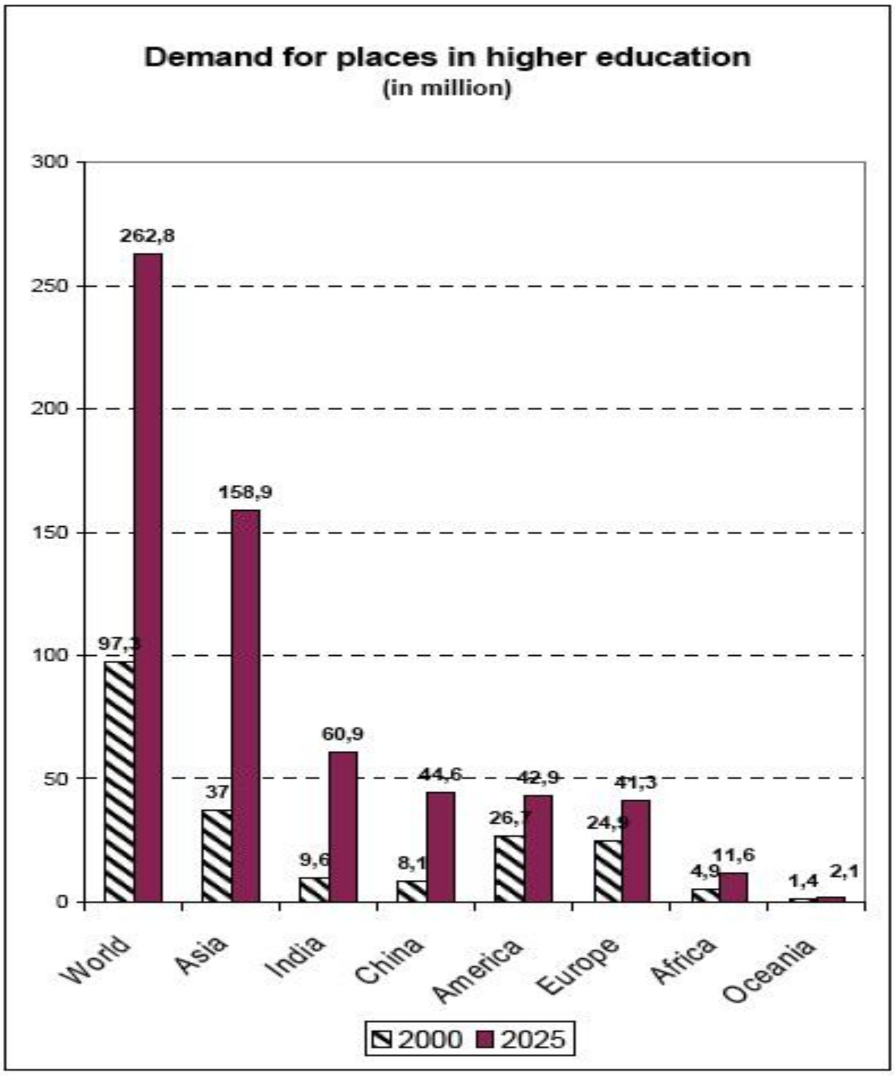
1. **Technological Advances** the first and most significant is the advance in technology – increased computing power has enabled the development of increasing complex simulations which can take advantage of a rich interactive media. In addition the phenomenal growth in Internet technologies and the

expansion of bandwidth has enabled remote delivery of simulations which can support complex graphics and video. In 2005 Gartner published a market analysis of projected developments and when projecting the growth of use of simulations made a strategic planning assumption that by the end of 2008 50% of all e-learning simulations would include rich multimedia interactive environments (Gartner, 2005). Because of the rapidity of technological change it is now the case that virtually all current business simulations take advantage of these advanced features and in addition are increasingly able to deliver them over the internet.

2. **E-learning Developments -** The second most significant factor contributing towards growth has been the developments in e-learning/e-training. The increase in e-training in the corporate market has been investigated by Newton and Doonga and the key drivers have been an increased demand from corporate to improve the effectiveness and efficiency of staff development. E-training which incorporates use of online simulations has been perceived as offering companies a higher quality of training which is viewed as more engaging than conventional face to face training workshops delivered either in-house or at external venues. In addition in the corporate sector a major advantage of this approach is to reduce the time in which employees away from work and providing flexibility in when the training can be done. (Newton and Doonga, 2007). In addition Gartner suggests that an important driver has been the success reported by early adopters of e-training and that competitive advantage has been an important consideration. (Gartner, 2005).

3. **Expansion of Higher Education -** The third significant reason given in the literature for growth in use of business simulation is the expansion in demand for education. In the Higher Education sector since the 1990s there has been a huge increase in demand for education. An obvious feature of higher education in the past few years has been its rapid growth. Figure 3.3 (below) illustrates projected world growth in demand for higher education.

Figure 3.3 World Wide Demand for Higher Education (from Brandenburg, U., et al. (2008)



This worldwide trend has been paralleled in the United Kingdom. Throughout the educational system in the 1990s there has been evidence of increasing student numbers. The MacFarlane Report in 1992 estimated that within the decade 1990-99 there would be an expansion by 50% of students registered on full and part time courses within the United Kingdom. (MacFarlane, 1992) and this has been a remarkably accurate prediction. Growth is reflected to an extent in a wider variety of courses being offered to those students but the main focus for expansion has been reflected in an increase in very large classes which as Gibbs reported in 1992 was being actively encouraged in some institutions. The consequence is that it was seen as imperative that a cost-effective solutions should be used to deliver the curriculum to a wider audience (Gibbs, 1992).

The developments in technology and the potential for delivering degree qualification by distance learning led many institutions to develop or purchase sophisticated learning platforms to facilitate this. In turn it has been argued by many authors that the result of this is an increased demand for effective teaching material which can be delivered via the internet. Moizer and Lean, for example, provide a conceptual analysis of the adoption of educational business simulations in a university environment. Using an epidemiology metaphor they examine the future prospects for wider adoption of the technology and conclude that there is evidence of strong though not radical growth and certainly high prospects for continuing uptake of simulations (Moizer and Lean, 2010).

4. **Changing Nature of Global Business** Fourthly and finally, in both the corporate and academic sector a reason put forward for the growth in application of business simulations is the changing nature of global business. Wolfe, for example, contends that the highly competitive nature and increasingly global nature of corporations has led them to place increased value on ensuring that their employees are capable of integrating up to date knowledge and skills across a range of business functions to make more informed decisions which take into account a whole range of factors which may impact on the firm's ability to be competitive (Wolfe, 1997). Mowray (1997) reports that a key driver towards increased use of simulations was the report from the AACSB faculty leadership task force which expressed concern about the need to improve pedagogy and the learning environment to lessen the gap between practice and teaching. This has been mirrored in the curriculum in higher education through an increased emphasis on teaching strategic management and decision making skills which require students to integrate their knowledge and skills of all the various functional elements of management and demonstrate that they can apply these across the enterprise. The use of simulations to prepare students for this 'real life' experience in the working place is also supported and consistent with a growing emphasis

within higher education on the importance of development of key employability skills.

Examining the four reasons given above which have contributed to the growth of use of business simulation games, therefore, the following critical observations can be made

1. **The first reason is related to growth in technological capacity.** This is a feature which is apparent in all areas of educational technology and can be seen as explanatory factor in terms of building capacity for delivering education through use of the technology but should not in itself be seen as providing a fundamental basis for increased use of business simulations. In the general literature on educational technology authors frequently point out that the use of computing technology must not be driven by the capacity of the technology itself but must be firmly rooted in the pedagogic objectives which technology based learning can support.

2. **The second reason is centred around demand for e-training and e-learning.** Again this factor can be seen as a reason for growth but does not explain why business simulation games are seen as an important part of fulfilling that demand. In fact there is no literature to support the fact that e-learning initiatives in Higher Education are making extensive use of simulations software – most of the respondents to the survey of academics (reported on in Chapter Seven of this thesis) noted that simulations were mainly used as in connection with final year undergraduate or postgraduate courses based on campus. There is, however, more evidence in the literature of their use in corporate training and these accounts for a significant part of reported growth. It should be noted in this connection that in comparison with published estimates of the world market for simulations in 1997 (valued at between $650- $700 million) the academic market which accounts for only $21 million, is still relatively small. The main market for development of business simulations is very much the corporate sector.

3. **The third reason is the growth in the demand for higher education prompting the need to develop more cost effective delivery methods.** It is interesting to note that there has been a considerable history of claims made for the potential of technology to make dramatic changes to the way in which Higher Education can be delivered more efficiently and with considerable cost savings. As early as the 1960s this was the main driver behind the Wilson's government's initiatives to radically change education through the 'white heat of technology'. More recently the objective of the TLTP (Teaching and Learning with Technology Programme) was explicitly to make higher education more cost effective through collective development of high quality computer based teaching materials by consortia of Higher Education providers. As the final report of the Programme by Coopers and Lybrand noted, there was almost no instance in any of the many funded projects (including some which involved development of simulations software) where this objective had been met. Academics it was noted were more comfortable in describing enhancements in the quality of teaching which could be evidenced in their projects rather than in any efficiency gains. Writing at the end of the 1990s Allen et al. contended that :

   > *Funding councils and some senior university management tend to see learning technology primarily as a means of bringing about efficiency gains … (Allen et al., 1996, p.14)*

   However, in terms of achieving these gains Booth sums up the situation very well when he notes that:

   > *Despite many noble efforts by the education community, realistically it is hard to point to any significant impact of computers in education other than small, isolated successes that are often the result of substantial investments of time, money and good will on the part of educators and the computing community. (Booth, 1994 p.9)*

   Realistically, therefore we should not consider the development and application of simulations as having the potential to provide cost effective teaching to mass 'remote' learning communities and should concentrate rather on its potential to deliver higher quality teaching in business and management.

4. **Changes in Global Business.** It can be argued that the fourth explanation which has been put forward in the literature is also the one which is most appropriate in terms of what business gaming simulations have the potential to do. The need to develop the Higher Education curriculum to incorporate teaching 'real life' skills to learners to allow them to gain knowledge and skills which are consistent with what is required in the changing business environment is something which many business simulation software packages would claim to support.

In the context of the above discussion on the key drivers which have had an impact on the development of business simulations the thesis will examine the extent to which the claims of business simulations – in particular those given in the fourth reason discussed above - can be justified. Particularly with respect to the United Kingdom it will examine the manner in which the industry is meeting the needs of the academic community to provide engaging and effective materials to support student learning in a changing business environment. The importance of conducting such an evaluation is underlined if we contrast the context for development and use of the majority of business simulations deployed in higher education in the UK with the manner in which other 'educational interventions' have in the past been developed and used. Despite the acknowledged need for and importance of evaluation in many cases evaluation of new technology in teaching has suffered because either it has not been conducted at all or if done it has frequently been flawed because of poor or inappropriate methods being used to rigorously test the claims made for educational benefits.

The following section looks in more detail at the type of business simulations currently available and notable developments within the simulations industry in order to examine more specifically the claimed educational benefits of using business simulation games and how these can be evaluated.

3.4 Current Development Priorities for Computer Based Simulations

The principal drivers which are shaping the manner in which the business simulation industry is developing its products are discussed below in terms of the technical developments which are currently influencing developments. The literature and publicity materials produced by suppliers were reviewed to provide a more concrete discussion of products and this is presented in section 3.6. The industry is clearly a dynamic one and there is clearly a strong focus on the need to continue to invest heavily in innovations based on new technologies. The technical developments which are discussed in the literature which have been of interest to developers of business simulation/games can be summarized as concerning:

- System models and system dynamics which are used to present the simulated environment to the user and in the background will calculate the impact of user decisions on the model and determine how these have influenced the overall environment;
  and,
- Use of complex decision trees or agent based software to translate and interpret user decisions and present the learner with appropriate feedback

These are supported in terms of systems interface improvements which are based largely around:

- Multimedia applications tools requiring video-game quality graphics and sound
- Natural language processing and voice recognition technologies
- and
- Developments in broad band technologies to support internet use

3.4.1 Systems Models and System Dynamics

Business simulations are, as noted in Chapter 3, more accurately described as 'situated simulations'. The simulated environment is generally an attempt to emulate a particular enterprise and using this as a scenario the student is then ‘situated’ in the environment – taking up a particular role either as an individual or as part of a team. The design skills of the developer are crucial in providing an engaging and realistic scenario and it is important that the learner can equate this to a ‘real life’ business. The background data in terms of financial position, competitors, external factors which may impact on the business etc. is provided as a starting point in the scenario. Most ‘traditional’ simulations are constructed using systems of formulae and collect learner inputs with respect to a set of variables which can impact on a particular scenario. Systems formulae are then applied to calculate the effect of these decisions to determine the impact of the decisions on subsequent scenarios which are presented to the learner. These are the most typical types of simulations which are used to support business education. They rely heavily on developing an ‘ideal’ model of the system. The user inputs effectively change the overall system by amending one or more of the key variables which may impact on other parts of the system. This can result in either a positive or negative effect in relation to the degree to which the resultant configuration of the variables changes the primary variable (which in most business simulations is typically a measure of profitability). Complex systems formulae are used to calculate the overall impact of changes in the equilibrium of the system which are effected by user inputs. In a single user system the effect of changes by the user can be compared with changes initiated by the computer system itself to give a comparison of performance. In multi-player simulations the system also calculates the impact of changes which are effected by other players of the simulation to simulate a competitive business environment. Clearly such simulations are highly dependent on the business model which is chosen and because there is no consensus on the ideal business model, when used in higher education to support learning of key principles and interactions in a ‘real life; business environment they have to be updated to take account of emerging research on business systems models. The issue of the system model is of primary concern to developers and as will be noted later in the thesis it is often the case that when developers discuss ‘evaluation’ of simulations they are referring to methods to validate whether or not the model is accurate (rather than evaluating its impact on the learner). The impact of user decisions on the system model is presented to the user in most cases by using complex decision trees or by use of ‘intelligent agents’.

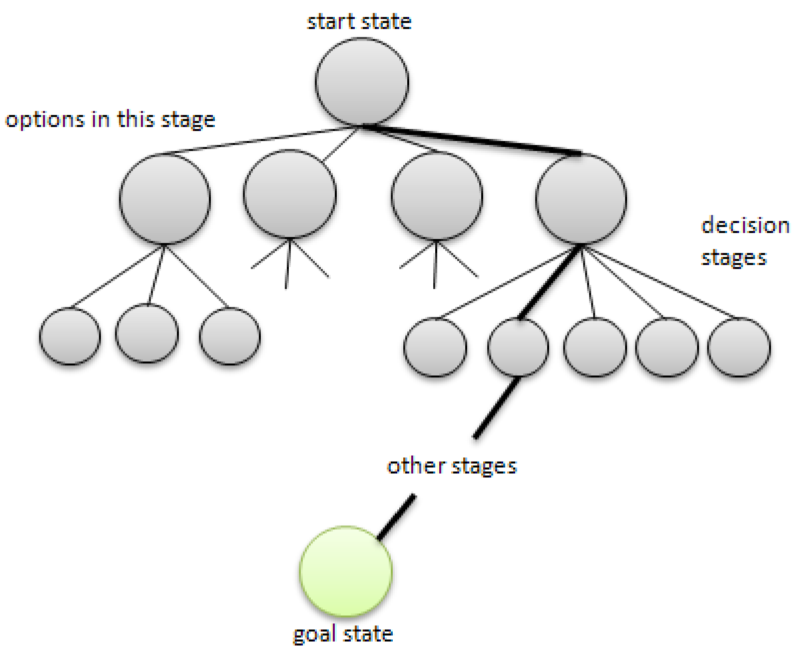
3.4.2 Decision trees and agent based simulations

Decision tree based simulations present the learner with a situation in which he has to interact with one or more computer controlled scenarios. As noted above this can be equated to the case study which the learner is put in the position of being provided with a background to the particular scenario and invited to take actions which will lead to solving a particular problem or contribute to effectively managing a computer modelled business organization. The scenario (through a written description or in some cases through a video introduction by a character who acts as a guide to the learner - initiates a 'conversation' with the learner and prompt a response. Depending on how sophisticated the simulation is this will normally restricted to relatively small number of possible responses which are presented to the learner in multiple choice format or as an option to input a range of decisions usually on allocation of resources across a range of options. Depending on the learner's choice of response the computer character will then present a particular response which informs the learner of the impact of the decision and/or requests more feedback. In complex situations where a number of variables are input the system will present the results of the learners' decision in terms of the resultant change in the competitive position of the organization (which may be presented as statistical charts or tables which the learner must correctly interpret). The computer uses systems formulae to change key variables in the simulated environment which are presented to the learner to provide feedback on the impact of his response on the environment in which he is operating. This pattern is repeated through a pre-defined number of iterations or until the learner either achieves the expected outcome or reaches a point at which the original goal is unattainable and the learner is informed that he has failed the task. Decision tree based simulations can be extremely complex. They are generally represented in terms of a hierarchical structure of nodes (decisions made) and branches (paths which lead to a new decision situation).

Decision trees can be represented as hierarchical trees – complexity is increased depending on the number of potential consequences of decisions (increasing the branches at each node). Additional complexity can be added where the structure is not a strict hierarchy but includes converging 'pathways' where the learner can be re-routed within the structure and potentially therefore return to an earlier part of the decision making process to repeat and potentially amend previous decisions. This effectively allows the learner to progress through the simulation and ultimately achieve the same ‘goal’ but progressing in a more or less efficient manner depending on the pathway which he selects.

Finally decision trees can be made more complex by including nodes or decision points which fundamentally amend the entire decision tree structure e.g. by opening or closing the options which are made available at subsequent stages or closing options which have been made higher up the hierarchy which makes it impossible for the learner to re-visit and change previous decisions. The basic structure of decision tree based simulations is illustrated in Figure 3.4 below).

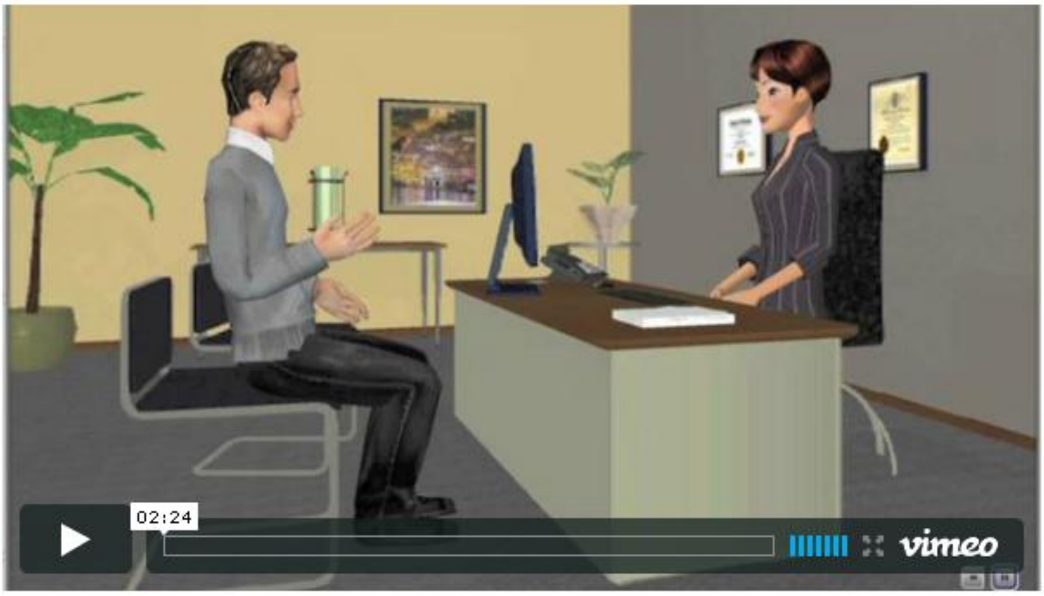
Figure 3.4 Decision Tree Structures



Agent based simulations

An agent is an object in a simulation which can be assigned a particular behaviour and which using artificial intelligence techniques can have the ability to determine its own behaviour in response to its external environment and changes within that environment which potentially affect it. The agents may take the form of ‘human’ characters within the simulation as in Figure 3.5 below).

Figure 3.5. Business Simulation using avatars to in behavioural skills training (From: wslash web site – e-learning consulting firms available at: http://blog.wslash.net/default.aspx?Tag=immersive%20learning%20simulation)



Typically agents, or virtual agents, can be used to represent people or competitors in a simulation. Each agent in a simulation operates by taking decisions on the basis of a set of rules. Agents can be introduced to a simulation to execute various behaviours. The mathematical methods used to develop agents for use in simulations is extremely complex and combine elements of games theory and evolutionary programming and the considerable computational power required to support rapid execution was not available until the 1990s although the theoretical principles on which agents could be constructed dates back to the 1950s. Very complex agent based models may incorporate neural networks, evolutionary algorithms, or other learning techniques to allow realistic learning and adaptation. In Leger’s Enterprise Resource Planning simulation, for example, teams of learners engage in various business transactions to maximize profits in a fictional company - a Muesli cereal company (Leger, 2011). Learners must engage in activities such as forecasting and production planning, material requirement planning, materials management, production scheduling, stock and sales management and accounting and treasury management. However, the system does not represent the market for products using a pre-defined aggregated demand function (where learners could easily predict product demand) but instead creates a population of representative customers each with their own preferences. The customers' behaviour thus depends on preference parameters randomly generated for the agents at the start of the simulation which makes it impossible to predict how the market will behave.

In some cases agents are given graphical representations and the computer generated 'person' is then used as part of the simulation interface. These are often referred to as animated pedagogical agents or avatars (currently becoming more and more common in role-playing entertainment games) and some studies have been conducted which claim that if properly implemented this design feature can significantly improve learning (Johnson and Lester, 2000; Moreno, 2000; Morozov et al., 2003; Marino, 2004).   Interaction between the agents and with the learner is triggered by inputs from the learner and result in complex competitive interactions between agents and other learners. A typical example of use of agents in a computer gaming context is illustrated by the development of 'The Sims' set of gaming programmes. The Sims (developed by Maxis and published by Electronics Arts) was a very popular game introduced in the 1990s. The inner structure of the game is actually an agent based program. Using artificial intelligence systems the Sims (agents which are given persona and characteristics) will respond to outside conditions by themselves but the player/controller's intervention is necessary to keep track of the 'characters' and ensure that their actions are beneficial and directed towards an overall goal which the player directs. Intelligent agents are gradually finding their way into advanced e-learning environments and a number of authors have explored their potential (Boy, 1997; Nijholt, 2001, Dobson et al. 2001). There are some examples of their use – particularly in modelling customer behaviour which typically in traditional business game scenarios is sometimes implemented using a pre-defined scenario or an over-simplified algorithm. Twoney and Cadman, for example, provide a good example of how agents can be used in this way in a simulation which models customer behaviour in the telecoms market. Specifically, with respect to addressing some of the perceived deficiencies in current business simulations Dobson notes their potential in terms of providing more timely feedback to learners on their actions, improving emotional engagement with gaming activities, supporting better output or feedback to learners engaged in the simulation (which is often done purely through spreadsheet type data sometimes presented graphically, and supporting de-briefing and explanation of optimal behaviour for making rational decisions (Dobson, 2004).

However, because of the expense of developing agent based simulations they are not used frequently in simulations targeted at the Higher Education market and tend to feature more prominently in packages developed for the corporate market and commercial gaming applications.

3.4.3 Supporting Technologies

Business simulation developments rely very heavily on advances in a range of computing technologies and systems design methodologies. Many of these have not been driven primarily by the simulations industry itself. Indeed, historically and currently many of the main developments have been made in support of the more lucrative (non educational) computer gaming industry. Central to the development of realistic scenarios and interfaces to support business simulations are the advances in computing power, expansion of bandwidth to support high speed communications, and graphics and sound interfaces.

In developing decision tree based simulations, at each node where user feedback or instruction must be provided, extensive use of multimedia clips is increasingly being used. In sufficiently complex systems this can provide a simulation of a ‘conversation’ with the learner. In agent based simulations it is clearly not possible to use such a technique as the number of potential interactions required is not as predictable. Such systems rely on databanks of possible responses providing advice or criticism. These can be delivered to the user by one or more of the simulated characters (agents) and thus the important developments in technology are more focused on computer generated animations and artificial intelligence.

With regard to gaining learner inputs, currently most simulations rely on users selecting options from multiple choice lists or inputting changes to pre-designed lists to record decisions. In the design of the systems this is necessary because users must be constrained to identify a specific option or limited range of options which the system can then process. However, some research has been done on the potential for using natural language processing (NLP) techniques which will allow learners to provide their inputs in a more natural manner. Combined with voice recognition technology this would allow the user to fully simulate the experience of having a conversation with the system.

3.5 The Contemporary Computer Based Simulations Industry - Products available

In order to provide a more detailed examination of the products and services offered by the contemporary computer based simulation industry an initial view on the range of business simulations which are currently available to support teaching at higher education level was derived by examining the Internet to identify products which were available. There is no generally available product listing for the industry as a whole but ABSEL provides a listing of products which have been developed by some of its corporate members which provided a good starting point to identify relevant business simulations. (Originally a the list was available at Towson University web site (http://www.towsen.edu/absel/Packages/packages.html), but unfortunately this is no longer maintained although ABSEL is currently re-creating a listing which is hosted on its own web site (http://absel2011.wordpress.com/gaming-packages-by-abselites). A general search using Google produced a number of companies directly advertising business simulation products designed for education/training and this provided many other web sites describing business simulations. In some cases the web site identified also provided an option to download a trial version of the business simulation software and this was useful to the researcher in order to gain a better understanding of main features which characterized currently available business simulation packages. Although they are relatively few in number, open source business simulation packages were also identified and reviewed. Finally the web sites also frequently included additional marketing literature and reviews of their educational software which again assisted in gaining a more complete description of the products which were being marketed. Where scholarly published information on implementation of the simulation could be found in the literature the publication was also used in order to provide more depth and understanding of how the simulations were designed to be used.

The purpose of this exercise was not to provide an exhaustive review of all products but to examine a sufficiently large selection of materials to gain an insight into commercial products available to the higher education community.

The search was not entirely random. There were 2 main restrictions on the range of products reviewed.

1. Where the content of the simulation package was clearly aimed at education of school children and would not be suitable for use in Higher Education the simulation was not selected for inclusion in review, and;
2. Where the simulation was clearly aimed as a game for use outside an educational setting the product was not reviewed. For example, the games Business Tycoon and eRepublik are clearly games which are intended primarily for entertainment. This is not, of course, to say that they do not contribute to learning[7]. Many games are capable of being adapted for use in an educational setting if there is sufficient support and contextualization of the game and the tutor or instructor applies sound educational principles to support learners to make appropriate connections with the 'academic' subject and underpin student learning. At times the distinction between a game and a simulation was a difficult one to make e.g. the business game Virtonomics notes on its web site that 'This is an economics strategy game intended for entertainment. Players do not need deep understanding of economy and any kind of special education to take part in the game'. However it also notes that ' Virtonomics' allows you to study many aspects of business management'. Thus a decision was made to include a range of simulation packages where there was a clear indication that the simulation could be used successfully in a teaching context when the supplier information made specific reference to potential benefits for college or university students.

[7] *In this respect it is interesting to note Axelrod's work of 2002 which he entitled 'Everything I know about business I learned from Monopoloy' and which demonstrates clearly some of the'serious' lessons which can be learned from business games.*

90 products were identified (of which 15 were examined in more detail by downloading a demonstrator copy of the simulation or logging in to use the simulation via a guest login). These were reviewed and the following sections summarize some of the key features of the products, the context in which they should use and some of the educational benefits which they claim to support. The objective of the survey was also to gain an understanding of the principal benefits which suppliers of simulations were claiming for their products rather than to conduct full case studies or provide exhaustive list of business simulation packages.

A full listing of the business simulations identified is provided in Appendix 1. There are clearly a number of leading suppliers who offer a range of products – many of which have a strong user base. These include Capsim®, Industry Masters®, Business Smart International®, Cesim® , Simactive®, Smartsims®, and Harvard Business Simulations® (the last of these being very focused on an established business school curriculum and developed largely to support specific teaching areas within business and management at that institution).

When searching it became apparent that there was a very wide variety of products which were being marketed as business simulations/games and that it would be useful to more further examine the typology of business simulations to narrowly classify the simulation packages.

Thakivalut (2009), for example, proposes a classification based on the purpose for which simulations may be used and groups simulations by:

- Subject discipline
- Industry
- Scope (e.g. total enterprise simulations or functional simulations)
- Difficulty

  and,
- Dependence (differentiating between those designed for a specific company and those which can be used across different companies or enterprises)

Clarke (2009) provides a summary of different types of business simulation from a review of the literature and provides a classification into 4 groups as follows:

- Micro-world business simulations – restricted to a business organization and examining in detail the internal organization, structure and functioning of the organization (generally custom designed by commercial specialists for a particular organization);
- Macro-world simulations – involving complex problems based around a simulation of a range of companies in a competitive market environment (usually competing for market share);
- Interpersonal skills simulations – focused on specific skills development and training needs for dealing with behavioural issues or critical decision making skills;
  and,
- Business acumen simulations – focused on strategic management issues and based on allocation of resources and services to meet customer requirements.

When reviewing a range of business simulation packages it was decided that neither of these systems for categorizing are fully appropriate. Both contain some categories which are difficult to distinguish between (e.g. in Thakivalut's classification the categories 'subject discipline' and 'industry' are difficult to distinguish between). In addition Thakivalut's classification is clearly designed to be comprehensive and in the context of the current research the category 'difficulty' has already been restricted to those simulations which can be used to support the Higher Education curriculum in business/management. Clarke's classification can be summarized as concerning whether the simulations are designed to teach specific subjects which are part of the curriculum or those which are designed to teach 'soft skills' and within that those which are designed for a specific subject within the curriculum or those which integrate the use of a range of business knowledge/skills. During the examination of simulations online it was found that this was a very sensible approach to looking at content coverage. However, neither classification deals with the practical issues of how simulations are designed for delivery and this is an important feature which can influence whether or not they are able to sustain the delivery of group learning and development of team working and group decision making skills. Also, neither of the classifications seeks to address the type of learning (or pedagogical benefits) which the simulation is designed to address. This is often difficult to establish without a detailed examination of the full simulation package but description by the supplier of their intended use can provide useful information on this. The following categories have therefore been used to clarify the scope of the business simulations in terms of:

- Content coverage (specific subject area of skills/knowledge development or covering a range of skills/knowledge i.e./total enterprise simulation)
- Delivery method and target audience (internet/intranet for group working or stand alone, training situations or HE situations or degree to which focused on a more general market for gaming)
- Learning objectives/outcomes (and in particular whether the focus is on training or education)

Of these categories the most important in terms of using simulations to support the delivery of the curriculum is the third one listed above and it is important to an overall understanding of how simulations are used to be clear on exactly what claims they make with regard to improving student learning in terms of either skills or knowledge.

3.5.1 Types of Business Simulation (by content coverage)

Of the 90 simulations which were examined the following chart demonstrates the relative percentages which cover specific areas of the curriculum and those which can be termed as general management simulations i.e. covering the full range of business and management disciplines and used as total enterprise simulations.. (Note that some companies offer a variety of products and this may include a range of subject specific packages as well as a total enterprise simulation).

The above breakdown by content (illustrated in Figure 3.6 below and summarised in Table 3.1 below) demonstrates the range of courses in which business simulations are available to support individual courses or substantial parts of a course of study. It should be noted, however, that on closer examination of those simulation packages which are directed at particular subject areas there is nonetheless an emphasis on the integration of disciplinary knowledge across the various business functions applied to a particular management environment. Such simulation may use a particular industry sector or product to provide a framework for development of generic management skills. The predominant model which is used is therefore very much one in which the student is expected to use prior knowledge of finance, human resource management, marketing as well as some specific knowledge of how these may be applied in a particular industry environment (e.g. agribusiness management, the music industry, media publishing or utilities management). The main exception to this are those simulations which deal specifically with specialist subjects in Accounting and Finance where the simulations deal with very specific aspects of finance (e.g. Capital Budgeting, Private Equity Finance and Stockmarkets) and simulations which deal with training in specific behavioural issues which are relevant to Human Resource Management professionals.

Figure 3.6 Simulations by Content/Subject Coverage)

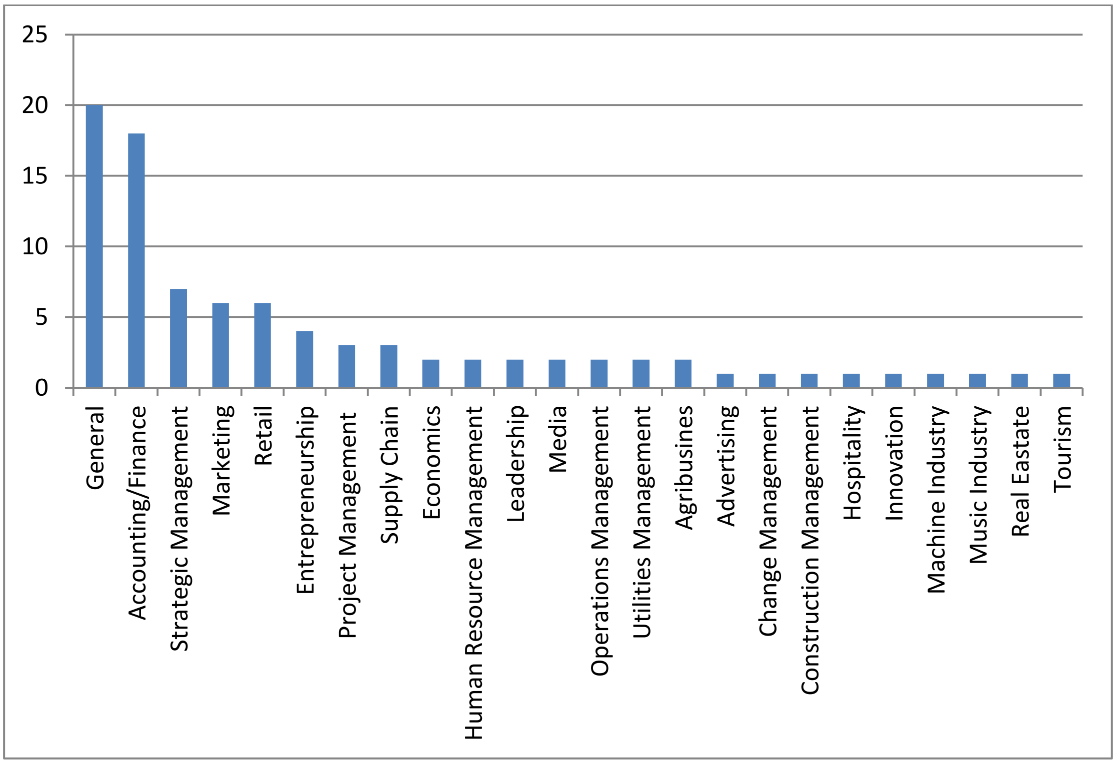


Table 3.1

Simulations by content/subject coverage

Subject	Percentage of Sample (n=88)
General	23%
Accounting/Finance	20%
Strategic Management	8%
Marketing	7%
Retail	7%
Entrepreneurship	5%
Project Management	3%
Supply Chain	3%
Economics	2%
Human Resource Management	2%
Leadership	2%
Media	2%
Operations Management	2%
Utilities Management	2%
Agribusiness	2%
Advertising	1%
Change Management	1%
Construction Management	1%
Hospitality	1%
Innovation	1%
Machine Industry	1%
Music Industry	1%
Real Estate	1%
Tourism	1%

3.5.2 Types of Business Simulation (by delivery method/target audience)

Delivery method of the simulations was examined in terms of both whether the simulation was designed for either single player or for group use and whether the packages were available for use over an internet/intranet or provided for installation and use on single PCs or workstations (either by downloading the software to the computer from the Internet or supplied as CD-ROM packages)

The majority of business simulation games are available for group use over the internet or can be installed on a company or University intranet to provide the same functionality. Single player mode is generally available in such simulations. Only a very small number of simulations (2) specified that they were for single player use only (the player ‘competing’ against one or more computer generated competitors or simply attempting to gain as high as score as possible through providing (what the system considers to be) the correct combination of decisions at appropriate points. At the other end of the scale a number of suppliers(10) noted that there product was intended for use by large numbers of concurrent players over the Internet – while this was particularly the case in simulations which were more focused on providing ‘edutainment’ rather than being specifically targeted for use by academic institutions.

Several of the simulations examined were clearly targeted at a wider audience and not narrowly restricted to the higher education market. Many of the business simulations which were reviewed , even if they could be applied in a higher education environment were clearly targeted for use by either corporate clients or at segment of the game player market which had a specific interest in ‘edutainment’. This was reflected very much in the descriptions provided of how simulations should be used. For those focused on training there was frequent reference to the number of ‘training hours’ which they were tailored to deliver and in some cases a clear bias towards describing how the skills developed can be integrated in the learner’s existing working environment. It was also noted that many of the larger companies were very much focused on emphasizing the potential use of the software for corporate training events or for customization to meet the specific needs of individual companies. For those targeted at game players the ‘fun’ aspect of using the simulation was strongly emphasized with the learning developed being a secondary consideration. As might be expected the clearest focus on application in an academic environment was in those simulations developed by publishers such as Harvard and by academics or members of the Association of Business Simulations and Experiential Learning - ABSEL (and marketed by them as individuals or through academic institution to which they were affiliated). In some of the online information provided by suppliers it is not clear what academic level of study the simulation is designed for. Generally those suppliers who give this information in terms of higher education level note that the simulation is appropriate for use in a ‘capstone’ level course which allows the student to demonstrate integration of knowledge from previous studies (either at undergraduate or Masters level). It should be noted that this poses a particular problem at Masters level in courses within the UK where traditionally a Masters level course is taught over a relatively short time span (1 year for the taught element as opposed to 2 years in Europe and America). The education equivalent of a 'capstone' course in the UK is generally implemented through the integration of an extensive thesis or project at the final stage prior to the award.

In terms of distinguishing those software packages specifically targeted at training use or for use in higher education as a formal part of the curriculum and those with a more general appeal as games, the distinction is often apparent when looking at the design interface as is illustrated in Figures 3.7, 3.8 and 3.9 below.

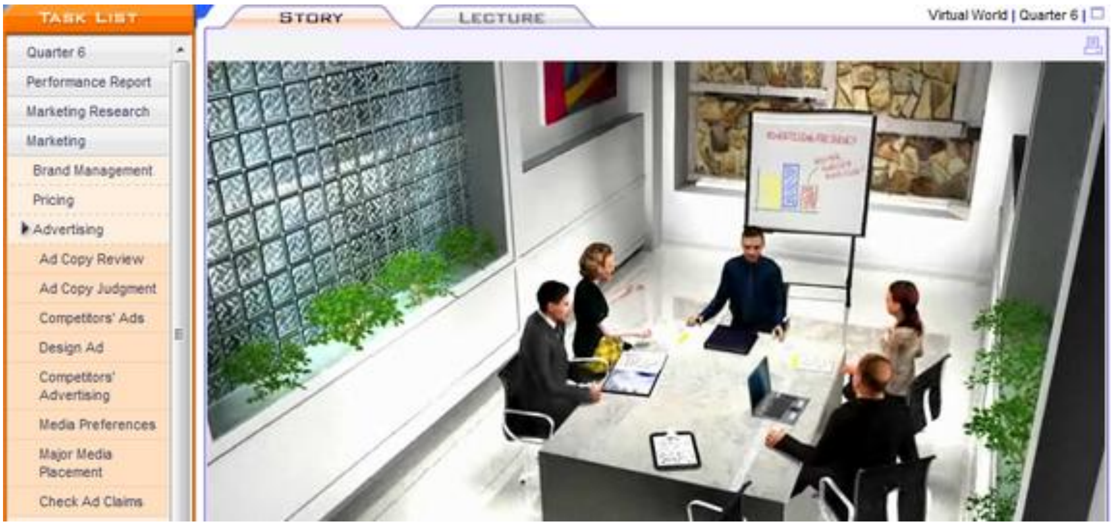


Figure 3.7 – Screenshot from FantasyCEO a 'serious' business simulation from Business Smart (http://www.business-smart.com/products/fantasy-ceo/)

Figure 3.8– Output screen from banking simulation (http://www.business-smart.com/products/banking-simulations/)

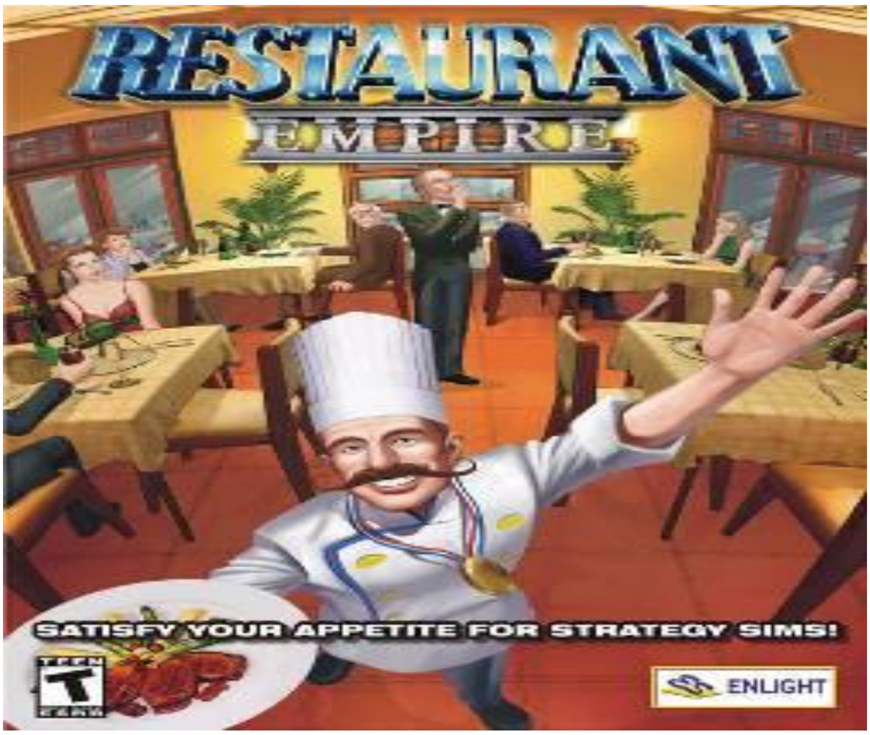


Figure 3.9 Screenshot of Restaurant Empire from Tycoon business games (http://businesssimulationgames.org/businesssimulationgamesonlinefree.html)

3.5.3 Types of Business Simulation (by learning objectives)

In terms of specific benefits of using simulations the suppliers were clearly focused around a relatively small number of educational outcomes which could be developed through using their products. (A few sites provide a list of learning outcomes but these are not usually given in the format in which universities in the UK would provide this information). As may have been expected the simulations reviewed which were being promoted by educational publishers or academics were more focused in describing learning outcomes in terms of pedagogic theory. The following section briefly lists the four main claimed benefits of using business simulation/games with supporting statements or examples drawn from the web sites of suppliers who made them. The claims will be more fully explored in the next chapter of this thesis both from the perspective of they are supported by current educational theories by both academic theorists and practitioners.

3.5.3.1 Real life scenarios

Across the whole range of simulations reviewed this was an aspect of simulation products which was emphasized and clearly seen to be an important benefit to be gained from using business simulations. The idea was expressed in different ways depending upon whether or not the focus of the supplier was on the gaming market or for academic use or use by corporate clients. The following examples illustrate the type of claims being made with respect to this.

“Business Tycoon is a realistic and highly addictive business simulation game that will keep you excited and wanting more as you build up your business fortune” (Business Tycoon, http://bto.dovogame.com/)

“Wall Street survivor is a full-on Wall Street business simulation game with real market data, real stock symbols and real market tracking, all tracked and accounted for on an impressive simulated trading platform. … “If you want to learn the market, hone your trading skills, and simulate your trading before you do real business with real money, Wall Street Survivor is a good place to start.” (Business Tycoon, http://businesssimulationgames.org/businesssimulationgamesonlinefree.html)

and, from another stock market simulation,
"… UMOO uses real market data for its games, creating 100% accurate simulated training environment" (UMOO, http://businesssimulationgames.org/businesssimulationgamesonlinefree.html)

Focused more specifically on corporate training one supplier goes further and notes that:

"The purpose of any simulation is to let you experiment with reality – without ruining your business" (Celemi, http://www.celemi.com/What-we-do/Business-Simulations/)

Moreover some suppliers assert that this provides an environment which allows students to more easily retain what they have learned and relate this to the real world

"The competitive, interactive nature of the strategy game meant that learning was embedded to a much higher degree" … "Our participants retain new information better" (quote from Unilever cited by Elgood, http://www.chris-elgood.co.uk/faq.php)

and in some cases supplier web sites make claims of the impact that this has had on their clients' business, or quote the experience of participants e.g. Celemi quotes one of their clients (Stroudwater) as saying that;

"The results were dramatic. Our company saw a 200% increase in business, much of which we credit to the internal changes brought about by Celemi Tango" Celemi, http://www.celemi.com/What-we-do/Business-Simulations/)

and, Business Smart International quote a participant as stating that:

"Compared to all the training I have received this was as close to real life business environment. So I felt like I was making decisions which would make an impact on the business! (Business Smart International, http://www.busines-smart.com/products/management-development/)

3.5.3.2 Integration of learning from across disciplines

Through the interpretation of market, management and competitor information and the decision making process, the participants gain increased commercial awareness and a greater understanding of the interrelationship of the various elements in running business and their impact on profitability" (Tenzing Business Solutions, http://www.tenzing.co.uk/business-simulation.html)

3.5.3.3 Decision making skills

These again are generally cited as being benefits and again the way in which the claimed benefit is articulated on the supplier web site varies between suppliers who see their target market as games players and those who target their products at the education/training sector.

"Quick reactions and cool decision making are important, as you have to remark smartly to market trend changes and adjust your business plans accordingly. Have you got the bargaining skills and savvy bargaining skills and determination to succeed in the competitive world of oil production? Can you multitask under great pressure and manage multiple oil fields at once?" (Oligarchy, http://www.learn4good.com/games/tycoonbusiness.htm)

"We offer a range of comprehensive business simulation games for higher educational institutions to provide both educators and trainers with a state of the art online team environment , where participants can practice their business and decision making skills" (Cesim, http://www.cesim.com/simulations/cesim-simfirm-buinesss-management-simulations)

SimFirm will enhance fact-based analytical decision making by linking the decision to cash flows and bottom line performance' (Cesim, http://www.cesim.com/simulations/cesim-simfirm-buinesss-management-simulations)

SIMBLs are byte sized learning objects that provide insights into very specific concepts or topics, within a learning time of 30-45 minutes. The focus is on application of a specific set of concepts. Abstract concepts are broken down into variables that replicate the system nature of real world decision making without potential risks involved. Learners typically play a central role in decision making roles within the detailed context of a storyline, characters, and scenarios" (TATA Interactive Systems, http://tatainteractive.com/business-siumations.html)

"Practice of business decision making and negotiation skills is relevant to every business person, who as a simulation participant is provided with the substantial authority and responsibility since the team must act on their decisions and live with the consequences" (Storewars, http://www.storewars.net/)

3.5.3.4 Team Working Skills

As noted above the vast majority of simulations are designed to support collaborative or group working and this is evident in frequent claims made the value of their products in terms of supporting group work:

… its strength is its emphasis on the development of business-business relationships between teams" (Marketplace Business Simulation; http://www.market-place-simulation.com/college/educational-value.php)

The complexity of the simulation requires a division of the tasks and coordination among the team members: the many tradeoffs force debate where students must learn to communicate effectively and fight for their ideas" (Marketplace Business Simulation, http://www.market-place-simulation.com/college/educational-value.php)

"Team Building business simulation games encourage a team to find effective ways of working together and build a great team spirit. Each team will face the challenge of setting up and running a virtual business and they have to compete in the very same market as their peers. The teams will work through the key stages of building a high performing team whilst learning about developing and managing a profitable business unit." (Business Smart International, http://www.business-smart.com/products/team-building-games-and-simulations/)

3.5.3.5 Challenge/Motivation

It should be noted that a number of business simulations suppliers (including 5 of the main suppliers) also sponsor ‘business challenge’ competitions which encourage students from a wide range of universities around the globe to participate in a competitive challenge based around ‘success’ in terms of use of their product to maximize business success. A very large number of the simulations reviewed also cite challenge as a motivating factor in their descriptions of their products. Many also make claims that the design interfaces which they have developed contribute significantly to motivating students to learn.

“It is difficult to persuade young people that business is interesting, but all the students who have played The Business Game have been thoroughly engaged” (PIXELearning, http://www.pixelearning.com/services-thebusiness.shtml)

‘our business simulations are highly involving, relevant and fun, so people want to engage with them’. (Profitability, http://www.profitability.com/us/resources/monthly-feature/06/2012

Many other examples could have been cited in terms of how suppliers view the importance of the outcomes cited above. A formal content analysis of the suppliers’ web site description of their products has not been undertaken but the examples provided above demonstrate a general consensus with regard to the type of educational benefits which are associated with the use of business simulation/game packages.

Overall this mini survey of business simulation/game products provided evidence of a very rich and varied resource base to support both teaching in specific subject areas and generic management knowledge and skills development. It is important to note that the web based survey makes no claims to being comprehensive and its design and execution were not based on a rigorous sampling methodology. However, it has fulfilled its function to provide a general overview of the products and provided a better insight into some of the drivers for development and application of business simulation/games from the perspective of developers.

3.5.4 Customized Business Simulations

A reported trend in the literature is that whilst in the past custom-made simulations were prohibitively expensive, and thus only available to large corporations, simulation developers could now provide tools to assist to develop their customized simulation packages at relatively low cost. Thus Summers, for example, notes that:

> *With object-oriented designs and software libraries, suppliers can now customize their off the shelf simulations to fit customers' needs while maintaining lower prices (Summers, 2004, p.216).*

It was not possible in the review of software to look at customized simulations but this is an important feature which may have a significant impact on the overall effectiveness when introducing a business simulation into the curriculum in higher education. It is particularly significant when one considers, for example, some of the reasons why other technology based educational materials have not been extensively taken up across the higher education sector. The 'not invented here syndrome' is a term used to describe an institutional culture that avoids using or buying already existing products because of their external origins. (Laurillard, Swift and Darby, 1993) The degree to which educational institutions have engaged in the process of externally commissioning or internally developing or customizing business simulations will be explored further in the empirical work undertaken with both developers and academic users and reported in Chapters 6 and 7.

3.6 Summary

This chapter of the thesis has reviewed the definition and typology of business simulations and context in which they are currently being developed and marketed. Clearly there is evidence that the deployment of business simulations as a whole is well established and is increasing. However, it is also evident from examining the literature that a substantial part of that growth is within the corporate market – notably by consultancy firms and training and development companies (either operating in a consultancy capacity or as an integral part of a large corporation). As Summers noted in 2004

‘ the new technology suppliers are not servicing the academic market as actively as they are the corporate market’ (Summers, 2004, p. 234)’

and also:

‘suppliers of the academic market … are ignoring the opportunities arising from the new technologies. The new technologies could produce a plethora of innovations such as interactive problem sets that through artificial intelligence provide student with instant feedback. ABBS [Agent Based Business Simulations] and decision tree simulations could teach leadership, teamwork and ethics’ (Summers, 2004 p. 235)

The review of the literature did not reveal any published articles which provide a full comparison of the academic and training markets. However, the review of available business simulations provided in this thesis and the findings of a survey of developers of simulations which examined the market for their products demonstrates that ten years on from this observation it is still valid. Commercially available business simulation packages which are used in higher education are still are still predominantly based around a model which relies on system modelling and system dynamics. There is clear evidence (from an external review of products available) of some advances in the design interfaces which are used and in particular the capacity to deliver distributed systems which can be used across the internet by multiple players or groups of players. However, some of the more advanced technologies – use of avatars, integration of intelligent tutoring systems and use of more sophisticated technology to support user input (notably voice technology) were not apparent in the materials reviewed. Also the potential identified in the literature for more sophisticated outputs and support for learners in interpreting the consequences of their actions did not appear to be evident (most systems still relying on some form of report – usually in the form of a spreadsheet and/or graphs with little or no assistance on interpreting these).

Finally the chapter has examined the claims made for the educational benefits of using simulations from the perspective of the developers and suppliers of the products

– particularly with respect to some of the claims made in terms of how they support learning. The following chapter will present the results of a literature review of use of business simulations by academics to provide an overview of the pedagogical benefits which they are hoping to achieve and how these are being met using the simulation products which are currently available.

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Chapter Four

Application of Simulations in Higher Education

The objectives of this chapter are:

- To review the literature which deals with the potential pedagogic benefits to be derived from using business simulations in the higher education curriculum
- To use the review and categorize the potential benefits which have been identified
- To critically discuss the basis on which claims made that business simulations/games can deliver the objectives identified are realistic.
- To analyze the context in which business simulations are used in higher education and the learning outcomes which academics seek to achieve when using the software and contrast this with the pedagogical objectives and the claims for learning benefits which have been put forward by developer and suppliers of such software.

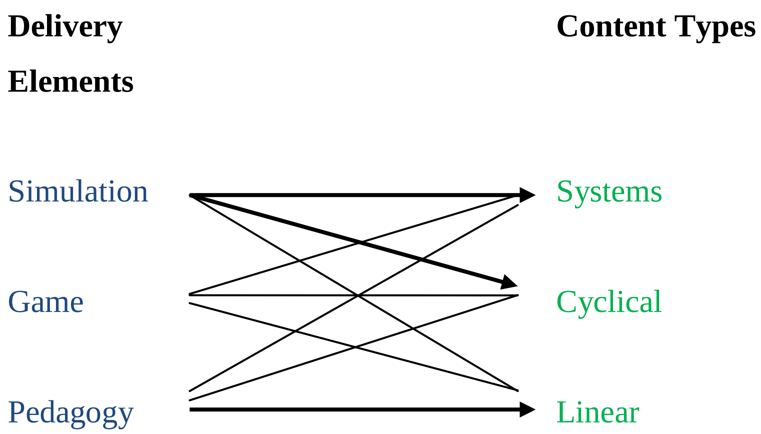
4.0 Introduction

The previous chapter examined the manner in which business simulations have been developed and the broad pedagogical objectives and benefits which have been claimed for the use of such educational interventions from the perspective of suppliers and developers.   It is also extremely important to establish the goals and objectives of academic staff who choose to use simulations as part of the curriculum – if it is not clear what these learning goals are then it is impossible to perform any type of evaluation of the effectiveness of using simulations.

This can be approached initially by reviewing the literature which specifically discusses the pedagogical strengths which would be expected when using simulations as a teaching method or in support of teaching. It can be added to by reviewing the literature on implementation of business simulations by academics to establish what claims academic authors make and are seeking to evaluate regarding the benefits of use of simulations in teaching. The question can also be directly explored by conducting a survey of academics who use simulations in their teaching. This chapter examines the literature and this is complemented by a discussion of a detailed survey of academics supported by interviews which is described in Chapter 7.

Before looking in detail at learning objectives which simulations are designed to meet it is important to re-iterate the central place of learning objectives in any discussion of learning. While, as noted in the previous chapter, there are significant claims made for the learning benefits which can be derived from using simulations, on the whole there is no clear link between these claims and the educational materials provided and the objectives which it is designed to achieve. This is to be expected and is not a criticism of the manner in which developers present the case for benefits of their products. However, examining the more general literature from suppliers or developers of simulations (which was done through the examination of their web sites as described in the previous chapter) there is clearly a tendency to focus on benefits in a general manner and fail to recognize that the fundamental starting point for any educational intervention is to clearly set out the aims which can be met by using the system. Thus, for example, Aldrich (who is a leading developer and writer in the field of educational simulations) discusses educational simulations and defines six criteria of an educational simulation (Aldrich, 2005). He categorizes these as two groups of three criteria (Figure 4.1). The first group defines the delivery elements of an educational simulation (simulation, game and delivery) and the second group defining content types (systems, cyclical and linear).

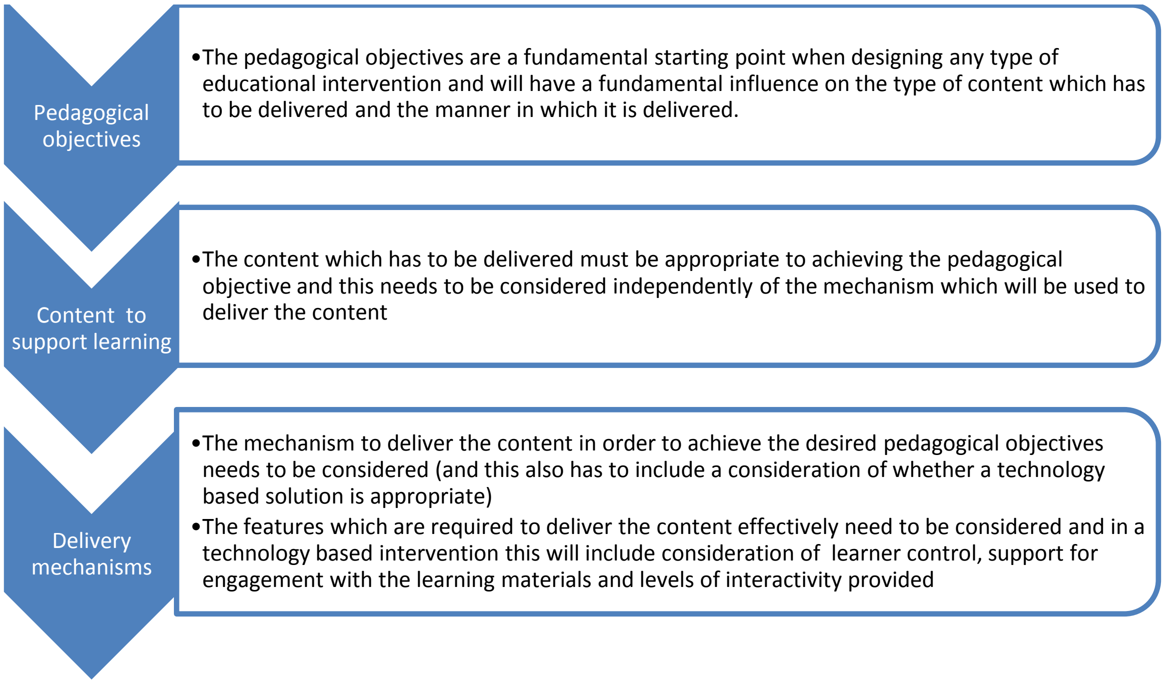
Figure 4.1 Aldrich's Six Criteria of an Educational Simulation (2004)



Aldrich's description of these criteria is rather confused and serves to illustrate the fact that the literature on development and use of educational simulations has not fully engaged with a rigorous definition of the purpose and function of simulations as educational tools. Thus, for example, Aldrich places very little significance on the importance of pedagogical considerations and in the text of his work from which his six criteria have been derived is actually quite dismissive of pedagogy. In addition, in examining the definitions which he uses to support this model his categorization of content type as system, cyclical and linear demonstrates confusion between content itself and the mechanisms used to deliver the content effectively (which include a whole range of features which provide support for the learning in engaging with the learning materials).

In contrast in the more general literature on use of educational technology learning objectives are recognized as a key starting point for development and it is frequently stressed in the pedagogical literature that these are the fundamental drivers for designing any educational experience (Barker, 1994; Biggs, 1987; Bloom, 1956; Clark, 1989; Jackson, 1990; Laurillard, 1993.). A more accurate definition of the key elements which should be considered in designing and using a business simulation (and one which is more consistent when considering other types of educational intervention) is better summarized in the following diagram. (Figure 4.2 which was developed by the researcher to summarise the key points in the literature which have been discussed in the literature on the importance of educational objectives).

Figure 4.2 – Criteria for design of educational interventions (Developed by the researcher)



It is also important to note that a clear definition of the characteristics of business simulations needs to be established (and this has been discussed in Chapter 3) and that in addition the way in which the simulation itself specifically contributes to the learning experience of students is required before any formal evaluation of their effectiveness can determine whether any improvements in student learning result from application of the simulation. The following section therefore sets out in more detail the important factors which need to be considered in terms of the different objectives which educational simulations are designed to achieve. Later in the chapter a more detailed examination is provided of the implications of this when evaluating business simulations with specific reference to where and how the different features of educational simulations can be measured and it can be demonstrated that these contribute to achieving these objectives.

4.1 Learning Objectives when using Business Simulations

There are a wide variety of claims made for the way in which simulations can support learning and a considerable body of literature from academics who report significant benefits achieved in teaching quality. It should be noted, however, that some of the reported benefits are not always fully supported by the experimental design or research methods used by the authors. As a starting point in identifying the different ways in which business simulations can specifically support student learning the writings of a range of educational technologists was examined in order to identify comprehensive list of educational objectives which could be met or partly met through use of simulation/games software. Examining the list also makes it easier to separate out the claims for enhanced learning which are specific to the use of the business simulation packages themselves and those aspects of learning which have to be developed in tandem with delivery of the simulation in order to ensure its effective use.

Ellington and Earl (1998) describe ten ways in which games, simulations and case studies can be used in tertiary education:

- to reinforce teaching of basic facts and principles;
- to demonstrate the applications of theory;
- to develop higher cognitive skills of all types
- to support and supplement laboratory and studio work;
- to develop library and research skills;
- to act as an icebreaker;
- to develop communication skills;
- to develop interpersonal skills;
- to develop multi-faceted work related skills;
- to achieve affective objectives of all types

This is a very extensive list and in order to provide a structure and framework specific to use of business simulations it is important to refine this and expand on the specific way in which such objectives can be achieved. The following discussion therefore focuses around the following objectives which have also been expanded to provide more detail about how the objectives are specifically achieved with reference to the type of business simulation being used and the context in which it is used. It should be noted that many of the different outcomes are inter-related. These are summarised in Table 4.1 below.

Table 4.1 Uses of Business Simulations (adapted and extended from Ellington and Earl, 1998)

	Use of simulation	Context
1	to reinforce teaching of basic facts and principles;	through interaction with the learning materials provided in the simulation case study scenario and the underlying system model used to integrate prior knowledge - often developed through use of drill and practice in order to re-inforce learning and development of specific behaviours
2	to demonstrate the applications of theory to practice	by allowing learners to interact with the simulation model of a business and examine the impact of strategic decisions on the overall performance of the business in a 'risk free' environment and also developed through interaction with the simulation which is designed to emulate a 'real work' environment.
3	to develop communication skills and to develop interpersonal skills	by working as part of a team in undertaking the simulation exercise learners are expected to develop these transferable skills. Some business simulations which are designed to enhance behavioural skills (such as interviewing and managing people) specifically seek to achieve these objectives
4	to achieve affective objectives of all types	mainly achieved in terms of enhancement of motivation of learners and encouraging a self critical and reflective attitude to learning – closely linked to development of team working and communication skills
5	to develop higher cognitive skills of all types	development of critical thinking skills and decision making skills – evaluation of alternative choices which will have an impact on overall performance in the simulation exercise and synthesis of a range of prior knowledge and experience to make informed decisions
6	to develop multi-faceted work related skills	to engage in experiential learning which is based on situations, decisions and problems which learners will encounter in a working situation

Referring specifically to the use of business simulations, Fripp (1993) in a UK survey of use of business simulations emphases the following advantages

1. Positive responses from students in terms of ‘enjoyment’ of using simulations which he asserts is a clear prerequisite of learning
2. Introduction of variety when introduced as part of a wider training or development activity
3. The opportunity to practice skills in a ‘risk free environment’
4. Immediate feedback on consequences of actions which supports experiential learning

These can be seen to be consistent with four of the categories of learning objectives described in Table 4.1 above. (i.e. objectives 1, 4, 5 and 6)

A review of a range of other surveys of academics (Killi, 2005; Keys and Wolfe, 1990; Wynder, 2004; Moreno-Ger, Burgos and Torrente, 2009) and papers published by academics who use business simulations in their teaching also confirm that the categories provided represent the major objectives which academics are seeking to achieve.

The following discussion, therefore, examines each of the categories of learning objective outlined in Table 4.1 and provides more specific detail on how it is envisaged that business simulation/games can contribute to these. It also further explores some of the issues and debates concerning whether or not the use of a business simulation in the curriculum is a suitable way in which to achieve the objectives. It should be noted that in dealing with the various objectives there is a degree to which the objectives are inter-related – thus for example issues related to the objective of teaching basic facts and principles may also have an impact on the simulation being able to achieve its objectives in terms of demonstrating application of theory, and issues around development of multi-faceted work related skills are also impacted upon by development of higher cognitive skills of all types. Issues relevant to affective objectives may also, for example, have an impact on or be impacted upon by the way in which the simulation package is used to develop communication skills –

particularly in relation to the way in which group working is built into the teaching experience.

To examine these issues the main themes which have been discussed in the literature in relation to how these objectives can be achieved through use of computer based teaching technologies are discussed. This involves examining the claims made in relation not only to the content of business simulations but the way in which they allow that content to be presented in a manner which provides more engagement by learners.

4.1.1 Basic Facts and Principles

The teaching materials which are embedded in any simulation package must be adequate to support learning at the level at which the expected learning outcomes are pitched.

The first issue to examine with respect to this is the factual content which is presented to students and the supporting content which they can access to assist them in engaging with the scenario which has been established to represent a 'real life' business environment. As has been previously noted in many business simulations the content provided can be equated directly to a fictional case study which describes the environment in which the learner is operating and seeks to engage students in exploring the case in detail or indeed situating themselves as part of the case. It should be noted that the literature generally deals with case studies as quite distinct from simulations (though Percival and Ellington as noted in Chapter 3 Figure 3.2 p. 69 of this thesis, note an overlap between them). The researcher would argue that the case study is an integral component of any business simulation.

Thus the case study is a key part of the teaching of basic facts and principles in a business simulation and provides a focal part for activities in which learners participate and there is a great deal of literature on how these can be used effectively. Case studies have a long history of application in the teaching of business management. Case studies involve using non trivial, realistic and sometimes authentic case scenarios to engage learners in examining problems and how they can be resolved. Van Merrienboer (1997) describes case studies as requiring 'learners to actively participate in actual or hypothetical problem situations situated in the real world' (Van Merrienboer, 1997 p.245)

Case studies typically describe how things take place and are organized in the real world and typically involve students in using a range of strategies to look for viable solutions. They provide evidence of the environment and include issues and assumptions which are often important in reaching a solution. Use of case studies is often associated with small group work and they generally incorporate questions to allow students to analyze and evaluate the data and the nature of the problem. The student is encouraged to recommend a conclusion and then reflect on their learning through an examination of the 'real life' resolution of the case study and the potential implications of their recommendations. Selection of an appropriate case study as the basis for engaging students with a real life problem in a business simulation is therefore very important. The case study must be sufficiently challenging and complex to engage learners and must be based on a concrete organizational scenario which clearly illustrates the real life conceptual model which is the subject of the simulation, illustrate the goal planning hierarchies which will be used as the basis for strategically planning how to work with the conceptual model and accurately represents the causal or functional models which describe real-life processes or principles when interacting with the model.

In terms of the literature on development of business simulations the relationship between the teaching content and presentation of a case study has not been fully explored. This has led some authors more recently to note that considerable research on the value and application of case studies has not been transferred successfully when designing business simulations (Merril, 1994; Leemkuil, de Jong and Ootes, 2000). However, it should also be noted that from the perspective of academics and students the case studies which form the content of the simulation are generally not seen to be significantly deficient. In part this may be because of the fact that in a business simulation/game the 'realism' of the case itself is not of importance as long as it is perceived to be sufficiently real to provide the learners with the impression that the simulated business is typical of what would be found in a modern business environment. While in a traditional 'game' the degree of abstraction from the real world to the fictitious world in which the game is set or played is not of huge importance, in a simulation/game designed for learning there must be a sufficient degree of confidence that the scenario is a ‘reasonable’ representation of the real world. However, by definition a simulation is an abstraction of the real world and thus those who engage in using the simulation do not have an expectation that the representation of the real world is not entirely accurate.

What is important is that the interaction with the simulated world is authentic in terms of the giving learners the confidence that interactions within the simulated environment mirror broadly the expected results of those interactions in a real world setting. Thus an important issue in the literature around the use of teaching content of business simulations centres around two factors which it is important to keep separate. The first of these is the adequacy of the theory and the model which is used to underpin the simulation case study. . In discussion in the literature this is often referred to as ‘model fidelity’ (Reigeluth and Schwarz, 1989; Alessi and Trollip, 2001). The second concerns the validity of the formulae on which the systems dynamics are based in terms of how accurately they reflect the changes to the business environment resulting from student interaction with the model. This is often referred to in the literature as ‘simulation fidelity’. Taken together these aspect of a business simulations are referred to as ‘content validity’ and concern the degree in which a simulation captures the important and relevant aspects, activities and parameters of the real-life environment it is seeking to replicate.’[8]. Clearly it is important that the functionality of the simulation is based on an accurate model and accurate interpretation of how inputs from the user impact on this and it is important that this can be verified or validated by system designer (Pace, 2004). The goal of verification of the underlying computational model is to provide evidence that it is sufficiently accurate for its intended use (Sargent, 2008).

[8] Note that these concepts are also important when considering the degree to which the overall experience of using a business simulation provides the learner with an accurate experience of a ‘real world’ business environment but this is slightly different from the objective of ensuring that the learner can successfully apply their learning in a ‘real world’ environment. This is discussed in more detail below in Section 4.1.6 when considering transfer of learning.

There is some debate in the literature about the accuracy of the specific business model on which simulations are based and this is to be expected. There is no general theory of business which has been universally accepted and even within specific functional aspects of business there is academic debate on what the key factors are and how they interact.

With respect to this there is frequent criticism in the literature of deficiencies in the theoretical basis for case study or scenarios used in commercially available simulations and current knowledge and research on the subject the manner in which the business simulation models the impact of different factors which contributed towards building a successful strategy. Wolfe and Roge conducted a study of eight strategic management business simulations comparing their content with the key content provided in seven strategic management textbooks. They concluded that the simulations were deficient in developing learner understanding of the conflicting demands of various external factors on strategy formulation and wholly ignored the importance of strategy-making coalitions which is an essential area which must be covered in the teaching of strategy (Wolfe and Roge, 1997). In a more recent study Enfield et al. (2012) investigated the 'Diffusion Simulation Game' to assess the consistency of strategies which were effective in the game with those which are generally accepted as appropriate strategies by the diffusion of innovations strategy theory (on which the simulation was based). The investigation was based on an objective examination of 2631 learners' performance and Enfield et al. concluded that only four of the seven 'winning' strategies adopted by learners were consistent with the strategies suggested by diffusion innovation theory.

Clearly it is also important that the formulae which are used to manipulate the outcomes of student interactions (in terms of the impact of changing variables in the simulation) must accurately predict and feedback to the student the outcomes of their actions based on established theory in relation to system dynamics. Again, however there is criticism of the manner in which this is done and authors have either noted:

1. the failure of simulations to provide the opportunity for learners to engage with system variables which may have a significant impact on their success in engaging with the model; or,

2. errors in formulae which produce results which are not consistent with current theory and may mislead the learner in wrongly attributing the causal implications of changes to key variables in a business environment.

For example, Gold et al. are very critical of the mathematical model used in marketing simulations for modelling the demand function of new product development. They highlight the deficiencies of the feedback which is provided to learners as a result of the decisions they make in such simulations (and in a range of other more general business simulations) because there is a fundamental problem in the way in which this factor is accounted for (Gold et al., 1998). The implication is very much that far from assisting students the problem with the models used in simulations can actually have a detrimental effect because they wrongly interpret the overall impact of learner decisions. This can even lead to a reinforcement of wrong decisions because they fail to accurately interpret and feedback to the users the actual impact of these decisions on overall business performance.

This is not a criticism which is targeted only at simulations which attempt to model the complexity of an enterprise as a whole (where it may be expected that given the complex variety of factors which impact on the overall success of an enterprise and the competing claims of the importance of different functional areas of business there would be less consensus on a unified model of what is important in contributing to business ‘success’). It is also seen in the literature which deals with simulations of narrower functional areas. Thus Badurdeen, et al., in their study of use of simulations to support lean manufacturing are critical of the degree to which such systems are realistic. (Badurdeen et al. (2010) and suggest that the simulations which they review are also based on a flawed interpretation of the basic principles of lean manufacturing.

It is important not to over-state the case. Whilst there is some discussion on specific deficiencies of the content of the teaching material there is clearly a consensus that the factual content of business simulations is adequate for the teaching level of the learners for whom it is designed. An examination of the case type scenarios for a variety of commercially available simulations demonstrates that they are fit for purpose and well researched.[9] As some authors have argued, the material provided in the simulation package itself, should in any case be supplemented by more specific teaching content provided by academics or instructors.

It can be concluded that in terms of the content which they deliver business simulations themselves are generally acknowledged as providing distinctive advantages over other teaching materials because of the wide range of supplementary materials which is provided as a 'support library' for learners and easy access to this material from within the learning environment itself.. It is therefore important to look beyond simply the factual content which is presented and examine in detail the mechanisms by which the content is delivered in order to assess claims for their effectiveness.

On a positive note Gold and Pray (2001) comment on significant developments in a range of simulations which has been stimulated by academic debate and input into helping designers to model the processes involved in the business environment. They note that particularly in terms of the discipline of marketing (which is often a key part of total enterprise simulations):

> *'The demand and market algorithms are more consistent with underlying theory much more stable than early demand models, incorporate more realistic attributes and variables and allow users and designers to easily change the parameters that influence market conditions. In the areas of finance and accounting, authors and designers have addressed key issues such as how to model cost and tax, how to measure overall performance, and how to manage different starting positions for firms. The operations arena saw a series of articles and mini-simulations to aid students in*

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[9] *Most business simulations are based around a fictitious enterprise engaged in a particular area of commerce – footwear manufacturing, food manufacturing - or in the example examined in this thesis bicycle manufacturing. An interesting example of how well thought out some of the case scenarios is noted by Chin who (prior to recent events in Pakistan which were reported widely in the news in relation to a disaster at a clothing manufacturing complex – describes a scenario in the GLOBAL JUSTICE SIMULATION which deals with a mythical country in Asia called Fabrikistan and asks teams of participants to deal with the aftermath of a deadly fire in an apparel factory in which 211 people, mostly women and children, died. (Chin, Dukes and Gamson, 2009)*

> *gaining a better understanding of key inventory cost and trade offs. Algorithms were developed for the underlying production and cost functions. Now game designers have available to them both short- and long-run cost functions that are consistent with modern economic theory.' Gold and Pray (2001) p.80*

The issue of content and validity of the content of simulations continues to generate a huge volume of commentary in the literature and is discussed further in Section 4.1.6 of this chapter when discussing the development of multi-faceted work related skills. It is also worth noting in fact that when discussing 'evaluation of simulations' the perception from the point of view of developers is that this refers to the issue of how accurately the content described in terms of the simulation model of a business and business functions is and how accurately the system responds to user inputs to 'realistically' change the model in response to their attempts to influence the success of the business enterprise by changing key variables.[10]

4.1.2 Application of Theory

The major benefit of business simulations in terms of supporting the application of theory is therefore that they are able to help and encourage learners to explore the 'learning space'. Learners can experiment freely with the system model and engage in exploratory learning. One of the main factors on which this is dependent is the degree of interactivity which is permitted within the simulation. However, probably more important is the degree to which learners are supported in reflecting on decisions and the overall interaction which takes place when using the business simulation.

At a basic level business simulations must:

- Engage the learner in adopting a particular role and clearly communicate with the learner in terms which are consistent with the role which has been adopted.

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[10] *This issue in fact caused some confusion in early stages of research when reviewing potential sources of literature as a number of articles were found which at first appeared to be central to the subject of evaluation of learning from business simulations but which on inspection were in fact concerned with methods used by developers to test the functional reliability of the systems which they were constructing.*

- Allow learners to vary factors which can influence ‘success’ within constraints or ‘rules’ which are made clear to the learner
- Allow presentation of feedback to learners in a manner which clearly illustrates the impact of their decisions
- Allow interaction amongst players (in competitive business simulations)
- Provide a clear indication of the time line for decisions (and equate this with the time line in real life)

Depending on the skills which are being developed by the simulation additional interactive elements may be introduced. For example learners may choose the role which they wish to adopt in the simulation, constraints or rules may be changed by introducing surprise elements, feedback on other players (competitors) may be provided or ‘purchased’, new players may be introduced to add complexity or time restrictions may be placed on decisions.

Application of theory in business simulations is very complex and it is important to emphasize that its application is much more difficult than simply knowing or understanding the theory and mechanically implementing decisions based on a simple formulaic approach. Application of theory involves understanding the complex dynamics between different and sometimes contradictory views of the impact of changing conditions and variables which affect a business enterprise. In addition, these decisions may need to be developed in collaboration with a team of other learners and there are often constraints on time available to make decisions which restrict completely free experimentation as the number of potential variables is too great to be able to attempt all possible options to examine potential impact before making a final decision. It is also frequently constrained by the time which is available to make decisions – in order to manage a simulation there are set periods at which users must input their final decision on changes and at that point the decisions are final and the learner (or more commonly group of learners) must then work within a changed environment to determine their response to the changed situation in which they find themselves. The extent to which the learner can explore a range of options based on understanding of theory is therefore much more restricted than it may at first appear and is certainly much more complex than e.g. in a physical sciences type simulation simply changing certain variables and immediately observing the impact of that on the overall performance of a particular system.

The extent to which a business simulation supports application of theory depends very much on the level of interactivity and the complexity of the interaction learners engage in and thus it is useful to examine the concept of interactivity in learning in more detail and in particular to examine how interactions support the learner in not only making decisions but in understanding the consequences of these decisions.

4.1.2.1 Interactivity

Interactivity is centrally concerned with the actions between the learner, the learning system and the learning material. Barker, states that interactivity in learning is

> *'a necessary and fundamental mechanism for knowledge acquisition and the development of both cognitive and physical skills' (Barker, 1994).*

The literature on educational technology examines interactivity at a range of levels. Very simply it can be used to describe the physical manner in which the user interacts with the system in terms of input controls Damarin (1982). However, this should not be taken to mean that interactivity is simply an issue around 'pressing the right buttons' or the ease with which the learner can understand and use the computer system. Simulations are complex involving interactions with not only the computer model of the system but with academic tutors and other learners.

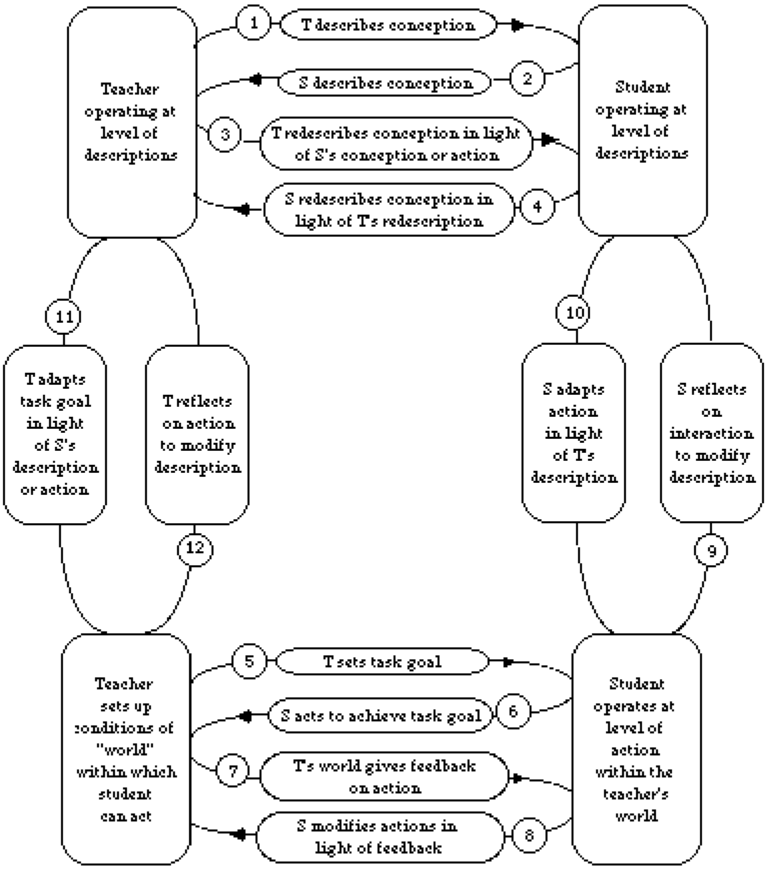
In any learning technology care must be taken to ensure that interaction is both meaningful and engaging to the user. In terms of the use of appropriate interaction therefore the development of business simulation is not significantly different from development of other instruction material irrespective of whether these are based on lecture delivery, writing a textbook or producing a video. In business simulations the learning environment interactivity should be seen as a combination of the inputs by learner, response by system and how these together contribute to the learner's understanding of the subject.

The very sophisticated interfaces which are used for delivering business simulations is certainly an important factor in contributing to the extent to which learners can interact with the teaching material.   Simply put, the level of interaction between the learner and the simulation needs to be seen in terms of a how accurately the interaction can represent a 'conversation'. In this respect the use of business simulations fits very well with one of the most important models of application of educational technology - Laurillard's conversational framework (Laurillard, 1993).

Laurillard put forward a generalized framework which describes all teaching approaches in higher education. Her work on the model is clearly very much influenced by earlier work by Pask   (Pask, 1975, 1976) Pask's Conversation Theory attempted to explain learning in both living organisms and machines using principles derived from cybernetics.   Learning according to this theory arises from conversations about the subject being studied which serve the function of making knowledge (and any gaps in knowledge) explicit. The model has since become very much associated with active learning and emphasizes the importance of dialogue in supporting active learning (Fink, http://honolulul.hawaii.edu)

Laurillard lists 12 categories of actions and interactions which she asserts must occur in a learning situation. These are shown in Figure 4.3

The four main aspects involved in the teaching-learning process are– discussion, interaction, reflection and adaptation. This is illustrated in the model as discussion between teacher and student in which their respective conceptual knowledge of the subject is made explicit.   This can be done through didactic learning processes.



T= Teacher

S = Student

Figure 4.3 Laurillard – Converational Framework (from Rethinking University Education, 1993 p.102)

The model also proposes that interaction also occurs on another level - the level of personal experience and action on the world. This part of the model presumes some form of interaction between teacher (which in this case is the business simulation itself) and learner with regard to some aspect of the world defined by the teacher. In the case of business simulations this is accommodated by the 'case study' forming the subject of the simulation and the learner.

These two levels are joined by a set of activities which link them and which involve reflection and adaptation by both teacher and student.

According to Laurillard, design of learning is thus intimately concerned with achieving "self-realization through structured learning experiences". (Laurillard, 1993)

Looking at Laurillard's framework it is interesting to note that it helps to clarify where the 'ideal' interaction is weak. If the issue of discussion between teacher and student is examined it can be seen that whilst interaction with the business simulation can be facilitated through a number of devices to allow the student to respond to the business model presented and to make suggested changes there is less scope for the application to dynamically respond in terms of questioning the reason for the student action or gaining a deeper understanding of the drivers which led to that particular course of action. This can be mitigated in sophisticated business simulations through building in feedback to the learner which explains the consequences of their action. In fact Jackson (1998) asserts that the immediate feedback given by the computer is more efficient than the feedback provided by traditional means. But the type of interfaces required to implement the degree to which this can be facilitated in a face to face learning environment are very complex and involves the application of techniques drawn from work on intelligent tutoring systems which are still not sophisticated enough to deal with the complexity typically involved in business simulation. Importantly also this still does not get to the heart of the conceptions or misconceptions which triggered the action. This is clearly a case where there is a role for complementing the use of the business simulation with additional support activities which are led by an instructor who must encourage students or groups of students to reflect on the theories they have learned and the implications of this on how they apply that theory.

4.1.3 Communication and Interpersonal Skills

The development of communication and interpersonal skills are also areas in which it can be seen that use of the simulation must be complemented by supporting learning with face to face communication – both between students and between tutors and students.

An integral part of the learning approach to using many business simulations is that they adopt a group approach to engaging with the simulation task. It is important that when adopting a business simulation which involves group working that the instructor does not assume that learners already have sufficiently advanced communication and interpersonal skills to engage with the task. Thus the way in which these skills are developed needs to be carefully considered.

It is important firstly to note that the majority of business simulations do not integrate the development of communications and interpersonal skills as part of the learning which is provided within the teaching content of the simulation itself. There are of course some exceptions to this. Simulations which are specifically designed to develop learners' communication skills or interpersonal skills have been developed for application in the teaching of human resource management or for skills training. These types of simulations are complex to develop and often reliant on the use of agent based simulation technologies. However, generally, as noted in Chapter 3, these agent based simulations are more common in simulations developed for the training in transferable skills which are aimed specifically corporate sector.[11] The types of business simulation most commonly adopted in business education are still predominantly cantered around a systems approach and involve manipulation of a business model.

However, this is not to say that these skills are not developed as part of the overall student learning experience when using simulations and it should be noted that use of simulation is often a very good vehicle for development of interpersonal, team working and communications skills 'off-line' The key determining factor is the extent to which the simulation is integrated into the teaching of the subject and the manner in which the instructor introduces and uses the simulation. Badurdeen et al. comment not only on the lack of a focus on soft skills in the business simulations which they reviewed in the field of lean manufacturing, but also on the misunderstanding

[11] *Some authors would argue that these types of simulation packages are not as yet sufficiently complex to model the real life communications and behaviours. Thus they argue that the simulations can only contribute by enhancing the learner's understanding of 'correct' behaviours or 'attitudes' but do not fundamentally change the learners own attitudes or behaviours. This debate is interesting but not central to the issues explored in this thesis.*

surrounding the key role of the facilitator in development of these skills. (Badurdeen et al., 2010). The issue is centrally one of the context in which the simulation is used and frequently the development of these skills centres around the use of working in teams.

4.1.3.1 Context for Use of Simulations

The context in which the courseware is to be introduced will vary significantly in terms of the level at which the courseware is designed to function (e.g. replacing a full course, replacing a specific part of a course or supplementing existing teaching methods), the manner in which the implementation is supported, and the manner in which the courseware is integrated into existing delivery. Authors such as Draper and Gunn have concluded that contextual issues are of primary importance when evaluating the effectiveness of educational technology.

Students ideally must be given the opportunity to discuss what they have understood from the materials both with an instructor and with other students and if this cannot be effected within the business simulation it must be done by additional activities which are led by the instructor. It should be noted that this additional requirement for instructor inputs (which may be extensive) for interaction with students whilst they are using the business simulation in part negates one of the reasons which were previously noted as giving a justification for the wider adoption of business simulations i.e. the argument around efficiency and the manner in which they can assist in dealing with the expansion of numbers in higher education. Also as noted above an important concept in Laurillard's model is the adaptability of teaching materials based on student feedback and performance (reflection and adaptation by the teacher). However, given the discussion provided in Chapter 3 on the separation of the development of business simulations and the academic users of simulations it is difficult to see how adapting the simulation itself to meet the needs of learners can be done effectively. It can certainly be done through academics engaging with suppliers and providing feedback and clarification on extensions which are required to provide enhanced ‘dialogue’ between the learner and the business simulation but this is a more complex and timely process than would be the case of the academic was in the position of being able to independently add to or customize the simulation. Thus the scope for reflection and adaptation of the learning environment by the student is also very often restricted. A number of researchers therefore, argue that the role of the facilitator is vital (Gentry, 1990; Lainema and Hilmola, 2005, Spector, 2000). Stainton and Johnson (2006) conclude that this is the single most important factor in determining success and emphasize that the careful design of simulations needs to be complemented by an equally careful design of their implementation. The implementation plan needs to clearly specify how the instructor or facilitator is involved with specific timetabling of key interventions and feedback and de-briefing sessions. Locke and Latham (1990) undertook a meta analytical study of 33 previous studies which demonstrated that feedback was more efficient when linked with clear pre-defined goals and provided confirmation that these goals were being achieved. Timing, it is argued is crucial as the complexity of the simulation environment means that learners not only require the support of an expert to provide coaching and facilitate reflection but also need time themselves to reflect on their learning. This is of particular importance in terms of supporting learners through the stages of reflection and generalization as described in the Kolb Learning Cycle (Kolb, 1984, Kayes, Kayes and Kolb, 2005a; 2005b).

4.1.3.2 Group Working

An essential part of business simulations in particular stems from the observation by many authors that planning in business is not the work of individuals but of groups.

In order to fulfil a pedagogic objective to develop communication and interpersonal skills it is therefore seen as an important element to engage students in group learning when using business simulations. This is equally important when considering how to facilitate the pedagogical objective of assisting learners to demonstrate application of theory and to develop multi-faceted work skills for as Doyle and Brown note:

> *'Techniques that create or build team working and decision making attributes in academic simulations are essential in providing students with relevant career-based skills' (Doyle and Brown, 2000)*

There are several questions which arise from this of which two of the most important are discussed in the literature. Firstly it is important to consider the question of how team or group working can best be integrated into the use of simulations in order to provide optimal advantage in terms of the student learning experience. (Mitchell, 2004) Secondly it is important to consider the impact of team dynamics on overall student performance when using the simulation (Wolfe and Luethge, 2003). Team characteristics have been seen as critical in terms of both the overall learning experience and on the specific performance of students in the simulation exercise (Flynn and Klein, 2001; Thompson and Dass, 2000; Walter et al., 1997)

Amini (1995) points out the opportunity to use business simulations to integrate computer based communication skills and Tompson and Tompson contend that this successfully prepares students more thoroughly for the world of work (Tompson and Tompson, 1995). However, the extent to which this is seen as valuable by learners has been questioned. Thus Walter, Coalter and Rasheed found that in some situations it was the 'individual locus of control' which significantly contributed towards learner satisfaction when using simulations and that the necessity to work in groups detracted from this (Walter, Coalter and Rasheed, 1997). It is asserted that teams can stifle creativity, encourage 'free riding' and cause conflict.

However, other authors have noted that the disadvantages experienced are not significant when compared with the very positive advantages to be gained by using group working and recommend that more attention needs to be paid to understanding the dynamics between team characteristics and the successful use of simulations as the integration of group working provides is essential when using simulations as an instructional tool (Anderson, 2005). Thus it is important to understand the team dynamics which have a positive or negative impact on both affective considerations (student perception of the value of using the simulation) and on overall performance.

In the literature on group working (Mullen and Cooper, 1994, Burns and Gentry, 1998, and particularly the meta-analysis by Muldrack, 1998) the important considerations which have been seen as impacting on group success can be summarized as:

- Team cohesion
- Team interdependence, and
- Team heterogeneity

It is acknowledged that there are many complicating factors when trying to explain the benefits or issues around use of simulations when considering team behaviour. Research by Shoenecker, Martell and Michlistsch (1997) found that group dominance by individuals negatively affected performance and satisfaction by learners when using simulations and thus it would appear that team cohesion would be an important factor to ensure when using simulations in teaching. Surprisingly, however, Anderson reports that students who perceived a high level of team cohesiveness also had a negative impact on performance when using the simulation though a positive impact on the value which students placed on the learning experience.. This may be explained because of the fact that in business simulations groups which are cohesive may fail to engage in looking at all of the options presented in the simulation and thus make poor decisions

Team members who are interdependent work better with others than they do when working alone and in the literature on group/team learning this is generally seen as an important attribute. However, team members who prefer to work independently and are forced into group situations cannot fully benefit from fully capitalizing on the synergies which arise from working with others. Anderson (2005) found that team interdependence was positively correlated with students' attitude towards using business simulations based on a study using the CapSim Foundation simulation (Management Simulations, 2004). However, he also noted that this factor had no significant impact on the overall team performance in the simulation.

Finally team heterogeneity is a more complex variable and has been variously attributed in the literature to cover issues such as diversity in race, background or culture (Mohammed and Angell, 2003) or background knowledge and understanding (Harrison et al., 2002) including prior work experience (Stanton et al., 2001). There have been no studies identified which demonstrate that there is any correlation between the heterogeneity of the group in terms of cultural diversity or background knowledge though there is some limited evidence of a correlation between prior work experience which suggests that this is an influencing factor in terms of group performance when using business simulations. (Michie et al., 2002)

In considering the pedagogic objective of developing communication and interpersonal skills with respect to team work and competition it is also important to recognize that competitiveness can have a negative impact on affective considerations. Jones (1997) in an article entitled ‘Damage caused by simulation/games’ argues that conflict is an inevitable consequence of using gaming simulations because the use of games and simulations are incompatible. He notes that this is because of the motives in both being quite different stating that:

> *In games (of skill) the players have a duty to try to win. In simulations the participants have a duty to fulfil their roles (function, jobs) to the best of their ability having regard to the circumstances and ethics of the real world. The two motives – gaming on the one hand and ‘professional’ behaviour (including real world ethics) on the other – are incompatible (Jones, 1997 p. 11)*

This, however, is an extreme position and most commentators would agree that whilst there are inevitably problems which may arise within groups that these can be moderated by the instructor/trainer. In fact some commentators have seen this potential conflict between ‘winning’ and maintain professional ethical standards as being a positive feature in terms of teaching the importance of ethical standards. It is also suggested that game theory has been shown to be an excellent way to introduce discussions of trust, co-operation and ethical behaviour in the classroom. In addition, specifically with respect to team working as Adobar points out team conflict can be seen as either task related or emotional/interpersonal (Adobar and Daneshfar, 2006). High task related conflict leads to greater learning and high emotional/interpersonal conflict negatively impacts on learning. It is therefore important to ensure that when using business simulations that the instructor or trainer is actively involved in dealing with any interpersonal issues involved within groups while at the same time encouraging inter-group and intra-group competitive behaviours.

In terms of development of communication and interpersonal skills, therefore, it is argued that by far the most significant issue is the way in which the simulation is used rather than the content of the simulation itself. Group working provides the opportunity to develop these skills to a high level but as is noted above it is difficult to implement successfully and great care must be taken in designing the learning to ensure that it has a positive impact.

4.1.4 Affective Objectives

Affective objectives in the use of simulations can be viewed from many different perspectives. These are defined as:

> *Behavioural objectives which emphasize changes in interest, attitudes, and values, or a degree of adjustment, acceptance, or rejection. (http://www.education.com/definition/affective-objectives/)*

Affective objectives concern feelings or emotions and arguably the experience of learning using simulations can impact on the whole hierarchy of affective objectives as defined by Krathwohl (1964). By far the most significant objective associated with use of business simulations is to enhance the motivation of students to learn.

4.1.4.1 Motivation

In reviewing the literature it is clear that the most significant affective objective which is noted as being positively impacted on by use of business simulations is the enhancement of student motivation to learn. (Reese &Wells, 2007)

Wideman, quotes Lave's work on cognition in education stating that:

> *The lack of motivation evident in traditional schooling has been viewed by many educational theorists and researchers as largely a consequence of the routinized decontextualization of instruction – the presentation of knowledge in its most abstract forms (Wideman, 2007, p. 11)*

Indeed in the literature dealing with approaches using computer based learning in general motivation is the most important features which is provided as a justification for the approach. Race provides a model of learning in which the first, and arguably the most important, stage is that the student must want to learn. Affective considerations in any activity are vital to its success and will obviously impinge on the evaluation of the activity. Motivation may be considered as either intrinsic (where the student is motivated because of a wish to increase his/her knowledge or understanding, through curiosity about the subject or interest engendered as part of the activity itself) or extrinsic (where a specific external goal or reward is the prime factor in determining the desire to perform well). It is extremely important to examine means of engendering the motivation to learn amongst participants in an educational exercise. Motivational theorists have proposed several factors which are important. Locke et al. (1981) stress the importance of setting clear goals; Maslow (1943) sees individual need as significant and McLelland (1961) views need for achievement as the most significant factor. McLelland's views are supported by Herzberg, one of the most important motivational theorists whose work has had a significant impact on the field particularly in relation to education. Herzberg, within his two-factor theory, views the desire for achievement and also for recognition as the key motivators. Thus Allessi and Trollip note that in terms of intrinsic motivation the features which encourage motivation in a learning environment are often associated with the relevance of the experience to the learner (which has to be made apparent in explicitly stated learning goals) and the provision of prompt feedback to validate learning (Allessi and Trollip, 2001). In terms of extrinsic motivation the most commonly cited factor in the higher education sector is the contribution of the activity to assessment and thus overall performance on the accredited course of study. It is one of the most important but also one of the most difficult features to achieve in developing educational materials (Entwhistle and Marton, 1984). Motivation gives direction to behaviour and it is contended that motivators such as challenge, fantasy and curiosity (Malone, 1984) enhance learning by encouraging students to spend more time on studying and relating what is studied to their own particular experience. (Stoney and Oliver, 1997; 1998). However, as Lepper points out we know surprisingly little about the fundamental question of how motivation affects learning. (Lepper, 1985).

Motivation can thus be considered as a learner variable or as an instruction variable and as such we need to consider both of these aspects in which it is a factor which impacts on the evaluation of business simulations. In relation to this thesis the focus of attention is on motivation as an instructional variable i.e. how does use of the simulation encourage and motivate students to learn (rather than how does student motivation to learn impact on their learning).

As an instructional variable there is considerable interest in the manner in which the sophisticated mechanisms and interfaces which are an intrinsic part of business simulations can enhance the motivation of students who use them. The business simulation must maintain the interest and motivation of students and engender a desire to learn. However, while it is common go see statements in the literature that business simulations are intrinsically motivating there is no real agreement on how this conclusion has been substantiated. Some studies have focussed on the benefits of presenting content using technology and the positive advantages to be gained by using a novel interface. In a number of early studies on the use of computers learning there was an assumption that the use of computers in itself positively impacted on learner motivation. However, such studies failed to fully explore this issue in detail and generally examine it in the context of overall reaction to using computers in learning rather than providing an analysis of individual learners More recently the assumption that use of the computer in itself is sufficiently novel to engender motivation is generally discarded and the focus of attention is on novel features which are made possible using the computer – in particular the use of sophisticated and engaging user interfaces which incorporate animation and video as motivating factors.

The impact of learners being able to use a variety of media has been researched extensively in the literature dealing with the development of computer based learning but overall the impact of using different media types in terms of supporting student learning has been inconclusive. Ritterfeld et al. (2009), for example, specifically examined the educational impact of multiple media types and interactivity in simulations. Generally it has been contended that use of multiple media (or multimodality) engages learners through multiple sensory channels and 'media richness theory' suggests that a higher degree of multimodality for information delivery and presentation assists the sense-making process in learning. (Moreno, 2006; Daft et al, 1987; Tao, Sun and Cheng, 2005; Moreno and Mayer, 2007) Such authors contend that the richness and variety of the media used is a significant factor in student achievement both in terms of overall satisfaction with the learning materials and in test scores administered to assess learning. However, Ritterfeld's study was less optimistic and she concludes that:

> *Apart from some differences in gained interest, overall results of the study indicate that the four media condition produced differences only in the multiple choice measures of knowledge gain, especially in the definitional subscale. There was no significant difference in either process-knowledge subscale or knowledge essays. Hence the educational impact elicited through the four media conditions exclusively affected rather shallow learning. By the same token the sustainability of the elicited effects diminishes over time. As the learning was not deeply enrooted into the participants' knowledge system, their performances after 2 weeks were substantially weakened (Ritterfeld et al.2009 p. 696)*

Despite a number of studies which have examined the 'value' of different media the conclusion has to be that the media in itself is not a significant contributing factor. It is, however, also important to point out that while there may be no direct correlation between use of multiple media and learning outcomes the use of well designed graphical interfaces may be an influencing factor when considering affective issues which help to motivate learners when using a business simulation.

A number of studies have sought to provide guidelines or exemplars to identify key motivating factors and to demonstrate how business simulations can be improved with respect to incorporation of features designed to encourage motivation. In their study in which they develop scales to evaluate factors which are critical to success in simulation software Dean and Webster note that motivation to learn is a key area (the other being ability to transfer tasks to workplace environments). However, they fail to provide a discussion on how the factors which they use to measure motivation have been derived and specifically how the use of the business simulation improved motivation. Overall given the importance of this factor it is an area which deserves much more research.

4.1.4.2 Motivational Aspects of Games

The interest by adolescents in arcade games and other microcomputer based software has often been seen as a model for the incorporation of motivating factors into educational software. It is difficult, however, to see how the main features of such software, i.e. the ability to engage attention through fantasies based on emotional factors which involve the user in interacting with the system at a personal level, can be incorporated in software designed for use in higher education. As Draper notes:

> *Inherent in the notion of fun is that it seems to be that it doesn't matter what the product of the direct result of the action is: something is fun to do not done as a means to an end, i.e. it is an activity done for its own sake, the sake of the process (Draper, 2000, Online)*

Viewed in this light it could be argued that simply incorporating elements of 'fun' into business simulations does not in fact contribute directly to learning since learning must be directed towards the achievement of goals as part of the process. We must, however, be careful to distinguish this from the idea of 'play' being incorporated into learning environments. Play is a performing process in which an important component is discovering what the outcome of performing the process will be and this inevitably leads to learning. It has thus been argued by some that building on play or a version of it should be an inherent part of a simulation program. The importance of games in learning is well established and there are numerous examples in the literature of where games contribute significantly to student engagement, (Stoney and Oliver, 1998; Kovalik and Kovalik, 2008). The underlying assumption is that if we can combine the play aspects within an educational framework improved learning outcomes should follow (Stoney and Wild, 1998). Elgood contended that business simulation games provided a higher level of excitement and commitment to learning than tradition methods of teaching and it has generally been assumed that learning is more effective when people are enjoying themselves – and that this is just as true of business executives as of children (Elgood, 1997; Rao, 1995, Carron et al. 2008). A summary of mechanisms to achieve a variety of desired learner effects for increased motivation is provided by Stoney and Oilver (Stoney and Oliver, 1998)

Another reason cited for enhanced motivation which is engendered by use of business simulations/games is the introduction of a competitive element. (Wilson et al., 2007) Jiau et al. report enhanced motivation because of the introduction of a competitive element in a simulation used to support students learning computer programming and a number of authors have made similar claims for this in relation to business simulations. Bonk and Dennen (2005), for example, note that the opportunity for learners to explore and discover new information and solutions is a powerful motivational aspect in game playing using business simulations. Yee (2007) and Kirriemuir and MacFarlane (2004) also stress the importance of encouraging learning through stimulating curiosity and exploration in a risk free environment.

4.1.5 Higher Cognitive Skills

An important feature in the development of educational theory is the recognition of the importance of ensuring that students high-level cognitive skills. This requires changes in teaching-learning processes from didactic models to encouraging students to acquire analytical, critical and reflective thinking. This covers a range of areas such as learning how to make decisions, solve problems, learning to learn independently and in particular to understand the notion that knowledge is not fixed and question the assumptions on which decisions are based. (Zoller & Pushkin, 2007). The use of simulations is associated with a range of pedagogies which all claim to support higher cognitive skills. . These approaches can be associated with experiential learning, problem based learning, resource based learning and student centred learning. All of these approaches are consistent with the use of simulations and are approaches to teaching and learning which emphasizes the role of the learner. These will be discussed in detail in Chapter 5 of the thesis in the context of a fuller discussion of pedagogies.

The most commonly cited cognitive skills associated with business simulation use are decision making skills. Mahboubian (2010) notes the importance of decision making and comments that

> *A combination of experiential approach and lectures enables students to examine the process of business decision making in a practical manner and enhances*

> *their ability to apply concepts and tools presented in class. (Mahboubian, 2010 p. 5404).*

The importance of business simulations in developing decision making skills is also emphasized by many other authors (Alderfer, 2003; Benek-Rivera and Mathews, 2004; McKone and Bozewicz, 2003) Muir, 2001). The importance of decision making skills is also highlighted in the importance which is placed on the use of business simulations in the development of strategic management skills and in particular the required skills to make strategic decisions based on an integrated understanding of all the different perspectives from which a problem has to be viewed. Strategic management in business education has been a core part of the undergraduate and masters curriculum since the 1960’s. Faria and Wellington (2004) note that this is also the main area of the curriculum in which business simulations are used. As noted above there are some concerns about the theoretical content which is used to underpin learners’ understanding of strategic management but an important point which is emphasized by commentators is the benefits which are gained in this area in terms of developing learners decision making capacity. In fact, despite criticisms of the content of strategic management in business simulations(Wolfe and Roge, 1997), Wolfe still suggests that from the educator’s perspective business simulations have been found to be generally effective (Wolfe, 1990) and also contended that when compared with other instructional methods business simulations produced higher levels of learning. Ganesh and Qin report use of a capstone simulation in a capstone course in the USA which was designed specifically to improve students’ decision making skills and techniques and conclude (based on overwhelmingly positive feedback) that the simulation was very successful (Ganesh and Qin, 2009)

Closely linked to the development of decision making skills is the issue of planning. One of the most important team attributes which has been linked to positive affective and performance outcomes is the extent to which the team engages in formal planning (Hornaday and Curran, 1996)

Again, however, in reviewing the literature, while there is a lot of discussion on improvement in higher cognitive skills and decision making there is a lack of literature which can actually substantiate this through empirical evidence.

4.1.6 Multi Faceted Work Related Skills

Finally one of the most commonly cited reasons for using business simulations is given by academics is their ability to provide ‘’realistic environments’ to allows students to engage with a wide range of practical issues which they will have to deal with in their professional careers (Chapman and Sorge, 1999; Wolfe and Luethge, 2003, Fripp, 1997, Faria and Wellington, 2004). Feinstein, Mann and Corsun suggest that the growing trend to adopt business simulation games into the curriculum is primarily driven by the need to ensure that graduates benefit from experiential learning which prepares them for employment (Feinstein, Mann and Corsun, 2002). However, this is probably also the most difficult objective to demonstrate as having been successfully achieved. In order to demonstrate this critical issues which have to be addressed are firstly to determine whether or not the business simulation is actually a valid representation of the ‘real world’ and secondly to find evidence which demonstrates that user can transfer the lessons which they have learned into the workplace.

4.1.6.1 Realism of simulations

This therefore involves the same debate which has already been discussed concerning the content of the simulation itself and concerns the extent to which simulations must replicate the ‘real world’ Simulations are seen to offer a vicarious learning experienced and are considered to be a sophisticated and effective means of replicating reality. On the surface it would seem that it was highly desirable that any simulation must be designed to be as close as possible to replicating the real world environment which it simulates. However, there are both practical and theoretical restrictions on being able to achieve this objective with respect to development of business simulations. Simulations by definition cannot be completely accurate representations of the real world.

There are various interpretations of what is meant by realism with respect to simulations and some of the issues which arise in use of simulations are related to the complexity of attempting to model all of the factors which are present in a ‘real world’ situation. The main issue is concerned with the fact that the more realistic a simulation is the more complex the rules and guidance required for learners is. Several authors (Keys and Biggs, 1990; Goosen, Jensen and Wells, 2001; Gold 2003) claim that the business world is too complex to be represented accurately in simulations while Teacher and Schwartz (2004) argue that in fact it should not be a goal to achieve complete accuracy as if the simulation is too complex this can actual limit its teaching potential. There is a tension between having a simulation which is so complex that the learner spends an inordinate amount of time and effort simply understanding the manner in which they can interact with the simulation rather than focusing on the main factors which are important to a broad understanding of the situation which the simulation is seeking to represent   Game complexity and prior knowledge strongly influence the learning process of participants and some authors argue against attempting to structure simulations which are overly complex even if this is more accurately represents the business world which is being simulated. Burns and Gentry (1998) point out that

> *'Information overload [is] created by the need to understand the complexity of the exercise on top of the need to understand the underlying theory (Burns and Gentry, 1998 p.147)*

Thus Norris (1986) argues that it is sufficient if the simulation is sufficiently representative of the real world if users perceive that the simulation is 'sufficiently 'realistic and others have argued that in terms generally of the development of 'microworlds' to describe the environment in which managers operate it is sufficient if it supports the main purpose of providing support for learning by doing. Authors vary about the exact way in which a balance can be struck (Pidd, 1998; Spector, 2000; Stretch, 2000; Rolfe and Hampson, 2003); and Spector goes as far as suggesting that the complexity of the problem is such that the designer of business simulations probably learns more about the complexity of business and management than students using the simulation do for they have to struggle to balance presenting the complexity in a way in which the learner can comprehend it. Some authors in fact (Rolfe and Hampson 2003 Lainema and Hilmola, 2005) conclude that determining requirements and what to include within a simulation is the 'art' of simulation design but warn about biases which this can cause because of the biases and prior learning of the designers. It could be argued that really this is not however, purely or even mainly a design issue. Striking a balance between complexity and conveying the essential facts and theories is one of the central roles which academics contend with in almost every learning situation and that there is thus a strong case for much more involvement of the academic with the designer.

As Feinstein and Cannon note:

> *'researchers have yet to agree on an appropriate level of fidelity for this type of learning environment'*
> *(Feinstein and Cannon, 2001, p.57)*

While there is disagreement on how it can be accomplished there is general agreement with the view of Bartlett and Amsler (1979) that from the perspective of the user the simulation must engender confidence that the outcomes it generates are consistent with the pre-defined goals or missions which were set as part of the simulation task and that the learners efforts have purpose and their accomplishments are valid and recognized.

4.1.6.2 Transfer of learning

The ability of business simulations to enable students to transfer their learning to the world of work is another theme which is widely discussed in the academic literature.

Doyle and Brown assert that :

> *Even though educators are constantly striving to bring management education closer to reality, the media of learning still tends to polarize into two scenarios: lecturing about business and training in skills. This polarization means that the context of learning remains artificial and it is difficult to reproduce the characteristics of a working situation in the classroom. Therefore the aim of the educator is to prepare the student for the workplace, in the sense that all learning is meant to be translated back into the workplace, a large gap remains. It is the view of the authors that this gap can be narrowed by the use of business simulation games (Doyle and Brown, 2000, p.330)*

The research literature on which this claim is based however is lacking and studies are often contradictory.[12] Thus, Wolfe and Roberts (1993), for example, have argued that simulation games have external validity in predicting the future career success of participants. Whitely and Faria, on the other hand concluded in their study on use of business simulations that they are effective in improving quantitative skills but not the acquisition of applied knowledge (Whitely and Faria, 1989) which can be directly applied in the workplace

There is no convincing research which has been published which is based on a sound methodology which can conclusively demonstrate transfer of learning to the workplace. Pal, Stubbs and Lee report on an attempt to measure this obliquely when commenting on the adoption of a business simulation based around developing experiential learning in the field of marketing. They note that learners were able to demonstrate all of the skills and knowledge expectations which are outlined in the learning outcomes proposed by the Chartered Institute of Marketing (CIM) and that evidence that students were able to demonstrate all of the CIM 's 'asset requirements' for this area of activity demonstrates transfer to work. However, the argument is rather thin and their article does not directly address the issue of whether students were able to demonstrate application of learning in other contexts (Pal, Stubbs and Lee, 2005)

To fully research the issue of transfer of learning to the workplace would require a very complex longitudinal study which was carefully controlled and followed up on

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[12] *Again it can be noted that the way in which terminology is used in the literature on business simulations adds confusion to the discussion. For example, Burns, Gentry and Wolfe (1990) commenting on simulation validity subdivide this into 3 important measures which need to be evaluated:*
Internal validity – that the business simulation functions in the intended manner
External validity – that the learning from the simulation can be applied to other contexts, and
Transfer-external validity – that the learning can be applied in the working life of the learner
However, other authors refer to internal validity as being concerned with the question of whether students achieve the desired learning outcomes from their use of particular simulation packages (Dickinson and Faria, 1994; Dickinson, Faria, and Wellington, 2004; Whiteley, Ledue and Dawson, 2004). They contrast this with the term external validity as specifically related to whether or not students can apply their learning to the real world (Wolfe and Roberts, 1993

learners' perceptions of the value of their learning in the workplace by testing this when learners were actually engaged in employment. Alternatively it would require a detailed study of learners who were actually currently employed and gaining their views on how the learning could be applied and how accurately it prepared them for decisions which they were engaged in during their employment. There is no evidence in the literature of any such studies.

4.2 Comparison of educational objective from the perspective of developers and academics who use simulations.

It can be seen that there is a very close alignment between the educational benefits which suppliers/developers claim can be gained from using simulations packages and the benefits which academics are seeking to achieve**.** This being the case it would seem that the use of business simulations would be universally supported in the academic community. However, there are other considerations which must be taken into account. In particular, of course, it is necessary to evaluate whether the benefits which are expected by both suppliers and academics are actually realised when using simulations in an academic setting. In addition it is necessary to look at some of the practical considerations which may prevent academics from fully realising these benefits because of constraints e.g. on cost of purchase and/or customisation of suitable simulation software, practical issues in deployment of the simulation or failure to implement and support the simulation in the manner in which its use should provide optimal results. These are all important factors to be considered when discussing the results of any evaluation of learner experience using simulations. These issues will be explored in more detail in Chapters 6 and 7 which describe surveys undertaken with suppliers and academics respectively.

4.3 Summary

This chapter has examined the main drivers for the use of simulations in business and management from the perspective of the objectives which academics are seeking to achieve using business simulations. The main arguments for using simulations closely associated with the development of a variety of objectives defined from a study by Ellington and Earl who describe the objectives which business simulations are able to support. The range of objectives encompasses both higher order learning skills development as well as affective skills – the principal elements of which are decision making, team working, and in particular the enhancement of learners' motivation to engage with the learning materials. In addition a number of system related features have been identified – notably the content base of the simulation, and the extent to which simulations provide engaging and ''realistic' learning environments. The way in which the use of simulations in teaching is integrated into the overall teaching environment is crucial in order to achieve many of the pedagogic objectives which academics wish to develop. In addition to reviewing in detail the educational objectives which it is claimed use of business simulations/games can support it has provided a categorization of these learning objectives and noted that these appear to be well aligned with the claims made by suppliers/developers in relation to the value of their products in higher education. The crucial question is whether or not the claims which are put forward for the manner in which use of simulations will enhance the student learning experience can be justified. In order to do this is necessary to examine use appropriate evaluation methods to demonstrate that any enhancement of learning can be directly attributed to the use of business simulations. The next chapter will therefore examine issues related to student use of business simulations setting this in the context of general theories on pedagogy and models of learning which are related to use of computer based learning environments and the manner in which academics have in the past tried to evaluate learning.

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Chapter Five

Evaluation of Simulations

The objectives of this chapter are:

- to review educational theories which are relevant to a discussion of how student learning is facilitated using business simulations
- to discuss learning models in relation to how business simulations facilitate student learning
- to discuss general principles of evaluation of educational software and relate this specifically to the evaluation of business simulations.
- to identify the different types of evaluation which may require to be undertaken to provide an holistic view of development and implementation of business simulations
- to examine implications of pedagogic theories and models on the evaluation of student learning when using business simulations, and
- to develop a model of how evaluation should be applied to development and implementation of business simulations.

5.0 Introduction

There is an extensive literature which deals with evaluation of the effectiveness of learning and a considerable history of educational theories and models which have been proposed to measure the effectiveness of different educational methods. A brief summary of these is provided below. In particular there is a large body of literature which looks specifically at the evaluation of computer based learning and some of this is of direct relevance to evaluation of simulations and this again is discussed below. However in terms of specific evaluation of simulations from the perspective of the learner the literature is scarcer and in many cases what is available is often very dated. Stainton notes that:

> The existing educational validity literature does not provide an adequate research methodology for business gaming simulation (Stainton, 2010)

In this chapter, the available literature is discussed in depth, and building on the discussions provided in previous chapters reasons for Stainton's observation are discussed critically.

5.1 Educational Theories

Before considering in detail the evaluation of business simulations/games as a vehicle for learning and the way in which these can support specific types of learning it is important to review the educational theories and practices which have been developed in relation to student learning and the context in which such theories have been developed. In itself this is a very extensive area of investigation so the main objective of this section will be to discuss briefly the developments of educational models and theories of learning and to examine more specifically those which are of particular relevance to the stated objectives and claims made for the benefits of using business simulations in teaching.

5.1.1 Behaviourism

The first attempts to use computers in education were based on behaviourist theories with emphasis on feedback and reinforcement actions (Burney, 1996; Ertmer and Newby, 1993). Associationist philosophers (such as Aristotle, Hobbes and Hume) provided the philosophical basis for the theory of behaviourism. Hume's work on associations and antecedents, the work of Brown and Ebbinghaus on 'recency' and vividness of association and Bain's links between association and sensory stimuli were all influential in developing this into a theoretical model for a behaviourist approach in educational psychology. (Black, 1995).

The main points on which the behaviourist school of educational thought was based were founded on a view that learning revolves around pairing stimuli and responses. Educational theorists, notably, Thorndike and Skinner's views of education of being essentially 'operant conditioning' led to the adoption of a very simple view that education was basically a consequence of applying the correct stimuli to elicit an appropriate response. Educational interventions were cantered around 're-inforcement' – positive re-inforcement when the 'correct' response was provided by the learner and negative re-inforcement being the consequence of a 'wrong' response. It was argued that these reinforcers encouraged learners to respond appropriately. Ultimately, therefore, learning was something which could be seen as external to the learner and for learning to take place the behaviour (or response of the learner) simply has to be modified or shaped by the educational experience. Thus Thorndike' 'laws' for instructional design were based on very simple principles i.e.

1. Setting behaviour goals
2. Determining re-inforcers
3. Select procedures to change behaviour
4. Implementing procedures
5. Evaluate progress and revise as necessary

As Newton observed:

> *'The exposes the fundamental weakness of the behaviourist approach in that it is based almost solely in achieving a 'transfer of learning' to the student and the sole manner in which this transfer is assessed or evaluated is that the student should be able to reproduce accurately the material with which he/she has been presented. This model of learning emphasises the systematic presentation of information and at its most extreme denies any individual differences in the learner. It is restricted to external observable behaviour and does not attempt to take into account any factors which might explain why a particular pattern of behaviour occurs. (Newton, 2001)*

The theory of operant conditioning on which many early used of computers in education was based is often directly linked to the development of programmed instruction. Again this approach saw the focus of instruction as the outcome behaviour of the learner and to an extent separate from process concerns and teacher behaviour and promoted a belief that the single most important factor which was central to ‘learning’ was the development of carefully constructed course materials.

In the 1970’s and 1980’s the work of Gagne and Briggs introduced a significant change in emphasis and focused attention on the internal characteristics of the learner. Whilst Gagné’s work was initially very much based on achieving certain observable outputs from the learning process (which was typically a feature of behavioural theory) later developments of his theory attempted to explain the learning process in terms of how the mind constructs and assimilates knowledge. Gagné’s theories, in particular, provide an interesting bridge between behaviourism and cognitive information processing (Davidson, 1998) but fundamentally they can still be seen to be quite firmly biased towards the former particularly with respect to the emphasis which they give to the design of instructional material.

Gagne’s instructional theory has three major elements:

1. a classification of learning outcomes
2. internal and external conditions which are necessary for achieving these outcomes, and
3. events of instruction’

Gagné proposed nine steps (or instructional events) as the conditions under which learning should ideally take place. These steps are quite clearly based on a behaviourist model for instruction and constitute – gaining attention, relating objectives, stimulating recall of prior learning, presenting the stimulus, providing learning guidance, eliciting performance and providing feedback. A correlation between Gagné’s instructional events and development of simulation and gaming software has been developed by the researcher and is outlined in Table 5.1.

Table 5.1 Gagné's Nine Instructional Events (application to design of simulations and games software developed by the researcher)

Instructional Event	Simulations	Educational Games
	Support the replication (or approximate replication) of specific tasks	Supports competitive procedures designed to inculcate or develop skills
1. Gaining attention	Scenario base needs to be established to describe context of the simulation and indicate procedures available for student to interact with or manipulate the simulation	Competition and challenge are essential elements
2. Description of Learning Objectives	Introduce student to the objective of the simulation and instructional goals	Game must have a goal – stated or inferred and rules to define actions allowed
3. Stimulating recall of prior learning	Generally assume student has prior knowledge of the procedure being simulated	Design of game may require student to recall prior knowledge
4. Presenting the stimulus	Discovery or experimentation approach	Constant flow of information on progress of game.
5. Providing learner guidance	Guidance is provided by the reaction or sensitivity of the simulation to student inputs	Guidance provided by game structure and rules
6. Eliciting performance	Performance reflected in control over simulation	Games elicit a variety of types of performance depending on structure of game used. In business simulations this is typically measured in terms of the competitive advantage the player has gained over the computer and/or other players
7. Providing Feedback	Feedback is immediate within a simulation and natural feedback of consequences of action are presented	Feedback on performance given throughout the course of playing the game
8. Assessing Performance	Assess on the basis of being able to predict or demonstrate an ability to identify key features essential to apply or understand the simulation in real life	Provide feedback to each player on the progress of the game and on individual performance. Supply information or 'hints' on how to play the game better.
9. Enhancing retention and transfer to other contexts	Repetition of the simulation till student is familiar with the content. Simulation should provide good transfer because the student can use what is learned and apply it to 'real life' situations and learn from mistakes	Option to replay the game with the possibility of improving performance given application of what has been learned. The importance of practice to improve performance in risk free environment is a feature which a number of authors suggest is an important feature which can increase learner confidence and thus increase motivation and effort

Although Gagne's writings clearly show an interest in individual processing of information the manner in which this is translated into instructional design is still clearly based around a behaviorist model.

5.1.2 Cognitive Approaches to Learning

Although it is often presented as historically 'more recent' than behaviourist theory the cognitive approach to learning has an equally long history. One of the earliest examples of a cognitive approach being recognised in educational psychology is to be found in the work of John Dewey (Dewey, 1916). Dewey was interested in the application of science to educational practice. However, Dewey saw learning as an activity driven, not by reinforcement, but by the learner's sense of disequilibrium when presented with new experiences and ideas. For Dewey, if real growth was to occur the student must want to learn and be active in the learning process. He argued that the traditional reinforcement of information - given by the teacher, memorized and given back by the child - led only to superficial learning. The job of the teacher was to create an environment in which learners can and should be presented with problematic situations which they would be motivated to resolve by learning. The idea that in order to provide "deep" or meaningful learning it is necessary to adopt a constructivist approach to the learning process can be traced back directly to Dewey and was clearly a very important influence on works by Piaget. In particular it is demonstrated in Piaget's writings on development of schema ore schemata and the processes of assimilation and accommodation of learning which recognised the important process of the learning changing existing cognitive structures to make sense of the environment. This was also the standpoint taken by Ausubel. Ausubel (1978) suggested that cognitive structures represent the basis for all learning experiences and Ausubel was concerned to determine how learners could be encouraged to recognize and manipulate new information and integrate this with existing cognitive structures.

The cognitivist approach is characterised by the fact that the learner is central to the learning process and constructs new knowledge on the basis of prior experience and learning. This philosophy of learning emphasises the importance of involving the student actively in developing his or her own view of the subject and in questioning information which is supplied by examining the logic and reasoning behind the ideas being presented and relating them to previous experience or knowledge. This is pursued to a logical conclusion by those who argue that in fact all knowledge is essentially constructed by the user and the goal of education is to assist students to construct their own knowledge rather than directing them towards a 'correct' belief or 'established' knowledge.

5.1.3 Constructivism

The concerns of Piaget, Bruner and Ausubel, and others can be seen to have had powerful influences in the development of the theory of 'constructivism' as put forward by Jonassen and others (Duffy and Jonassen, 1992). Constructivists believe it is important to encourage reflexivity, the process whereby a student becomes aware of how their own thinking processes work. Helping students to think about how they are arriving at conclusions, or how they go about solving problems, may help to form more meaningful links between knowledge and develop more elaborate schemas. In a seminal work on social constructivism Vygotsky (1986) proposed that learners construct knowledge based on the results of active learning (a key claim put forward for business simulations) and the teacher must create a learning environment which allows students to construct their knowledge by experiencing and interacting with the environment.

Pedagogic scenarios based on this constructivist approach are central to arguments which support the use of business games and simulation in learning as constructivism sees the basis of all meaningful learning experiences is that knowledge is bound to the situation in which it is learned and in order to learn students must act in environments which replicate the real world (providing real expert guidance as much as possible) i.e. 'authentic environments'. It is, however, also important to stress that it is not the degree of realism which is the main 'ingredient' in constructing a constuctivist learning environment. As noted on the Tata Interactive Media web site

> *if we speak of simulation merely as an imitator of reality without mentioning its relationship to the learner we are likely to miss the point. Actively constructing knowledge leads to ownership of the knowledge and the*

> *ability to apply it (Tata.com: http://www.tata.com/tata_interactive/media/20040322.htm)*

Thus simulations in particular can provide a focal point for learning where students are being encouraged to interact in order to explore collaboratively a particular learning environment. In addition constructivists hold the view that reality is a shared process of social negotiation and thus stress strongly the importance of student interaction in the learning process and increasingly this is also been recognized as involving interactions with other learners.

As has been pointed out previously a number of a number of teaching approaches have been associated with the use of simulations and furthermore these can largely be seen as derived from cognitivist principles and theories. In this respect note has already been made of problem based learning (Boud and Felletti, 1991; Koschmann et al., 1994; Nulden and Scheepers, 1999), collaborative learning (Slavin, 1990), experiential learning (Gentry, 1990), case based instruction (Demetriadis and Pombortis, 1999; Jarz, Kainz and Walpoth, 1997), 'learner centered education' (Norman and Spohrer, 1996), and discovery-based learning (Jacobs, 1992a, 1992b). These are all approaches which follow the logical consequences of adopting an approach to teaching and learning which emphasizes the role of the learner. Although the emphasis of the different approaches may vary they can all be seen to be consistent with the main principles of constructivism and in particular the principles which Cunningham et al. note as important in designing constructivist learning environment which are: to:

1 Provide experience of the knowledge construction process
2 Provide experience in and appreciation of multiple perspectives
3 Embed learning in realistic and relevant contexts
4 Encourage ownership and voice in the learning process
5 Embed learning in social experience
6 Encourage multiple modes of representation
7 Encourage self-awareness of the knowledge construction process

(Cunningham, 1993)

In a constructivist learning environment the task of the teacher is not to be a ‘purveyor of knowledge ‘ but to create a learning environment enabling the student to construct her/his own knowledge by experiencing and interacting with the environment. As Thavikulwat and Pillutla note in their study on constructivist approaches to designing business simulations for strategic management, instructivist methods work on the assumption that there is an optimal method of learning for everyone while constructivist tools acknowledge that this varies from person to person. (Thavikulwat and Pllutla, 2010)

Constructivist approaches emphasize the idea of an active student who is placed in a situation where knowledge is not directly transmitted by an instructor to the student (though it may be accessible using various tools at the student’s disposal). Unfortunately some suppliers who market business simulations have interpreted this as minimizing the input required by the academic and thus promote business simulations as an effective way to teach large classes. In fact the process needs to be very carefully guided by tutors and some would argue requires much more effort and involvement on the part of the instructor. Knowledge is therefore constructed through individual or group activity and guided by the instructor.

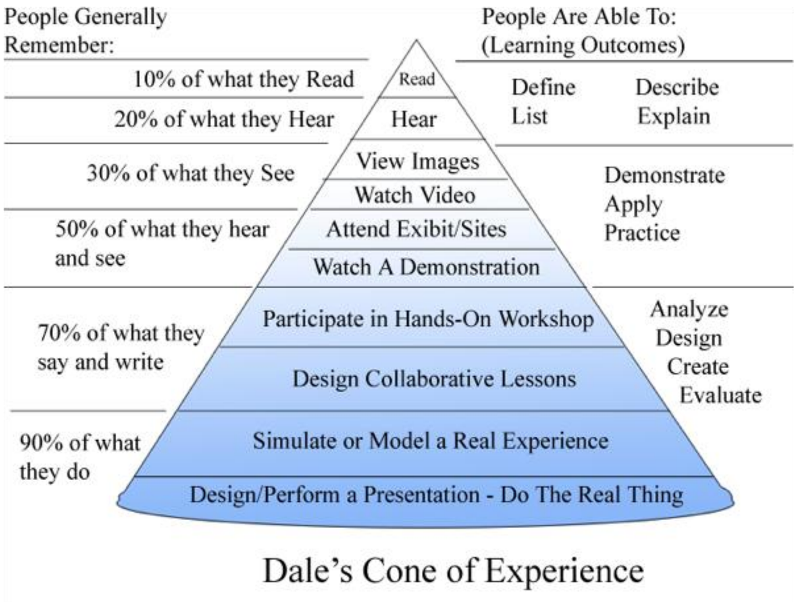
5.2 Models of Learning

The teaching approaches described above have been developed into some useful models which describe the learning process. Two of the most significant of these in relation to the use of use of business simulations are Dale’s Cone of Learning (or more correctly Dale’s Cone of Experience) and Kolb’s Learning Cycle and these are described below.

5.2.1 Dale’s Cone of Learning

The Cone was originally developed by Edgar Dale in 1946 and was intended as a way to describe various learning experiences. It has been used extensively in the literature in connection with the active learning. Active learning proposes that in order for students to learn effectively, they must make connections between what they already know (prior knowledge) and new content to which they are exposed. Dale's Cone of experience shows a progression of experience from the most concrete (bottom of the cone) to the most abstract (top of the cone).

It is important to note that Dale never intended the Cone to depict a value judgment of experiences. The important point he used the Cone to illustrate was that those learning experiences nearer the bottom of the cone were linked with active learning and were better means to ensure that students retained the learning. He saw all of the levels of learning experience as being important.



Figures 5.1 Dales Cone of Experience

Figure 5.1 above shows what students will be able to do at each level of the Cone (the learning outcomes they will be able to achieve) relative to the type of activity they are doing (reading, hearing, viewing images, etc.). The numerical figures on the left side of the image, (what people will generally remember), indicate that practical, hands-on experience in a real-life context will allow students to remember best what they do. Again, it is important to note that this doesn't mean reading and listening are not valuable learning experiences, simply that "doing the real thing" can lead to the retention of the largest amount of information. This is in part because those experiences near the bottom of the Cone are closer to and include real-world experiences and makes use of more of our senses. It is believed that the more senses that are used, the greater our ability to learn from and remember an event or experience.

It is important to be careful in making too many claims for the model. When Dale first published his Cone there were no numbers associated with the model at all. There was no research used to generate it and Dale even warned his readers not to take the model too literally. However, a ‘myth’ has grown up around the model and the percentages are often quoted as being factual and based on research[13]. This, however, should not detract from the fact that, as many authors have pointed out, there is a large body of evidence to support the use of active learning. There is also a direct link between using business simulations and encouraging students to participate in active learning as can be seen through an examination of Dale’s Cone of Experience and noting the types of learning experience associated with business simulation use.

5.2.2 Kolb’s Learning Cycle

Kolb's learning theory (1975) sets out four distinct **learning styles** and Kolb notes that different people naturally prefer a certain single different learning style. Various factors influence a person's preferred style. Whatever influences the choice of style, the learning style preference itself is actually the product of two pairs of variables, or two separate 'choices' that we make – which Kolb presents as the processing continuum and the perception continuum,

Kolb's learning styles are often represented in terms of a two-by-two matrix. Each learning style represents a combination of two preferred styles in terms of how an individual approaches a task (processing continuum) and how an individual thinks or feels about a task (perception continuum). Table 5.2 summarizes this using Kolb's terminology for the four learning styles; diverging, assimilating, and converging, accommodating:

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[13] Investigations undertaken by the blog “Myths and Worse”, indicate that most likely, the bogus percentages were first published by an employee of Mobil Oil Company in 1967, writing in the magazine *Film and Audio-Visual Communications*.

Table 5.2 Kolb Learning Styles

KOLB LEARNING STYLES	Doing (Active Experimentation - AE)	Watching (Reflective Observation - RO)
Feeling (Concrete Experience - CE)	**Accommodating (CE/AE)**	**Diverging (CE/RO)**
Thinking (Abstract Conceptualization - AC)	**Converging (AC/AE)**	**Assimilating (AC/RO)**

Briefly the four learning styles can be summarized as given in the following brief descriptions of the four Kolb learning styles:

Diverging - These people are able to look at things from different perspectives. They are sensitive. They prefer to watch rather than do, tending to gather information and use imagination to solve problems. They are best at viewing concrete situations from several different viewpoints.

Assimilating - The Assimilating learning preference is for a concise, logical approach. Ideas and concepts are more important than people. These people require good clear explanation rather than practical opportunity. They excel at understanding wide-ranging information and organizing it a clear logical format. People with an assimilating learning style are less focused on people and more interested in ideas and abstract concepts. People with this style are more attracted to logically sound theories than approaches based on practical value.

Converging - People with a converging learning style can solve problems and will use their learning to find solutions to practical issues. They prefer technical tasks, and are less concerned with people and interpersonal aspects. People with a converging learning style are best at finding practical uses for ideas and theories. They can solve problems and make decisions by finding solutions to questions and problems.

Accommodating - The Accommodating learning style is 'hands-on', and relies on intuition rather than logic. These people use other people's analysis, and prefer to take a practical, experiential approach. They are attracted to new challenges and experiences, and to carrying out plans. They commonly act on instinct rather than logical analysis.

In 1984 Kolb proposed the concept of experiential learning which he defined as a process where concepts are derived from and continually modified through experience. Kolb's experiential learning theory works in conjunction with his four separate learning styles to describe how experiential learning is linked with learner's internal cognitive processes. An important idea which is central to this is Kolb's view that:

"Learning is the process whereby knowledge is created through the transformation of experience" (Kolb, 1984)

The experiential learning style theory is typically represented by a four stage learning cycle in which the learner 'cycles through all the stages (Figure 5.2 below)':

1. Concrete Experience - (a new experience of situation is encountered, or a reinterpretation of existing experience).

2. Reflective Observation (of the new experience. Of particular importance are any inconsistencies between experience and understanding).

3. Abstract Conceptualization (Reflection gives rise to a new idea, or a modification of an existing abstract concept).

4. Active Experimentation (the learner applies them to the world around them to see what results).

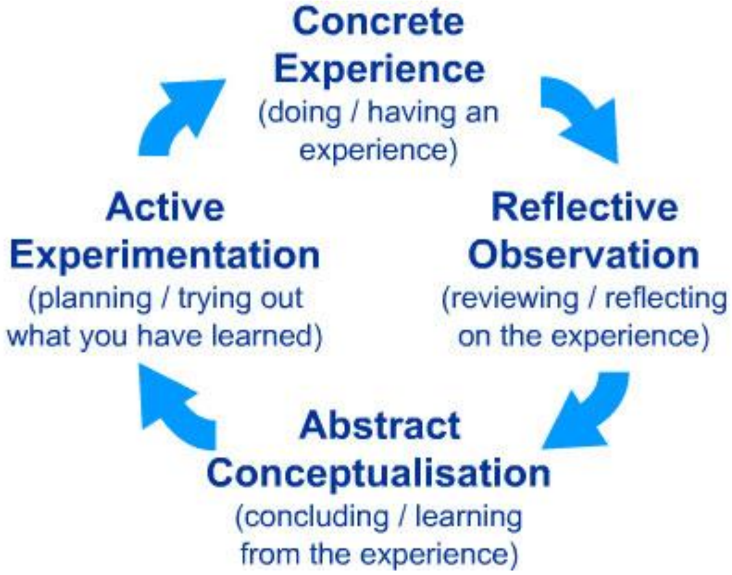

Figure 5.2 Kolb's Learning Cycle (from McLeod (2010). ***Kolb's Learning Styles and Experiential Learning Cycle.*** **http://www.simplypsychology.org/learning-kolb.html)**

The learner must progress through this cycle of four stages as he/she engages with new learning experiences. Each stage supports and feeds into the next as illustrated in Figure 5.3 below and all stages must be engaged in.

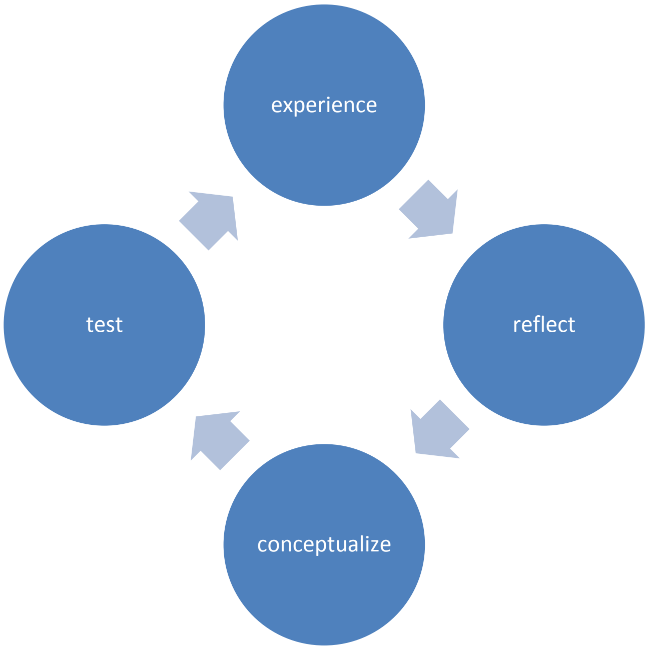

Figure 5.3 Kolb's learning cycle processes

The implications of this for designing 'learning experiences' are particularly relevant to a consideration of use of business simulations. Viewed as systems to support an experiential learning, business simulations would appear to offer an ideal mechanism to fully exploit implementing Kolb's learning cycle.   They provide a learning environment in which activities and material can be developed in ways that draw on abilities from each stage of the experiential learning cycle and take the students through the whole process in sequence. The fundamental question therefore is does the manner in which business simulations have been developed and implemented actually provide this support. To answer this question it is important to look at how we evaluate student learning.

5.3 Evaluation of Business Simulations

Having examined the learning objectives which are important considerations when implementing business simulations and the manner in which the development of these are supported by educational theories and models it is now important to examine carefully the methods by which the achievement of these objectives can be evaluated. The following sections of the thesis will therefore consider the issues related to evaluation of business simulations. To provide a comprehensive evaluation this will mean not only examining measurement of the objectives in terms of student learning (which is by far the most complex evaluation to be undertaken) but also the evaluation of the simulation itself in order to ensure that the instrument for learning is appropriate to achieve these objectives.

As noted previously the way in which the term evaluation is used varies in the literature concerning simulations. It is important to clearly distinguish what is meant by evaluation of business simulations and how and by whom such evaluation should be conducted. There are various elements to evaluation – functional evaluation of the learning packages themselves, evaluation of the suitability of simulations in the context in which they are going to be used to support teaching and learning and evaluation of whether or not the business simulation actually achieves the intended learning objectives which were set. It is important to separate out the different types of evaluation which need to be conducted and to clearly identify the context in which these are used and who should conduct the evaluation.

To clarify the issue of what is meant by evaluation the following definitions have been used to refer to the different roles or purposes in which evaluation is used. The definitions are derived from the study by Newton (2001) which itself draws upon a range of literature on the evaluation of computer based learning literature.

- **Formative evaluation** – to provide an effective measure of the quality of the courseware being introduced
- **Illuminative evaluation** – to explore the manner in which the resource is used and its perceived value to students

- **Integrative evaluation** – to examine issues related to the integration of computer based learning materials or software packages into an existing course of study
- **Summative evaluation** – to confirm that the computer based educational materials have a ‘proven’ benefit in terms of quantifiable measures which demonstrate enhanced learning.
- **Cost/benefit evaluation** – to demonstrate that the introduction of the computer based learning system is economically viable in terms of delivering the same educational benefit at a reduced cost or enhanced educational benefits at the same cost

The following sections provide some more detail on these types of evaluation.

5.3.1 Formative evaluation

Formative evaluations aim to identify problems with resources and suggest appropriate solutions Formative evaluation is conducted using a number of different tools which attempt to arrive at a rating for a variety of factors which describe how the system is designed and functions.

5.3.2 Illuminative evaluations

Illuminative evaluations aim to discover the factors and issues that are important to the learners (rather than aiming to assess only the improvement in student performance). The main goal of illuminative evaluation is to examine how the business simulation works and how it used by learner rather than to focus on the outcome of using the simulation. In this respect it can be seen that the methodology which was described as the basis for conducting the experimental work with students is based very much around an approach which uses illuminative evaluation. This type of evaluation was intended to replace rigorously quantitative experimental evaluations which often failed to provide conclusive evidence when assessing educational interventions. As such its overall philosophy can be seen to be very closely linked to phenomenology and undertaking a phenomenographic study.

5.3.3 Integrative evaluations

Integrative evaluations focus on the learning situation and again are very closely linked to a phenomenographic approach as they focus on a particular space within which phenomena are situated and observed. They can provide opportunities to explain the learning experience in terms of factors which may not be directly linked to the content or design of the educational materials themselves but which result from the way in which the business simulation is implemented and can therefore help to explain any reported ‘learning effects’ which are not directly attributable to the system being used. Some educational psychologists (notably Draper) argued strongly that integrative evaluations are of more significant to teachers and instructors because they look beyond the properties of the educational materials themselves and examine broader issues on how to use the educational materials to maximize the learning achieved. A key feature of integrative evaluation is to evaluate the learning system in an ‘authentic’ environment and in the case of business simulations therefore the methodology would not accommodate artificial experiments which are set up specifically to test a system but must involve learners using the system as an integral part of their learning.

5.3.4 Summative evaluation

Summative evaluations are extremely important as they aim to investigate how successful a resource is in terms of meeting its stated aims and objectives. This approach focuses on learning outcomes, but the main question around use of summative evaluation is frequently how these outcomes are measured. As will be discussed below the type of approach taken in summative evaluation needs to be different depending on the type of pedagogic objective which is being measured.

5.3.5 Cost benefit/effectiveness analysis

The evaluation of benefit in terms of cost effectiveness is an important theme when considering the social and political demands which are increasingly being placed on higher education to justify costs. It could be argued that in terms of some of the claims made for business simulations in relation to helping to cope with increased numbers of learners in higher education and make more effective use of teaching resources by providing assistance to teach large cohorts of students this should be considered to be very important. However, in practice there is very little attempt to engage in this form of evaluation and attempting to do this would introduce a set of very complex issues which are not in the scope of the current research.

When used collectively and appropriately these various forms of evaluation can provide an accurate picture of the value of particular business simulation and through replication studies across a range of business simulation products they can provide more generalisable conclusions about how business simulations impact on student learning taking into consideration any environmental considerations which influence change in performance which have been observed (and how some of these considerations may in part explain them).

As Newton and Doonga commented (with reference to e-training but equally applicable to evaluation of any teaching intervention):

> *Evaluation is never an easy task. However, it is a task which is of critical importance and in the context of e-training must be engaged with in order not only to provide justification of achievement of anticipated benefits but also to contribute to the continued refinement and improvement of the systems used for its delivery. (Newton and Doonga, 2007)*

Thus, the focus of the discussion provided below will be to identify and differentiate the roles of the academic and the developer with respect to evaluation of business simulations. The role of the developer and the academic as discussed below in Section 5.4 will be restricted to the manner in which they evaluate business simulations when either testing the system which has been created (developers) or are engaged in the process of selecting an appropriate package to meet the pedagogic objectives which they intend for their teaching (academics). The more complex issue of how academics evaluate the impact of use of simulations on students with respect to whether or not business simulations actually achieve these objectives will be discussed in Section 5.5 of this thesis.

5.4 Formative Evaluation of business simulations

In terms of the above typology of evaluation the role of the developer is to engage in formative valuation. However, in terms of assessing and selecting a particular simulation package it can also be seen to be an important consideration for the academic.

5.4.1 Formative Evaluation – The role of the Developer

Feinstein and Cannon (2002) note that from the perspective of the developer simulation validity is based on:

- Internal validity – that the business simulation functions as intended, and
- External validity – that the business simulation accurately represents the phenomenon or situation which is the subject of the simulation

This is clearly a limited definition of evaluation and in no way covers all of the tasks which are important in terms of ensuring that the business simulation actually delivers the range of pedagogical objectives which have been discussed above. Nor does it provide an assurance that all of the benefits which developers and suppliers claim can be associated with the implementation and use of business simulations in either a training or higher education context. (These benefits were noted above when examining what claims were being made by suppliers and which represent significant benefits in terms of the teaching and learning experience of users). Nonetheless the very restricted definition of what the role of the developer is in terms of evaluating the products which are being developed is justified. The developer of a business simulation, as is the case with any other software development, must assume responsibility for ensuring that the product works according to specification and the most important part of this is to ensure that the software itself is rigorously tested to ensure that it functions correctly. To a large extent this, therefore, means that the developer must ensure that the technical specification of the software is accurate and there are no technical or operational issues which mean that user experience system failure or unexpected results when using the materials. Other authors note that software testing is an empirical evaluation of the product or service with respect to how it was designed to operate and attempt to identify the key steps in doing this when developing business simulations – notably through a full requirements analysis, report systems, defect analyses and retesting which are typical of any software development quality assurance process. It is contended that more importance needs to be placed on requirements analysis and other authors argue that in the case of business simulations developments problems most frequently arise because designers do not have a full understanding of the nature and purpose of the application. Ultimately, however, it is clear that using the terminology of evaluation defined above the role of the developer of a simulation package is theoretically restricted to ensuring that the learning package is 'fit for purpose' in terms of functioning correctly to deliver an appropriate level of content and activities to support student learning and using appropriate design interfaces.

There are a number of checklists of features which business simulations should have which can be used to assist their evaluation. Nikoukaran et al. (1999) provide a comprehensive review of the various published criteria for evaluating simulations and provide a useful model which brings this work together in a framework for evaluation. Their work is concerned exclusively with the manner in which academics should perform this task when selecting a simulation package or making comparisons between different simulation but it is equally well suited in parts as an aid to simulation developers – particularly in terms of considering the technical features which should be included and the manner in which the software should be tested. They develop a hierarchical model to perform what they term an 'assessment of suitability' of simulation packages. The main criteria which are at the top of the hierarchical structure are illustrated in Figure 5.4 (below). Each of the 7 elements at the bottom of the hierarchy are further expanded and developed to include subhierarchies of specific criteria to be evaluated under each element.

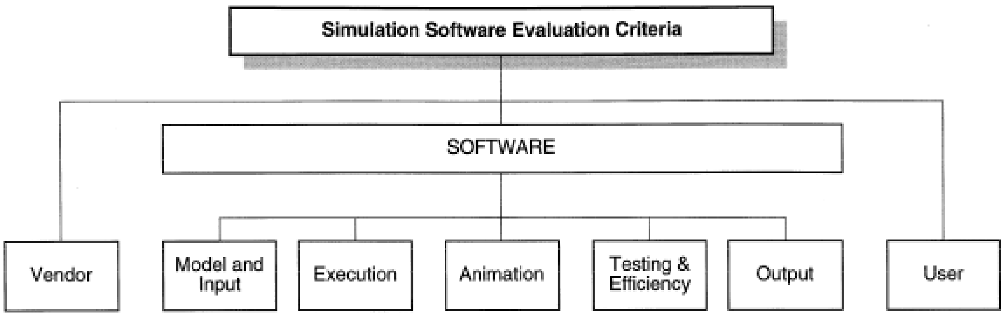

Figure 5.4 Main Criteria Groups in Hierarchical Evaluation Framework for Simulations (from Nikoukaran et al. Criteria for software evaluation (1999) p.221)

The model is very well developed but it should be noted that the part of the hierarchy dealing with users does not address some very important issues   In particular there very little development of how the simulation package should link with specific educational objectives which an academic may wish to achieve when using the simulation.

5.4.2 Formative evaluation – the role of the Academic

Formative[14] evaluation may also be conducted by the terms of selecting an appropriate system to meet teaching requirements. Clearly there is a difference in the manner in which this has to be conducted and does not involve extensive software testing.   The evaluation by the academic should not be focused principally on the detailed functioning of the system – it can be assumed that the developer has undertaken this task. To ensure that this is the case the academic would generally have the assistance of an IT department who could verify that the system functioned in the manner described by the developer – e.g. meeting any technical requirements for being integrated into the existing IT network, ensuring that the appropriate bandwidth required for an internet based application could be supported, checking the detailed specification of any equipment required and ensuring that there was a reliable support system for use of the package and appropriate procedures for dealing with systems development and upgrades.

The role of the academic is to ensure that the simulation being purchased meets the requirements for which it is to be used in terms of addressing the specific pedagogical objectives which it is designed to deliver. This obviously entails ensuring that the content and level of content is appropriate but should also entail examining in detail the claims made with respect to usability of the package, the design interface, the level of learner interaction provided and any additional requirement which are

[14] *It should be noted that there is another issue around confusion in use of terminology as the term formative evaluation is also often applied to mean the assessment of learners where the outcome of the assessment does not contribute to their overall mark or grade for an accredited course of study.*

necessary to underpin use of the learning materials in the context in which it is envisaged they will be used.

A model which is particularly useful for academics who are considering using a simulation and which is cantered much more around the pedagogical objectives of simulations is provided by Reeves in what he describes as the effective dimensions of interactive learning systems (Reeves, 1997 Online: Accessed April 2011). The dimensions established by Reeves are assessed on a non-scalar continuum and thus provide a general indication of pedagogic approach rather than a proscriptive classification. (Figure 5.5 below).

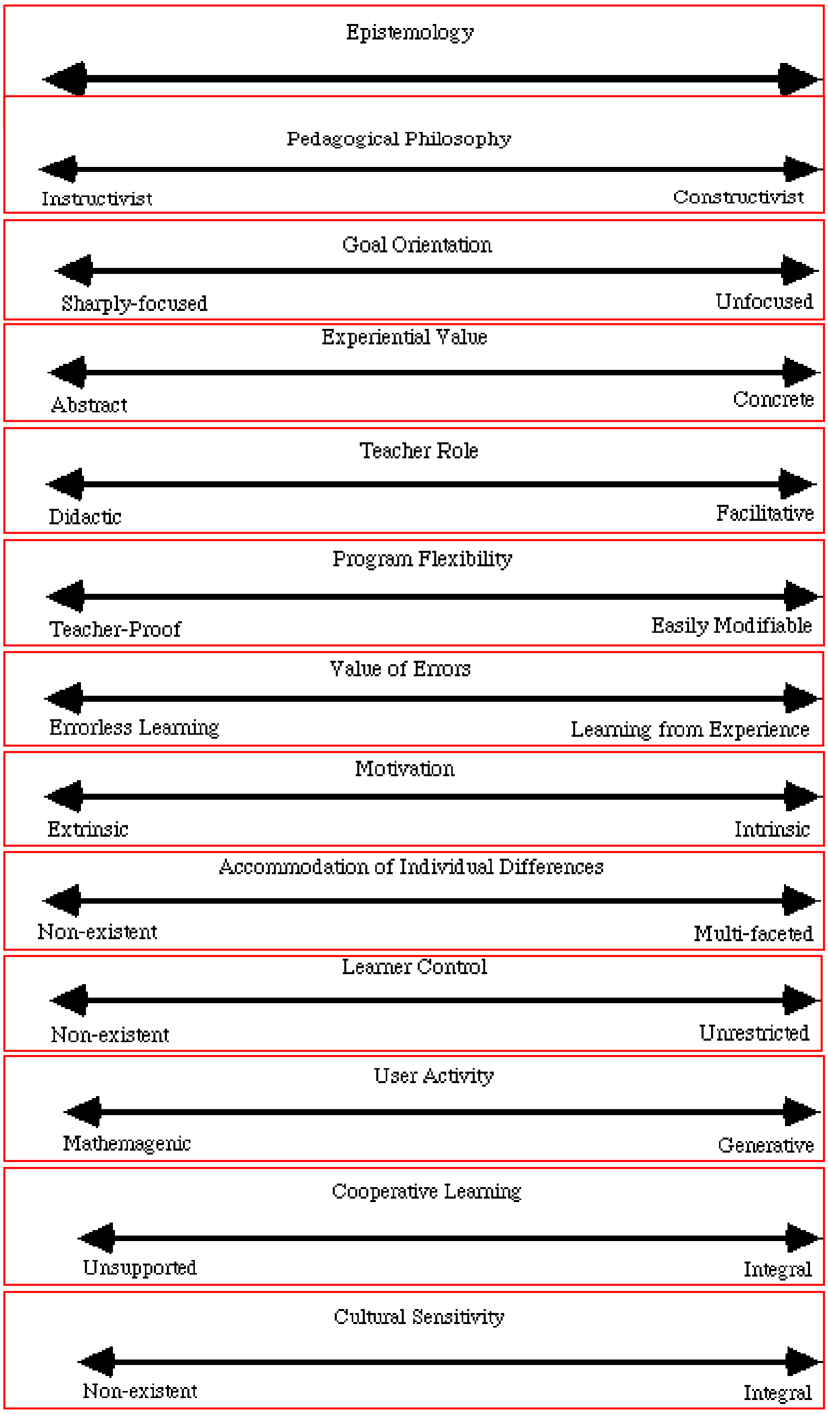

Figure 5.5 Summary Reeve's Evaluation Dimension

The dimensions which are evaluated are described briefly below and some of the pedagogical concepts have already been discussed in more detail earlier in this chapter of the thesis as they will have a very important bearing on how the instructor sets about evaluating student learning. Reeves' description of the dimensions (which is based on any computer based learning material) has been put into the context in which it applies specifically to use of business simulations.

1. Epistemology

This refers to the extent to which the content of the instructional material is based on providing learners with access to a comprehensive body of material from which they can learn and apply facts, principles or theories. The scale on which it is measured is based around the extent to which this feature of the instructional material predominates. The scale measures the extent to which the learning materials emphasize the importance of acquiring the knowledge provided as opposed to the extent to which the learner is required to create their own knowledge and understanding through engagement with the learning materials (often in problem based scenarios).

2. Pedagogical Philosophy

Interpretivist learning philosophies put the emphasis on achieving goals and objectives which are pre-set within the teaching materials whereas constructivist philosophies place more emphasis on discovery learning and self exploration of the learning materials.

3. Underlying Psychology

Behaviourist psychology puts an emphasis on memorization, direct instruction, and drill and practice while cognitivist psychology places much more stress on development of thinking skills and problem solving abilities

4. Experiential Validity

Experiential validity is measured on a scale from abstract to concrete – the concrete end of the spectrum referring to learning experiences which are grounded in 'real world' experiences – sometimes as Reeves suggests replicating apprenticeship . Environments which rely heavily on lecture type presentations, text based materials or theoretical discussion are seen to be more abstract and less obviously demonstrating experiential learning value

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5. Teacher Role

The teacher role ranges from didactic to facilitative. This evaluative dimension is designed to assess the extent to which a business simulation package is designed to support the instructor in providing an independent learning system which supports the teacher in undertaking a more facilitative role in individual or small group work. In the light of the discussion above on the role of the academic when implementing simulations it is again worth stating that as Gilgeous and D'Cruz (1996) emphasize that business simulation must support but cannot replace 'traditional' learning mechanisms and this is an important point to consider when examining the potential value of simulations in teaching. Specifically with reference to evaluation it is important to clearly identify the context in which business simulations are used as this will have a crucial role on whether or not they can achieve the pedagogical objectives set by the instructor.

6. Programme Flexibility

A theme which is often raised in the literature concerning the implementation of new and particularly computer based educational interventions is that a common reason for failure is because of inadequate implementation by the instructor. This pedagogical dimension is designed to measure the extent to a business simulation is designed to constrain the instructor to adopt a particular approach to teaching 'teacher proof' or is designed to be adaptable and support a variety of teaching approaches i.e. 'easily modifiable'.

7. Value of Errors

This dimension ranges from what Reeves terms 'errorless learning' to 'learning from experience'. It is a dimension which encourages an evaluation or examination of the extent to which the learning system allows the learner to experiment with the teaching materials and undertake tasks or assessments where it is possible to make errors and then learn from these so is particularly important when evaluating business simulations In business simulations which involve cumulative decision making in order to achieve the 'ideal' position for the organization in terms of competitive advantage it is clearly important that the system can accommodate errors and allow the user to compensate for these at a later stage – i.e. help the learner to 'learn from his mistakes' .

8. **Motivation**

This is a complex dimension and Reeves has represented this on a continuum from extrinsic to intrinsic motivation. As Reeves notes on a separate article:

> *Intrinsically motivating instruction is elusive regardless of the delivery system but virtually every new approach to come along promises to be more motivating than any that have come before. (Reeves, Online Accessed April 2011)*

This is an accurate observation. However, it should be noted that whilst it is very important to look at this dimension in terms of intrinsic and extrinsic motivation the two should not be viewed as being necessarily exclusive (which Reeves appears to imply). Ideally this dimension is actually two dimensions which should cover each of these factors separately and range on a continuum from non-existent to highly supported. In terms of intrinsic motivation this must be evaluated by a careful study of the business simulation package and developing a judgment or opinion on the degree to which its design is likely to provide an engaging environment which encourages students to interact with the materials and take control of their own learning (and this may include the extent to which the gaming elements which are provided are motivating and engaging). Extrinsic motivation is a factor which is almost exclusively influenced by the instructor and is determined largely in practice by the extent to which students are rewarded either for participation or performance in using the simulation. The single most important extrinsic factor for learners in a higher education context will be the manner in which their participation and/or performance is assessed. Snow (2002) cites Faria's 2001 survey of 25 years of research in business simulations as noting that in this particular area it is consistently reported in the literature that

> *'teams in high simulation/game grade weighted sections out-performed teams in lower grade-weighted sections'. (Snow, 2002 p.527).*

9. Accommodation of individual differences

It is generally recognized in the pedagogical literature that all learners must be treated as individuals and accommodation must be made for factors such as demographic characteristics (e.g. age, sex, social background) prior knowledge or experience, degree of comfort or expertise in use of technology, or individual learning styles. However, it is not always the case that learning approaches take these into account and in particular in computer based learning the systems will vary to the extent that they do this. Generally this dimension is considered on the basis of users adopting particular learning strategies with which they are comfortable and depending on the instrument used to determine this learning style (e.g. the Gregorc learning style, Myers-Briggs test) they may be variously categorized as concrete learners, sequential learners, abstract learners, etc. Because of the nature of collaborative learning which is supported by most business simulations it can be argued that the focus of this dimension should be more directed at the extent to which inter and intra group differences can be accommodate but there is little research on how this can be achieved.

10. Learner control

Learner control refers to the extent to which learners can make choices both in terms of the parts of the material they study and the order in which they do this but also in the manner in which they can interact with the system to gain information, gain feedback or control the pace at which they learn. Research findings on learning control are generally inconclusive in terms of how beneficial it is and there is some debate as to whether the learner is capable of making informed choices on their own pathway through learning materials which is often seen as primarily the function of the instructor. Generally in business simulations the materials developed are designed to be tackled sequentially with a number of critical decision making points embedded in the simulation. The tutor or instructor, however, may be able to influence the degree to which learners control their progress through the simulation by setting deadlines on decision making, introducing additional exercises to provide learners time to reflect on their learning at different stages of the simulation exercise. This in fact may be a crucial aspect depending on the time which can be devoted in the curriculum to deliver the simulation and to ensure that it is fully integrated with development of pre-requisite skills and knowledge taught in other areas of the curriculum.

11. User Activity

Some learning environments are focused almost exclusively on delivering content to the learner in one particular format while others provide access to various representations of content to encourage learners to engage with the learning material to build up a representation of knowledge which can themselves feel comfortable with. User engagement with the learning system is crucial if the aim is provide learners with the opportunity to question what they are learning rather than to passively accept what is given. The terms ‘mathemagenic’ and ‘generative’ to describe different extremes of facilitating the learner to be actively engaged in the learning process are derived from Hannafin’s studies on use of technology in learning environments (Hannafin, 1996)

12. Co-operative Learning

This dimension refers to the extent to which the learning package supports group working, small team working or collaborative learning across teams. It is interesting to note that at the time Reeves first put forward his pedagogical dimensions for computer-based education the support for group or team based approaches from learning was not well developed. It is now generally acknowledged that group learning is beneficial both instructionally and socially. As has been previously noted most business simulation packages are designed specifically to support group learning and advances in communications technology has allowed this to be developed across large groups of learners who may be geographically distant.

13. Cultural Sensitivity

This can range from non-existent to being integral to the simulation. Generally if it is important to ensure that the learning is delivered to an heterogeneous, international group of learners and/or it is implicit in the learning objectives of the course or component of a course that an international dimension is required this area must be carefully examined to ensure that there are no cultural biases which may impact on learning. A more subtle cultural bias which is almost endemic to simulations is that they often adopt a US based approach both in language and in general approach and ideally academics should evaluate simulations which have a broader cultural perspective more favourably.

5.5 Methodology for Evaluation of Student Learning from Business Simulations

The above sections have examined evaluation very much from the perspective of development and selection of business simulations which have been categorized as comprising formative evaluation. It is also important to consider evaluation more holistically and in particular examine the role of illuminative, integrative and summative evaluation from the perspective of the learners. Gosen and Washbush (2002) contended that for educational systems to be viewed as credible tools for learning it is essential that they can by justified in terms of the involvement of student time and cost. However, little progress has been made on this. Chin et al review the assessment of the educational value of business simulation and gaming over the past 40 years. The review analyzed the data from an extensive number of studies and metastudies in order to examine themes which were recurrent in the literature on evaluation. They contend that evaluation of simulations has been more thorough than in other areas of education partly because of the sceptism of the validity of using simulations and games in higher education. (Chin, 2009). However it has equally been pointed out by a number of authors that the existing literature on the educational validity of simulations does not provide an adequate research methodology to conduct such investigations and whilst the number of studies may be large they do not always address the significant issues which need to be tackled when evaluating student learning. Stainton (2010) concludes that past studies on business gaming simulations (and more specifically total enterprise simulations) have been inconclusive and attributes this to the lack of a clearly defined research framework. In attempting to develop a research methodology framework for examining the educational validity of business gaming simulations Stainton reviews work of earlier researchers in the area e.g. Carvalho, on simulations (1991) and Peters, Vissers and Heijn (1998) on games, were considered. However, none of the existing approaches fully take into account the different environmental factors which impact on student learning. Stainton's own suggested model for evaluation, however, like many other studies into the evaluation of computer based technology is cantered mainly around what he terms the 'quality of the model design' of the business simulation and does not focus on the central question of the overall teaching and learning objectives which the business simulation is designed to achieve.   Thus when Stainton agrees with Burns, Gentry and Wolfe (1990) that 'a primary measure of business gaming validity is the learning effectiveness of the teaching medium' (Stainton, 2010 p. 706) this demonstrates a very narrow view of how learning should be evaluated. It is clear that a better framework is required both for both interpreting the results of previous evaluations on the use of business simulations and for application in conducting new evaluations.

5.6 Framework for Evaluation

There have been a number of attempts to clarify the issue of when and where quantitative or qualitative techniques are required and when it is appropriate to use the different types of evaluation techniques which have been described above. It is important to examine these models and to reflect critically on them from different perspectives. As Schwandt notes it is always important in evaluation to ask the question 'Are we doing the right thing and are we doing it well' (Schwandt, 1988 p.11). Thus a number of different approaches to evaluation were examined. A logical starting point was to look critically at the model put forward by Kirkpatrick which is widely used in evaluating the benefits of training interventions – including technology based learning. Kirkpatrick (1959, 1976, 1994) looks at four levels of training outcomes – reaction, learning, behaviour and results. Reaction covers affective issues such as user response to the teaching and perception of relevance, learning is subject to objective measures to 'test' the learner's comprehension of the learning material, behaviours address the extent to which the knowledge and skills are applied (transfer of learning) and finally results are quantified in terms of the overall benefits to the organisation which implemented the learning intervention. The four levels are seen as being progressively more difficult to evaluate. The model is important in that it was probably the first attempt to look at evaluation in a systematic manner but increasingly the model is seen to be flawed and is subject to criticism in the literature. In particular the model does not translate well into a formal higher education setting and related to this is the considerable difficulty which evaluators have experienced in attempting to objectively assess learning and make a direct causal link between learning gains and the learning intervention itself. As Mueller-Hofvenschoeld (2004) reports Kirkpatrick's Learning and Training Evaluation model 'provides a vocabulary and rough taxonomy for evaluation criteria'. However it fails to provide a clear link to practice and ultimately raises many questions about how the four levels can be accurately measured.

Newton (2001) summarises a range of these issues and developed a framework which attempted to capture the basis on which evaluations should be conducted when considering the use of new technology in teaching. The framework which he presented (Figure 5.6 below) was derived from an examination of a number of existing frameworks for evaluation and in particular drew heavily on the model proposed by Jones et al. at the Open University. The framework considers how evaluation should be conducted, data collection tools and techniques used for interpreting results.

The framework is presented as a matrix which provides the basic structure which ties together the developmental and implementation issues concerned with technology based teaching interventions and seeks to give general guidance on what is required (in terms of action to identify and analyse information) at each stage and how this information can be gathered. As such it provides a useful starting point for a framework for evaluation of business simulations but more specific information is required on the manner in which factors influencing the evaluation must be dealt with in terms of developing an evaluation strategy.

	Educational Objectives (Development Stage)	*User Interaction and Acceptance (Formative Evaluation Stage)*	*Learning Outcomes (Summative Evaluation Stage)*
Purpose	Evaluation of CAL must be framed in the context of what CAL was intended to achieve.	Ensure system performs according to specification	Learning outcomes and/or affective outcomes (perception or attitude) must be considered when evaluating courseware
Data which must be collected	A clear statement of aims, and objectives of CAL and the context in which it is designed to be used	Feedback from learners Learner Profiles	Evidence of: Quantitative changes in delivery costs Quantitative changes in knowledge/cognitive skills Qualitative changes in attitudes
Possible data collection/analysis methods	Analysis of policy documents Interviews with CAL developers. Analysis of published output	Questionnaires to elicit demographic data Learning Style Inventories Observation Online tracking of actions Confidence logs Think aloud' protocols Focus groups	Costing models for educational delivery Standard tests and quizzes delivered pre and post use of courseware or comparative success of paired groups Attitudinal questionnaires administered pre and post use of courseware Performance criteria for course delivery and completion e.g. student success ratios, student wastage, course evaluation questionnaires

Figure 5.6.Evaluation Matrix (for Computer Assisted Learning (from Newton, 2001 and based on a range of other frameworks and work on evaluation – notably the Open University framework for evaluation) (Jones et al., 1996)

The evaluation matrix is still seen to be generally a viable framework for conducting evaluation. However, in order to provide more focus on the specific issues which relate to business simulation evaluation the matrix has been modified by the researcher and has been more closely tied to those issues. In addition when considering the evaluation matrix it was decided that more specific focus needed to be given to a discussion of the general types of evaluation which may be conducted and clarify in particular the role in which integrative and illuminative evaluation should be viewed in terms of an overall model for evaluation and make clearer the distinction between formative and summative valuation. Broadly in terms of the tools used in evaluation these are generally applicable to any educational technology evaluation..

The new matrix (Figure 5.7) follows the previous one in examining evaluation from the point of view of purpose, data to be collected and analysis to be conducted for each stage of the evaluation process. However, the columns of the matrix are tightly focused on evaluation from the perspective of:

1. the developer/or academic having to determine which business simulation package to adopt
2. the academic evaluating how students learn using the business simulation/how best to integrate the simulation in teaching, and
3. the academic evaluating student learning outcomes which are achieved

Figures 5.7 Evaluation Matrix for Business Simulations (developed by the researcher incorporating an extensive review of the literature concerning previous frameworks or providing guidance on evaluation of technology based teaching)

EVALUATION TYPE	*Development and Selection Formative Evaluation*	*Integration and Use Illuminative Evaluation*	*Integration and Use* Integrative evaluation	*Outcomes of Use* Summative Evaluation	*Economics of Use Cost-benefit Analysis*)
BASIS FOR EVALUATION	***Systems performance***	***How students learn***		***What students learn***	***Justification of costs***
FOCUS OF EVALUATION	***Functionality of system***	***Stated learning outcomes for students***			***Policy documents***
	System objectives	***Student experiences***	***Context in which simulation used***	***Assessment of Student Performance***	***Data on costs***
FOCUS OF TESTS	***System specification***	***Student perceptions of value***	***Student experience of use***	***Quantitative changes in skills/knowledge***	***Comparison of costs***
INSTRUMENTS	***Standard systems and usability testing for systems hardware and software*** ***Implementation guidelines and user documentation***	***Student experience questionnaires*** ***Interviews*** ***Focus Groups*** ***Observation of use*** ***Confidence logs*** ***Think aloud protocol***	***Student experience questionnaires*** ***Interviews*** ***Focus Groups*** ***Observation of use*** ***Confidence logs*** ***Think aloud protocols***	***Standard tests and quizzes administered pre and post use of simulation*** ***Attitudinal questionnaires administered pre and post use of simulation*** ***Performance criteria for course delivery, course completion, student success ratios*** ***Objective assessment tests***	***Costing models for educational delivery***

The framework outlined above has been used in the analysis of the literature on the evaluation of business simulations and it has also been adopted in considering the illuminative and integrative evaluation case study which is described in Chapter 8.

The basic twofold purpose of evaluation matrix remains focussed on:

- assisting in the systems development and selection process (formative); and
- determining the effects of a particular educational intervention on the process being studied (illuminative, integrative and summative).

The framework matrix explicitly recognizes that in terms of formative evaluation there are 2 distinct processes which can be viewed respectively as being the principal responsibility of developers and academic staff/instructors respectively.

Illuminative, integrative and summative evaluation would normally be conducted by academic staff. The manner in which this is done is one of the most contentious areas in research not only of business simulations but in terms of evaluation of any educational innovation. These types of evaluation contrast sharply with the narrowly defined purpose of formative evaluation to establish 'internal validity' which has been discussed in terms of the way in which developers should test their products or academics should assess their suitability when selecting products. The evaluation of student learning is much more complex. Such evaluation needs to reflect a broad range of activities which attempt to measure the educational benefit or make more explicit the mechanisms by which students learn in response to introducing a new teaching method. Such studies tend to be distinctive because (at least in theory) they are designed to tackle the fundamental question of whether an improvement in the quality of learning or effectiveness of teaching can be detected.

5.7 Application of the Framework for evaluation of student learning from business simulations

It is vital before conducting any evaluation to be clear at the outset on the purpose of the evaluation. This will form the basis for selecting an appropriate type of evaluation. The use of illuminative evaluation will lead to conclusions about how students learn. Undertaken in conjunction with integrative evaluation this will provide further details on the factors which have a positive or negative effect on the reported learning. It would still be valid to undertake a separate summative evaluation but the researcher would need to be much more cautious about the conclusions which can be drawn. Illuminative evaluation is generally supported by consideration of a range of contextual factors which provide evidence to explain its conclusions.   This approach therefore answers an evaluation question which can be framed in the form 'How do students learn using …' or 'Why do student learn … ' or 'What are the factors which contribute to students' perception of a positive or negative learning experience'.

In contrast summative evaluation is used when attempting to address an evaluation objective which seeks answer to a different type of question. Typically questions which require use of a summative evaluation methodology are those such as ' How well did students perform using …' or 'Did students perform better using the simulation as opposed to using a different form of learning?' Generally the outcomes of a summative evaluation try to provide a 'statistically significant' conclusion to confirm or deny the benefits to be gained from using a business simulation.

The summative approach can be seen to be more closely aligned with a positivist research paradigm and seeks to provide concrete answers to questions which can be objectively validated[15].

Not surprisingly therefore, when considering the different approaches to evaluation the literature shows a difference in ideological standpoint typified by a quantitative versus qualitative debate (Miles et al. 1994; Flagg, 1990), different emphases on the stages of an evaluation (e.g. the relative importance of formative and summative evaluations) and different issues which are relevant to the overall strategy adopted by the courseware and the objectives it sets for itself. The literature reviewed on summative evaluation can be considered as falling into two main categories – the advocates of a rigorously quantitative approach to determining the manner in which 'learning effects' can be measured subsequent to the introduction of a new piece of

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[15] *It should be noted that while it is outwith the scope of this research issues relating how to conduct an evaluation as are also evident when attempting to measure the benefits of using simulation in any evaluation related to costs (again using a positivist approach). Ideally results should be presented clearly in terms of financial statistics which should demonstrate the return on investment. Claims for return on investment are frequently cited by suppliers of training simulations to corporate clients but are frequently open to criticism. The most frequently cited evaluation methods is Kirkpatrick's model which attempts to quantify the return on investment for training activities but there is an extensive literature which throws doubt on the validity of the methods used. It is interesting to note that whilst the academic community is increasingly operating in an environment of financial constraints there has been no attempt to evaluate the benefits of using simulations in terms of costs which incorporates claims of efficiencies in costs associated with student learning. The literature on implementation of business simulation is much more focussed on discussions of improvement in quality rather than justifications on economic grounds. This observation was also evident in Cooper and Lybrand Accountants report on the UK TLTP(Teaching and Learning with Technology) programme which evaluated the various projects which had been funded and notes that:*

> *An original TLTP objective was to make teaching and learning more productive and efficient. Our fieldwork suggests that this objective became less prominent as the programme progressed; the emphasis instead has increasingly been placed on quality improvements. The academics to whom we have spoken have certainly been much more comfortable with the concept of working towards improving quality than improving efficiency. (Coopers and Lybrand, 1996, p.61)*

This also provides a useful example which highlights the need to clearly define the overall objectives of any evaluation study in order not to run into the danger of 'asking the wrong questions'.

courseware and those who advocate a qualitative approach to evaluation based often around measures which explain affective considerations of those involved in using the software and measure success on the basis of student perception of the learning experience.

The fundamental problem for summative evaluation is that in terms of student learning the basic reason for reported findings (whether positive or negative) in terms of why the students succeeded or failed to learn is often not fully explored. I.e. it still leaves the question of why students learned or failed to learn better. In addition the underlying reasons for success or failure may be associated with a range of ‘confounding variables’ i.e. reasons which account for success or failure which are not accounted for in the reported research.

In addition, a very important point in terms of summative evaluation of student learning with respect to use of business simulations is to clearly establish what is meant by ‘success’. Learning within a simulation is an individual level construct – performance is an objective measure of how individuals compare with others (or with the computer) against set criteria.

The manner in which criteria are set for measuring student success is therefore very important. There is an important link between use of summative assessment and learning theory depending on which pedagogical objectives of the learning system being are being assessed. The learning theories which have described above in terms of being behavioural, cognitivist or constructivist) vary in the extent to which learning can be objectively measured. Thus a system which is purely designed using a beviourist approach and involves only a transfer of knowledge may be adequately assessed using simple assessment tools such as multiple choice questions which can give much more well defined and objective criteria for specifically defining a learner’s performance. However, assessing cognitivist or constructivist based objectives are much more difficult and require much more complex assessment instruments and incorporate factors in the assessment which are not entirely based on the specific content on which the learner is being assessed. Cognitive approaches to learning (and specifically constructivist models) are currently the dominant paradigm in educational psychology. They have given rise to a great deal of interest in adopting a cognitive view which lays considerable store on the learner's need to build internal representation of knowledge through their involvement in learning. Business simulations as has been noted above almost invariably claim to support a cognitivist or constructivist learning philosophy and can demonstrate that the principles which characterize such approaches are clearly integrated in business simulations/games packages. Significantly and paradoxically therefore it is thus very difficult to provide a firm basis for use of summative evaluation in relation to constructivist environments given that the aim of that environment is to promote an 'open-ended' learning experience and, if successful, the results of the learning experience may be unique to each individual learner.

Indeed there is a also question surrounding whether the assessment of learning should be done in terms of success in the results of student use of the simulation (their 'game result' or position overall in terms of other competitors) or by using other means such as performance in class assessments, or by assessment instruments which are designed specifically to test learners knowledge and understanding of the concepts and theories dealt with in the simulation. As Washbush and Gosen (2001) point out learners who perform badly in a simulation may in fact learn substantially. Similarly a high performance in a simulation game does not necessarily mean that the participants have learned – comparative performance can be measured by looking at performance in objective tests but this does not give an assurance that the learning objectives in relation to higher order learning has been attained as demonstrated for example studies by (Keys and Wolfe, 1990). Gopinath (1999) thus explores learning as a perceptual variable rather than a variable which can be measured by quantitative performance. Some authors have voiced criticism of the lack of 'hard measurement' (e.g. Clarke, 2009). However, by definition, there is an inherent difficulty in determining objective scales to measure the outcomes of constructivist learning environments. Thus studies such as those reviewed by Wolfe (1997) show learning benefits measured by assessment instruments which are very basic – e.g. true false statements, performance in coursework, mastery of facts rather than learning which clearly are not instruments which measure the pedagogical objectives set for the simulation.

It is difficult to predict and measure the relative advantages and disadvantages of introducing educational technology into a course but it is essential to evaluate whether the benefits of using new technology have been realized. Often it is the case that because the technology is new evaluation tends to be confused with issues which are cantered on the effectiveness of the technology itself – the hardware and the software and the systems methodology adopted to design novel courseware packages. (As is the case, for example in the survey described earlier which was undertaken by Doyle and Brown, 2000) However, as has been discussed in the previous chapter these should primarily be the concern of the developer of the technology and not the main concern of users of the technology who should be focused on ensuring that the learning benefits expected from using the technology are realized.

Finally, another important point which should be discussed prior to a full examination of possible evaluation methods and frameworks concerns the issue of who should be involved in conducting an evaluation. Ideally, in a summative evaluation seeking to achieve objectivity, this should not be the developer of the materials or anyone closely involved in the implementation of the project though for practical reasons it is generally the case in evaluations of learning technology that the academic who is responsible for introducing the technology is also the principal person involved in conducting an evaluation. There are also important reasons why the academic responsible should be involved (particularly in illuminative and integrative evaluations) as one of the main reasons for conducting the evaluation it not simply to determine whether or not the implementation has been successful but also to uncover the way in which the use of the business simulation has contributed to achieving the objectives set,

It is nonetheless important to achieve as much subjectivity as possible and to avoid the problem which is typical of some 'evaluations' which are essentially rationalizations which attempt to prove the worthiness of the work conducted. If, as is often the case, an evaluation has to be conducted by academic staff who have been involved in delivering the business simulation then it is essential that there is a clearly defined methodology for conducting the evaluation in order to avoid this problem and to deliver reliable conclusions about the effectiveness of the business simulation. In addition academics who have introduced the new technology and then evaluate it have to be aware of what Dill refers to as the ‘halo’ effect leading to a bias in judgment in terms of success of the new technology because it has been introduced to them as something ‘new’ and as an ‘improved method’. (Dill, 1961)

5.8 Literature related to Evaluation of Simulations

The framework for evaluation which has been developed by the researcher and described above provides the basis for an informed discussion of the effectiveness of previous studies in this field. The literature research failed to find any study which fully encompassed all of the issues which are made explicit in the framework though various studies demonstrated that research had been undertaken on some elements within the framework.

Essentially the framework deals with the integration of a range of dimensions which are required to prove an holistic evaluation of simulations whilst acknowledging that for specific types of evaluation (formative, illuminative, integrative and summative) some of the dimensions are less prominent than in others. A full evaluation must acknowledge the importance of a range of all issues which may explain either the behaviour of the learners or the results achieved by them. These issues will have a significant impact on the type of data which needs to be collected and the tools which are used to conduct the evaluation. The three main areas which must be explicitly defined are:

- Pedagogic Approach –i.e. Identification and clear statement of pedagogic objectives in developing the business simulation (defined broadly as behaviourist, cognitivist or constructivist).
- Target Learner Group – i.e. identification of who the business simulation is for. This should takes into account the educational level at which the materials are targeted, whether the material is designed for use in accredited learning courses or to be delivered as part of a training course, and whether the simulation is based on individual or group learning. It is also very important that the business simulation comprehensively covers all of the members of the target group so this factor may also address issues such as individual learning styles or individual learning

differences which may have an impact on how the learners interact with the simulation and therefore potentially influence the overall learning experience of individuals. The importance of the target learning group is often not fully taken into account when reporting on evaluation of business simulations.

- Context of Delivery – clear identification of the context in which the business simulation is used and in particular what other teaching is provided to support learners to acquire the skills and knowledge to be delivered using the business simulation software. Snow et al (2002), for example, note that:

> *Despite the fact that a business simulation is an experiential method of learning, very often it is introduced to students by means of them having them read the manual and then having the professor lecture about it (Snow et al., p.526).*

All three of the dimensions described above will have a major influence on the evaluation which must be conducted because they collectively provide data which informs us of the purpose and context in which the courseware was developed and the intended outcomes of using the business simulation. This will then have a direct impact on the hypotheses or research questions that need to be addressed and hence influence the evaluation strategy that must be employed. Within any individual study all three of these issues may have an impact on the validity of the findings. It is therefore argued that the framework for any evaluation of business simulations (and in fact any evaluation of teaching) needs to be multidimensional and that the reason evaluations fail or give inconclusive results is generally because they fail to ensure that all of these dimensions are taken into account.

In order to explore the main issues which had been evidenced in the literature of business/games simulations, in 2001 Faria reviewed the conference proceedings of the previous 25 ABSEL (Association of Business Simulations and Experiential Learning) conferences and noted that there were 3 major themes which had been explored by contributors:

- Correlation of business performance with attributes of the learners (as individuals or in teams) –i.e. appropriateness of simulations in dealing with specific differences within the target group of learners

- The appropriateness of business simulation games in developing their strategic management knowledge and skills (mainly through comparison with other learning activities and the manner in which learning was supported)

and,

- What types of learning business simulations could effectively support (subdividing this into what he termed cognitive learning, affective learning and behavioural learning)

A range of these research papers was reviewed and additional studies either in other journals or more recently published within *Simulation and Gaming* or in other journals dealing with educational technology and learning were reviewed and their findings are discussed below. Firstly it should be noted that a simpler and more comprehensive overview of the literature on business simulation evaluation may be defined in terms of a categorization of publications in terms of:

1. Studies which explore the benefits of using business simulation on the basis of pedagogic approaches which they support.
2. Studies which aim to demonstrate the benefits of business simulations as a teaching method and do this by comparing the results of using business simulations with those reported by other teaching methods – generally using quantitative approaches to identify significant differences
3. Studies which aim to identify (and explain) individual or multiple factors which contribute to success or failure when using business simulations – either using quantitative or qualitative approaches

Critically reviewing these it is contended that the first of these is now well established. The pedagogic benefits have been extensively reviewed and related to both approaches to learning theory and models of learning. The discussion earlier in this chapter has dealt with this.

The second and third themes dealt with in the literature are more problematic In particular the second theme in research papers on use of business simulations (i.e.

comparison of ‘results’ achieved when using the simulation with ‘results’ when using other teaching methods) fail to provide positive results. Where there are claims that results are positive an examination of the studies are show that they are either not comprehensively described or fail to take into account a range of contextual factors which may influence the results. Examples from the literature of uses of the second or third approach helps to clarify the contribution (or lack of contribution) which these studies make in terms of evaluating student learning.

An example of the second approach is Wolmaran’s study which discusses the use of a simulation for teaching financial management and analyses the results of three separate applications of the simulation in different contexts. The simulation used was PROSPEX (Macey, 1977) which is a whole enterprise simulation of moderate complexity. The groups who undertook the simulation were

38 students registered on a three year science degree who used the simulation during a 3 day course on finance, two groups of managers (62 learner) on a Management Development Programme, and two groups of MBA students (66 students). Whilst the groups were very diverse in terms of educational background and experience in finance the reported outcomes of the study demonstrate a similarly positive outcome in terms of the reported benefits of using the business simulation. In terms of learning outcomes the groups all reported (in slightly varying degree) in terms of better knowledge and understanding of the financial environment in which companies operate, and improved skills in decision making, and team working. The study attempted to determine how learners rated use of the business simulation in comparison with use of lectures and case studies and again the results (summarized for each group in Table 5.3 below) demonstrate that learners perceived the business simulation as a better method for delivering educational content. The learners in each group were asked to rate their learning experience from different modes of study on a scale of 1 to 10 (10 representing the best learning experience). Means were grouped to indicate whether they were significantly different (A) or not significantly different (B).

Table 5.3 Statistics from Wolmarans' 2005 study on preference for business simulations (adapted from tables presented by the author)

Group	N	Learning Opportunity	Average rating	Standard Deviation	Grouping
Engineering Students	38	Business Simulation	8.63	1.63	A
		Average Lecture	7.18	1.56	B
		Average Case Study	7.16	1.46	B
Management Development Programme Students	62	Business Simulation	8.26	1.29	A
		Average Lecture	7.40	1.28	B
		Average Case Study	7.18	1.47	B
MBA students	66	Business Simulation	8/19	1.49	A
		Average Lecture	7.16	1.35	B
		Average Case Study	7.05	1.27	B

This study has been examined in some detail because it typifies a problem which is common in many similar studies i.e. that the basis on which comparison of learning methods is done is not explained. It is not clear what is meant by an 'average lecture' or an 'average case study'. In addition the impact of context on the results is not clearly taken into account. It is not clear to what extent the business simulation was supplemented by lectures and tutorials on the subject – either delivered during or prior to use of the simulation package. There is clearly potential for learners to be biased in favour of providing a positive assessment of the 'new' teaching method to which they have recently been exposed. In addition to the flaws in the way in which the study was conducted there is also a fundamental limitation to the evaluation which, in common with other studies does not 'illuminate' the reasons why students prefer using the business simulation.

The third of the 'evaluation' themes contributes more significantly to understanding the basis on which business simulations should be evaluated because it addresses specifically how students learning using the business simulation. It therefore contributes to our overall understanding of the critical success factors when introducing and using a business simulation. However, it should be noted that many of these studies also provide inconclusive results because the approach taken is to use complex statistical calculations to attempt to demonstrate statistical significance which is often not fully supported.

Doyle and Brown (2000), for example, attempt to examine the superiority of using business simulations as a method of teaching used of content analysis of user responses in examining responses of students to use of the Business Strategy game. They report 80% positive, 15% neutral and 5% negative responses to using the business simulation. They observed that overwhelmingly negative responses were related to technical difficulties in using the simulation. However the range of interview questions asked which they provide as an Appendix to their study shows that the study was very limited and questions related more to very specific issues related to the content of the simulation and the international context in which the simulation was conducted (being run over a 12 week period by students at universities in Ireland, France and the United States).

Some studies are focused very much on improving the instruments to gather data to demonstrate transfer of learning and significant links between this and use of the business simulation. Anderson and Lawton (2009) note that there has been little progress in research associated with the assessment of cognitive learning in business simulations.
In an attempt to address this Cronan et al (2012) report on use of a simulation for training in Enterprise Resource Planning (ERP). The simulation used was the ERPsim game developed by Leger and used extensively in over 70 universities worldwide. (Leger, 2011) They attempt in their research to develop some objective measures to assess learning at different levels of Bloom's taxonomy (as revised by Krathwohl, 2002). Essentially this involves subdividing an assessment instrument which makes use of objective test questions which academic staff graded in complexity in terms of testing basic knowledge and skills through to testing higher levels of cognitive learning. They also compare these with self-assessed perception of learning by students and conclude (providing statistical evidence to support this) that based on a comparison of the objective criteria they use the self-assessment measures of learning are not significantly different from the objective measures which they have developed.

As noted in the introduction to the thesis Dean and Webster (2000) have attempted to develop an instrument for evaluation of simulations as a learning resource. Their approach using factor analysis to develop a range of ‘ dimensions’ to examine factors such as learner support and engagement, measures to incorporate elements of motivation and measures to attempt to assess transfer of learning. Like Cronan’s work the approach taken is based largely around the application of statistical tests using factor analysis to determine the key factors which contribute to providing a positive learning experience and attempting to quantify the contribution to this made by use of the business simulation.

The development of better instruments to evaluate student learning is certainly an important development. However it should be noted that there are a large number of studies which look in detail at particular factors which do not provide conclusive evidence of a link between enhanced learning and use of the simulation. (many of these have been discussed in Chapter Four of the thesis when describing the main themes around which pedagogical benefits have been claimed for use of business simulations). These all contribute in a limited way to understand student learning using simulations but ultimately do not provide an overall picture of the complexity involved in learning from simulations. As Kriz and Hense note

> *‘the main aim of theory-oriented evaluation approaches is to go beyond testing the outcomes of gaming simulation with regard to meeting their learning goals. The goal is not only to prove whether a simulation works but also to show how and why it works (or fails to work) in a given context (Kriz and Hense, 2006 p.269).*

5.9 Summary

The chapter has reviewed pedagogic theories and noted the context in which business simulations support achieving particular types of learning. It has also reviewed educational models which are important in determining how business simulations can support the learner. A general framework for evaluation of how pedagogic benefits can be evaluated has been presented which looks at the significance of the specific pedagogic objectives or learning outcomes has been set and also identifies context of implementation and the individual characteristics (or group characteristics) of the learners as being a potentially significant factor in designing any evaluation of learning.

As noted in the methodology section of the thesis the focus of evaluation in this study will mainly deal with illuminative and integrative evaluation but as the discussion below demonstrates this does not necessarily have to be the case in all evaluation studies of business simulations. It is, however, entirely consistent to the overall research paradigm on which the thesis is based.

The next three chapters will present findings from the empirical work undertaken as part of this research and in turn they examine the views and opinions of developers of simulations, academics who integrate them into their teaching and the learners themselves.

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Chapter Six

Survey of Developers of Simulations

6.0 Introduction

As noted in Chapter 3 of the thesis a web based survey of business simulation products was undertaken to provide more detail on the types of simulation which were being developed and marketed for use in higher education. The survey reported in this chapter was designed to provide a more comprehensive review not only of the products but of the views and opinions of suppliers on the market for their products and the manner in which they believe their products can support learning. The survey was started in August 2009 and concluded in February 2010 to give the maximum opportunity to gain feedback from as wide a range of suppliers as possible.

The objective of this more detailed survey of simulation developers was to gain more information on their views on the key drivers and demand for business simulation products in the academic sector and what developers themselves perceived to be the main educational benefits which could be gained by integrating the use of simulations in teaching. In addition it was noted in Chapter 3 that the key areas in which developers of business simulation packages had an impact on the effectiveness of business simulations was in the content which they were providing and more particularly the design interfaces which they used to deliver this content. Given the complexity of the design interfaces the capacity for the development of sophisticated business simulations is not within the scope of most academic institutions within the UK (Summers, 2004). (Though there are clearly examples of development of simulations which had their beginnings in the work done within the academic community which was later taken up, developed and marketed by corporate developers) (Thompson and Stappenbeck, 1995; Gold, n.d.; Frizsche, D. 2010; Keys, n.d.; Jordan, 2011)... Given this separation of function it was noted that is particularly important to examine whether or not the design of business simulation packages were fit for purpose in terms of achieving the pedagogical aims they were seeking to address.

Having also undertaken literature review in Chapter 4 of the main pedagogic considerations which academic staff were seeking to achieve through using business simulations in the curriculum, a further objective of this survey was to critically examine how aware developers of simulations were of these considerations and how they were reflecting these in their products.

6.1 Selection of business simulation developers

As noted in Chapter 3 there is no comprehensive listing of business simulations suppliers or developers. The published sources which were identified were too old to be useful and no updates on these could be identified. The ABSEL web site provided some useful links to simulations which had been produced by ABSEL members as did the SAGSET website (though the latter was surprisingly dated and appears to have been last revised in 2003). Listings covered two types of supplier – specialist suppliers who specifically marketed business simulations (for higher education and also for training) and academic publishers. Both are clearly relevant if the objective is purely to consider the size of the market. Thus Faria for example in his seminal studies on the market for simulation products included a number of publishers within his surveys (Faria, 1998). However, as the main objective of this survey was to examine potential growth in terms of the general trends in the business simulation industry rather than simply the volume of the market it was decided that the most important group to survey were the companies who dealt with e-learning technologies rather than those marketing products as part of a wider involvement in the publishing industry. Potential participants were identified from a web search using the Google search engine and the suppliers identified as part of the general survey reported in Chapter 3 provided a good basis for compiling this list. On identification of companies which were to be contacted an Excel spreadsheet was used to list the name of the company, web address and e-mail contact details with a brief description of the type of simulations which were being provided. In addition, where the web site provided a list of organisations using their products this information was used to provide additional contacts which helped in targeting individuals to take part in a second questionnaire which was delivered to academic users of simulations (reported in Chapter 7).

6.2 Design of questionnaire

The questionnaire was designed in 4 sections:

1. The first section cover areas relating to perception of the market for simulations and type of products being marketed
2. The second section examined the manner in which business simulations were developed and the main factors influencing design and development
3. The third section dealt with the developers' perception of what the important criteria were in developing business simulations for the academic market
4. The fourth section dealt with the developers' perception of the benefits of using business simulations in higher education

It should be noted that questions posed in the third and fourth sections of the questionnaire were put into an appropriate context and reproduced as part of a questionnaire which was issued to business school academics who used or could potentially use business simulations as part of the curriculum.

A copy of the Questionnaire is provided as Appendix 2.

6.3 Administration of the questionnaire

The questionnaire was originally created as a Microsoft Word document but it was decided that a web based survey tool was an ideal method for distribution and collection of data. However, it was useful when designing the questionnaire to start from a paper based format which provided ease of review and discussion of different aspects of what was required and the sequence in which questions should be asked. Overall, the main advantage of the web based survey was immediacy of response and the easy manner in which recipients of the questionnaire could be provided with a link to the survey, complete it online and despatch it to the researcher. The web survey tool selected was SurveyMonkey™ which provides very easy to use functions to design the questionnaire and excellent diagnostic tools to summarise and present results. Web based surveys often result in poor response rates. However, given the ease with which the survey could be administered it was decided that this could be compensated for by sending a very large volume of e-mail requests for participation (ultimately this was 98 developers who advertised either a single product or a range of products). An initial batch of 20 questionnaires was e-mailed in order to ensure that the questionnaire did not pose any significant difficulties for respondents. Thereafter, the researcher systematically worked through a list of potential developers (and as noted supplementing the initial list from the survey described in Chapter 3 of the thesis where further investigation and web searching identified other potential companies). The process continued until a sufficiently large number of responses was achieved. To be significantly viable it was determined that this would require at least 30 valid responses. It was noted that in terms of responses using this approach it was usual to find that those who would respond did so very quickly. However the numbers who actually did eventually participate were disappointing given the large number of requests sent. The volume of returned questionnaires was initially 27 but on a follow up request a month after the initial e-mail had been sent (and in 23 cases using a different contact within the organisation) a further 8 responses were provided giving an overall return of 35 questionnaires. Respondents were assured that all data provided would be treated as confidential and there were no questions which would easily identify a particular organisation. The fact that the research area was of interest and value to developers was confirmed by several enthusiastic responses from companies who also indicated that they would be interested in receiving a copy of the overall results of the questionnaire as they themselves felt that there was a lack of critical market analysis data on the future direction in marketing their products. Several companies not only provided very full details when completing the questionnaire but also made use of open questions to expand on their views.

6.4 Interviews with suppliers

Six interviews with developers were undertaken subsequent to completion of the web based survey – four by telephone (as the companies were based in the United States) and two undertaken in person to companies who had offices in the UK. The first of the face to face interviews was with a representative of a large multinational supplier (TATA IS) and the second with a representative of Tenzing Business Simulations UK. The main reason for the interviews was to corroborate the findings of the questionnaire survey and provide the opportunity to further investigate any questions which merited more in depth discussion – particularly around the rationale for using business simulations and the manner in which benefits were evaluated. An outline interview schedule was developed to ensure that the interviews were structured but sufficiently open to allow respondents to talk freely around the issues which were to be investigated (Appendix 3). Interviews were not recorded as this may have inhibited discussion but the researcher kept notes of all key items discussed and after the interview these were written up. Member checking was undertaken in that interviewees were provided with a copy of the notes and invited to supplement or correct these. None of the interviewees responded with any corrections to what they had provided during the interview but one did provide some additional written comments and materials which provided further information on the company's approach to dealing with the higher education market.

A copy of the interview prompt notes prepared is provided as Appendix 3.

6.5 Results

The results are presented in the same sequence as the questions which formed the questionnaire but information from open questions is frequently provided to give further clarification of results relating to particular themes explored in the questions. Results from the open question provided at the end of the questionnaire which asked for other comments and observations are frequently integrated with a discussion of the information provided in the small number of interviews which were conducted after the questionnaire survey had been completed.

6.5.1 Market for Simulations

This section of the questionnaire was designed to find out who developers perceived to be the main market for their products and give a general overview of the subject areas in business and management for which simulations were available or could be developed. Given that the commentary in the literature was very much biased towards developments in the United States, in order to establish the context in which the developers were operating, this section of the questionnaire also examined the market from a geographic perspective.

The first question examined whether the corporate sector or education sector was of more significance to developers. (The responses are presented in Table 6.1 and Figure 6.1 below). Clearly the overwhelming concentration of activity by developers was designed to meet the needs of the corporate training sector. However, it should noted that a large number of respondents (18 of 35) pointed out in open feedback that while a relatively small percentage of their market was for higher education institutions that this was an area which they were targeting and expressed the view that this part of the market had potential to grow significantly. In addition 2 large suppliers of commercial business simulation packages noted that they had a number of queries (though they did not quantify this) from academic institutions who were interested in developing business simulation products for use with corporate clients which they noted was an increasing area of activity in higher education.

Table 6.1 Customer base for business simulations

Who are the main customers for your products/services		
Answer Options	**Response Percent**	**Response Count**
Educations (Public or Private)	28.6%	10
Corporate Organisations	71.4%	25
	answered question	**35**

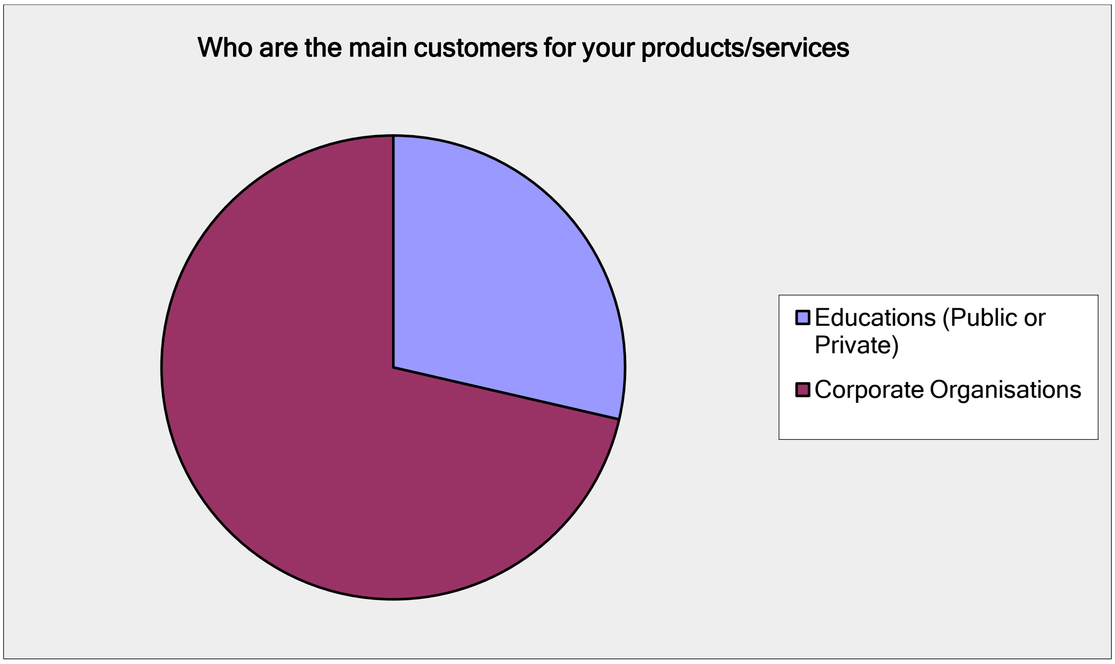

Figure 6.1 Customer base for business simulation products

Because the focus of the research was primarily around the UK Higher Education sector two questions were asked in order to establish from the perspective of developers whether this was geographically a significant market.

The second question on which geographic area was currently the largest consumer of business simulation products resulted in a very clear indication that the US and Canada were of most significance (See Figure 6.2 below). It should be noted that the developers were only allowed to select one region from the choices provided as the purpose of the question was to determine where the bias was in terms of what developers saw as their primary market. A full analysis of the relative distribution of markets would have required a much more detailed question which would have involved suppliers providing a much more detailed breakdown of the volume of simulations which they were selling and how these were geographically distributed.

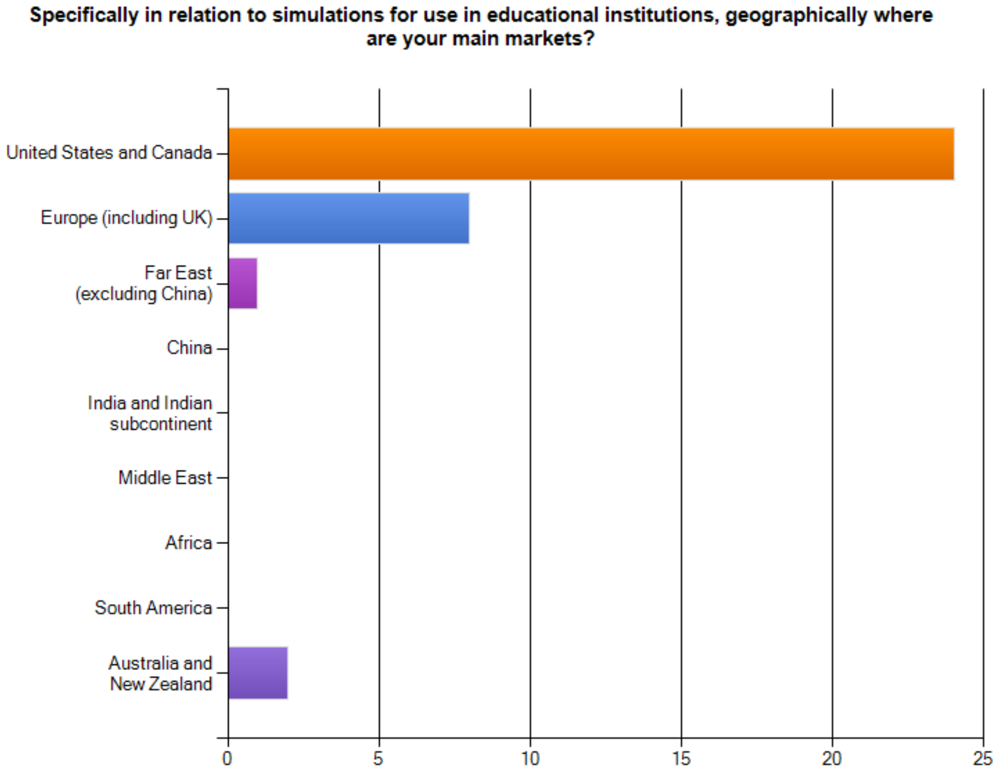

Figure 6.2 Geographic spread of markets for simulations

The responses to the follow up question which related to market development however indicated that the developers clearly saw potential growth within the UK and Europe (See Figure 6.3 below).

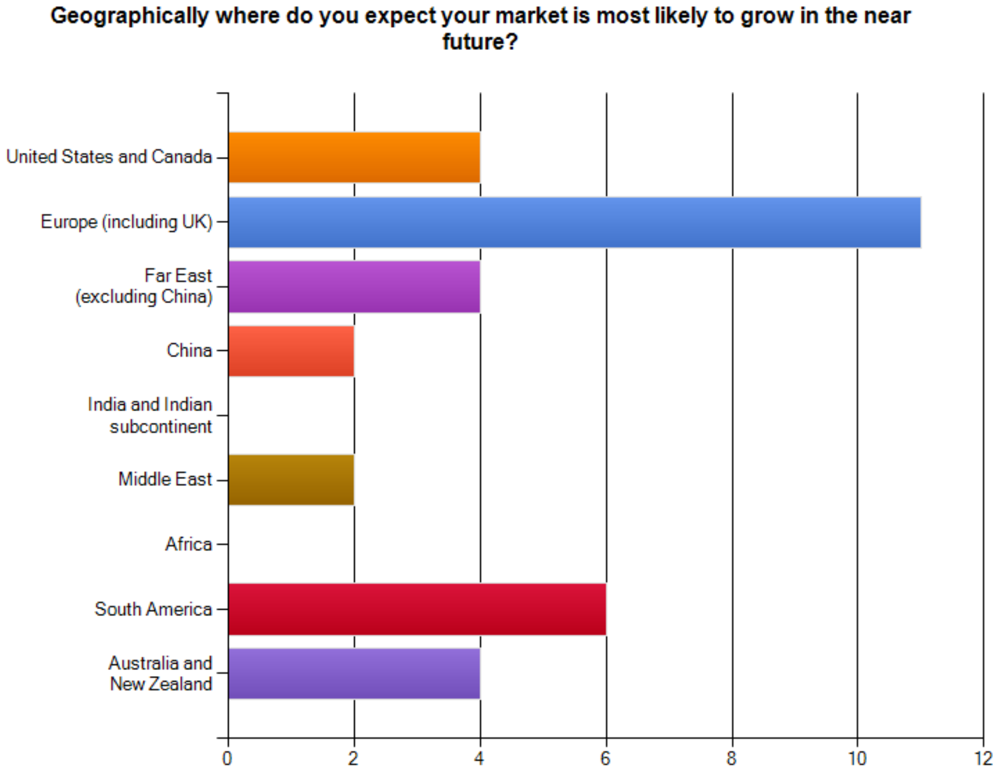

Figure 6.3 Expectations for growth by suppliers/developers in the market for business simulations

Interestingly, despite reported market trends in the demand for higher education (which indicate a potentially much larger demand in India, China and Africa than in the 'western world') the developers tended not to rate these as potential areas for growth. This is perhaps explained by two factors: (1) the fact that the level of sophistication required not only in terms of the technological infrastructure to support using the materials and (2) the degree to which, as some authors note, the more student cantered teaching approaches which are supported by use of simulations is still more clearly evident in the United States, Australasia and Western Europe as opposed to other countries (Chang, 1997; Liu, Ho and Tan, 2009 and Pongpanich, Krabuanrat and Tan, 2009.

The next two questions in this section related to the subject areas in business/management are covered by the simulations which were being developed. This was intended to provide an overview of the types of simulation which were most prevalent for use in higher education. Specifically the questions concerned the balance between business simulations designed as total enterprise simulations (illustrated in Figure 6.4 below) and those which covered specific subjects, and the detail of which subject specific simulations were provided (the responses are given in Table 6.2 and illustrated in Figure 6.5 below)

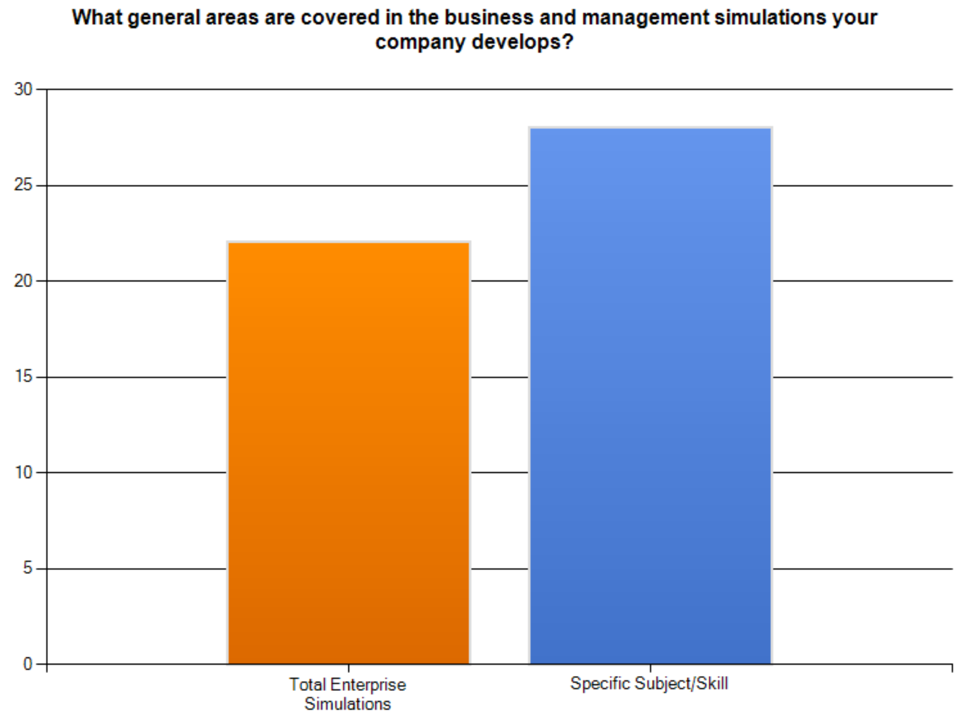

Figure 6.4 Total Enterprise Simulations/Subject Specific

As expected a large number of developers reported that they marketed Total Enterprise Simulations and supplemented this by commenting that they had the capacity to develop customized solutions in a range of specific subjects. Not all respondents who noted that they provided subject specific simulations went on to list the specific areas covered. (18 of the 28 respondents did give detail). In total 60 subject specific simulations were identified by respondents (on average individual responses listed 3 specific areas but this varied by respondent between 1 or 11 subject areas provided) In total 9 broad subject areas were identified. Most commonly the subjects covered are in the general areas of finance and accounting, marketing, and human resource management. In addition, however, there were a significant number of suppliers who reported that they offered simulations for skills development (17) -

mainly in interpersonal skills development in leadership, team working, and interviewing and managing people. In addition those who commented that they offered specific subject oriented simulation packages also commented that if there was sufficient demand or requests for specifically customized simulations in other subject areas that these could be developed. A relatively small number of developers (7) specifically offered only simulations which were designed for one or more specific subject areas within business and management and further investigation during interviews revealed that typically these were suppliers who published and marketed a range of educational materials to Higher Education institutions.

The result was consistent with the general survey of web sites of suppliers who offered simulations. Where a supplier only offered specific subject simulations it was confirmed from open comments and supported later through interviews that this was often part of a larger publishing operation where the simulations complemented a range of print based textbooks and the simulations were either part of a 'package' and provided on CD or through the company web site. Again it was confirmed from interviews with developers that this is a relatively common approach in the United States where companies market directly to educational consortia and seek to provide a range of products and services to support their customers (Faria and Wellington, 2004).

Table 6.2 Simulations by subject/skills area covered

Subject Area	Number of suppliers noting provision
Accounting and Finance	15
Marketing	11
HRM	6
Logistics	5
Other specialist disciplines	6
Leadership	8
Team building	4
People skills	3
Interviewing skills	2

The inclusion of a range of skills based simulations was not evident in the previous general survey undertaken of simulations available on the web and from interviews it was made clear that often this may have been attributable to the fact that these are generally offered as customized simulations and the previous survey of simulations available on the Internet did not specifically examine this. In general the relative distribution of non skills based subjects identified was consistent with both the previous survey and comments on use of subject specific simulations evident in the literature.

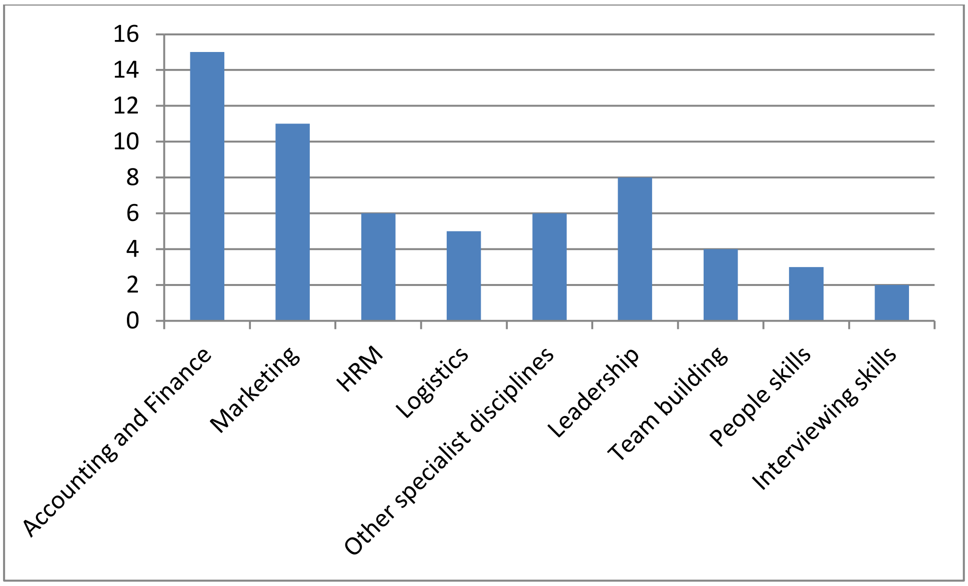

Figure 6.5 Business simulations covering specific subjects/skills

6.5.2 Design and Development of Business Simulations

The second section of the questionnaire focused more on technical considerations and design and development of simulations.

The first question of this section was to determine the manner in which simulations were distributed and intended to be used by learners. It was apparent from the results that only a relatively small number of developers produce material for individual use on standalone personal computers only (Figure 6.6 below).

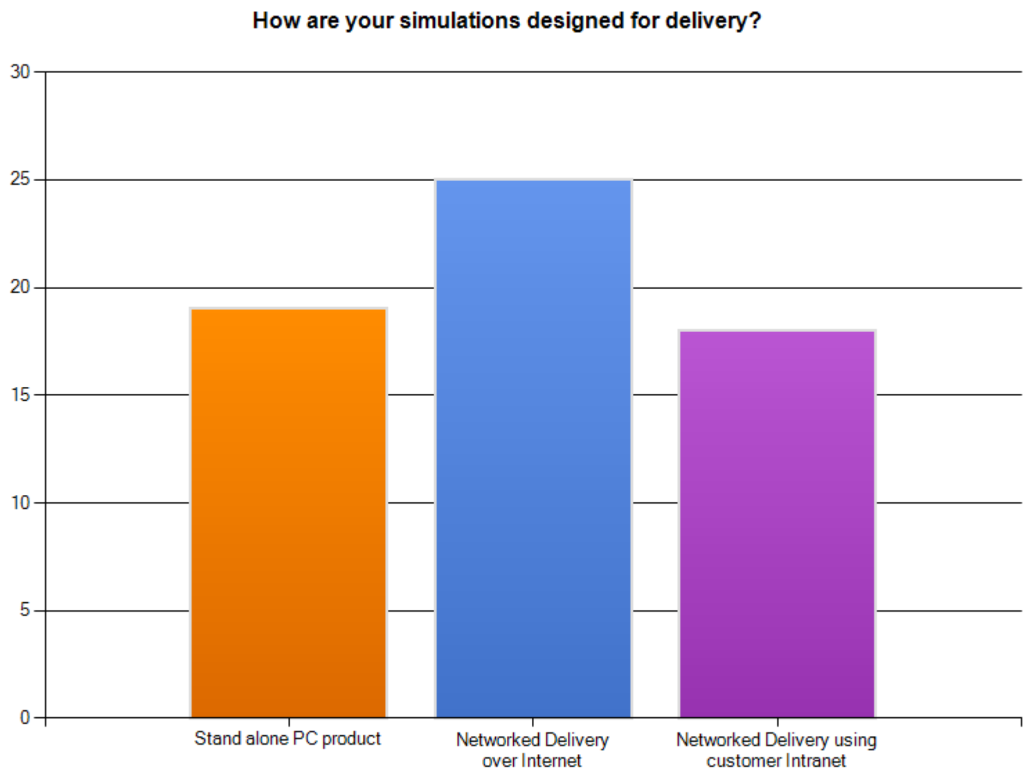

Figure 6.6 Delivery modes of simulations

The trend in the industry is to deliver networkable solutions.

The second question was to assess the extent to which simulations were designed for use by individuals or by teams. While the survey report demonstrates that the developers envisage that their products can be used for both individual and group use a number of comments were made that indicated that the developers really saw that the potential benefits of using the simulation were greater if they were used as part of 'syndicated' or 'group' learning (Figure 6.7 below). In particular 3 of the respondents noted current developments in massive multi-player business simulation/games and noted that their organizations were exploring the potential of this particular mode of delivery within the academic market (its use currently being mainly cantered currently around less academic 'gaming' applications). Again this is a trend which has been reported in the literature as being of potential interest to academics (Wuest, and Kuppinger, 2012; Lainema andMakkonen, 2003)

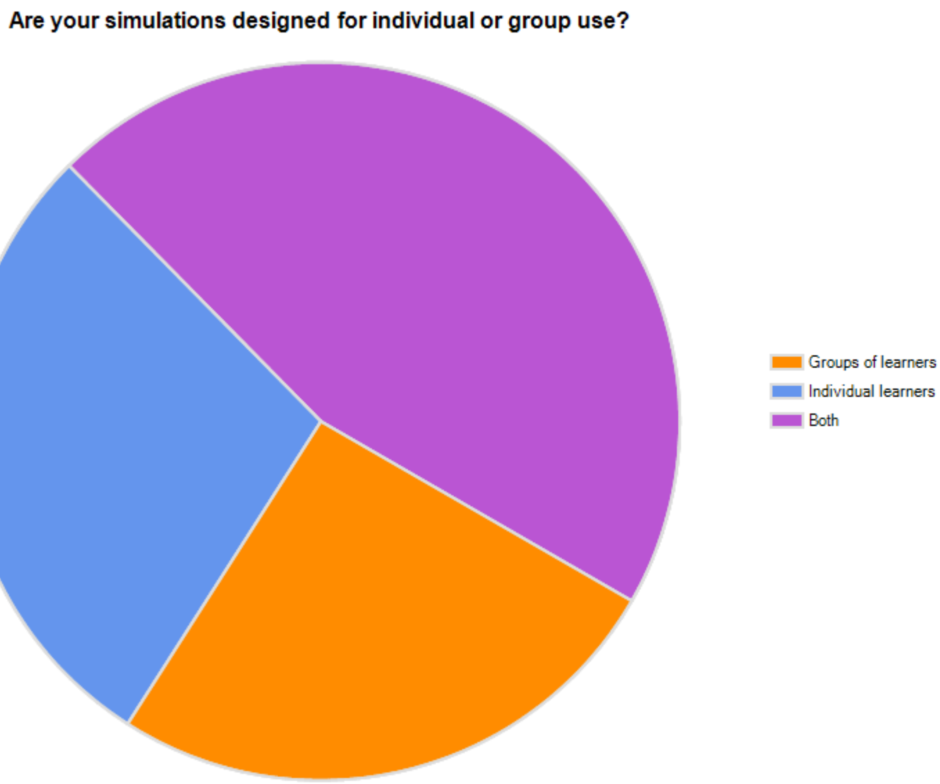

Figure 6.7 Individual/Group Use

The final two questions in this section were open questions which asked for information about the main design considerations and technical considerations which are taken into account when developing business simulations and how developers validated that accuracy of content of the business simulations. These provided a range of comments.

It was clear from a large number of responses (13) to the open question on design considerations that this was a very important factor for developers. This concurs with the literature which emphasizes that the design interfaces for simulations are crucial in determining the level to which learners can easily engage (and are motivated to engage) with the learning material (Adobar and Daneshfar, 2006). One respondent noted that ‘if the basic design is not attractive to the customer in terms of the visual appeal and quality of the interfaces provided then the product will simply not be acceptable’. It was evident from the responses given that developers were aware of the literature on this area and the significance of the design issues to overall success and acceptance of their products. Several respondents (14) indicated that they made extensive use of web design experts and graphical artists to provide creative inputs which ensured that the product was visually appealing and engaging. New products generally undergo a series of tests before general release and several developers provided details of extensive in-house (or alpha testing) methods which were used to ensure that the software was free of any defects and ensure that the software coding and the interfaces for collecting data from users are robust and reliable. One respondent made reference to recent published articles on beta testing and commented that this was an area in which more work was being undertaken by his organization. The same respondent noted also that it was an area which was not fully addressed when considering the needs of students as learners and that more work in this area would be useful to ensure that the products fully met the purpose for which they were designed. The fact that the majority of products were created as customized solutions in response to client demands was clearly evident in the extensive use which was reported on requirements analysis to provide a clear understanding of the customers' needs. However, while it could be argued that the customers are not only the instructors or training companies who are making use of the produce but also the learners it was evident that the developers when constructing requirements lists did not liaise directly with the learners but relied very much on these being accurately conveyed to them by the clients who commissioned the product.

Another theme which was noted in this section of the survey was the complexity of designing gaming elements in the simulation. Several respondents (8) noted that this was a crucial element but one which was extremely difficult to address. As one commentator noted 'there is a huge difficulty in balancing the extent to which 'fun' elements can be incorporated without prejudicing the development of the main learning or training objectives'. Another noted that this was an area in which there seemed to be high expectations from customers but very little guidance on the extent to which the customers themselves saw this as being of significance other than general statements on ensuring that the material was 'fun to use'. Three of the respondents made the point in different ways that the main issue was ensuring that there was a competition and that the rules for the competition were clear and fair to all participants in the simulation.

One respondent confidently summed up his attitude to design and development by stating that; ‘anything is possible – we have the technology to deliver highly sophisticated learning solutions – but the key question is how much is the client willing to pay for this and what specifically does the customer expect the learner to get out of using the simulation’.

The respondents were all confident that the learning materials which they used in their simulation packages were accurate and up to date and several noted that they used external academics as consultants for specific subject based content (6) and/or based the content on established management theories from current textbooks on the subject (12 respondents) . Two respondents actually noted that the simulations which they marketed were developments of programmes which were originally designed and used by academics and that the original developers were still very closely involved in further development and expansion of the business simulations. Only one respondent noted some difficulty in balancing competing views on the relative importance of different theories on how to model the results from learner inputs to accurately reflect their performance in terms of what constituted a ‘successful’ set of decisions. The same respondent also noted, however, that at times the arguments were perhaps ‘over academic’ and that in reality the simulations provided a realistic balance between providing the learner with good feedback on the results of decisions rather than being over theoretical in taking into account every possible theoretical implication of changing certain parameters which he commented was the job of the instructor or the academic using the simulation. 4 respondents made comments in relation to the extent to which the design had to be as ‘realistic’ as possible which is consistent with references in the literature which suggest that perceived realism and ease of use affect both learning and performance (Venkatesh and Davis, 2001; Davis, 1989).

It should be noted that the bulk of the developers viewed the market as one in which they offered services to clients in terms of providing a ‘customized solution’ for training or education and their comments need to be viewed in this light. One respondent expressed a degree of frustration that academics often wanted an easy ‘off the shelf’ solution for delivering parts of the curriculum and were unable or unwilling to put sufficient effort into clearly articulating what they required and had unreasonably high expectations of being able to simply take a product and make no changes in their own teaching approach to integrate it into their overall teaching of the subject. He commented that academics sometimes appeared to believe that business simulation could simply be selected in the same way as ‘they choose a standard textbook’ and that they in general academics did not understand the complexity of designing this type of educational material.

The responses to the question to suppliers on how they validated the teaching/training content of their simulations provided some interesting comment. Three suppliers made reference to the use of their simulations as part of ‘global challenge’ events involving an open competition which they sponsored involving students from business schools across the world who register for a competition using their business simulation. They noted that this was not only a marketing tool but also gave them the opportunity to speak directly to students and get their feedback on using the simulation. One supplier noted sponsorship of research into the use of their simulation by one of the universities which used it to deliver part of their curriculum. (It should be noted however that this ‘evaluation’ was one which had previously been reviewed by the researcher and it was questionable how objective the results of such an evaluation were given the potential bias to provide a positive outcome (Harte and Stewart, 2010 - analysis of SIMVenture). Most respondents either did not complete the question (21 of the 35 respondents) or noted that they did not themselves perform evaluation (8 of the 35 respondents) though they were aware of, and made use of the general literature on evaluation studies by academics. Overall the responses support a view that the developers of simulations are much more engaged in undertaking formative evaluation of the design and functionality of their products rather than seeking to engage in formal evaluation of the pedagogic benefits (which as one respondent noted was ‘really the job for the academics using the simulation in teaching’).

6.5.3 Perceptions of requirements of the Higher Education Market

To attempt to determine how the developers perceived the needs of the academic community when developing simulations a question was included which asked respondents to rank in order the main factors which they believed influenced academics when considering purchasing their products? The list was derived from themes which emerged from the analysis of the literature and was:

- Accuracy and currency of content of the simulation
- Cost
- Quality of the interface
- Degree of interactivity provided for learners
- Ease of use of the simulation
- Ability to customize simulation

The responses from the developers/suppliers are noted in Table 6.3 and ranked in Table 6.4 below and the results are graphically presented in Figure 6.8 below).:

Table 6.3 Ranking of important features of business simulations

	RANKING OF IMPORTANCE (1 most important - 6 least important)					
QUESTION	1	2	3	4	5	6
Content	13	7	10	4	1	0
Cost	12	6	4	8	4	1
Quality of design	6	11	13	4	1	0
Interactivity	0	1	0	11	17	6
Ease of Use	4	9	8	7	5	2
Customisability	0	1	1	1	7	25

The responses need to be viewed from the perspective that many of the developers who were surveyed are mainly concerned with marketing products to corporate training companies or large companies who are out-sourcing their training needs – the academic market being a relatively small part of their business. However, many developers are clearly interested in servicing the educational services sector and it is thus interesting to examine how they perceive the Higher Education market in particular. The responses thus provide a useful basis for looking at the relative importance which developers perceive to be important from the point of view of academics. The overall ranking order from the collective responses was achieved by calculating a ranking score. This score was derived by examining each return and summing the inverse ordinal ranks (between 1 and 6 – least important to most important) given to the category by all respondents and dividing this by the total number of respondents. This created a ranking score in a range between 1 and 6.

Providing this ranking score in the results shows more clearly the different emphasis given by the respondents to the significance which they believe academics place on the different criteria. (See below Table 6.4)

Table 6.4 Overall ranking of important features of business simulations

Criteria	Overall rank
Content	4.77
Quality of Design	4.48
Cost	4.31
Ease of Use	3.63
Interactivity	2.23
Customisability	2.20

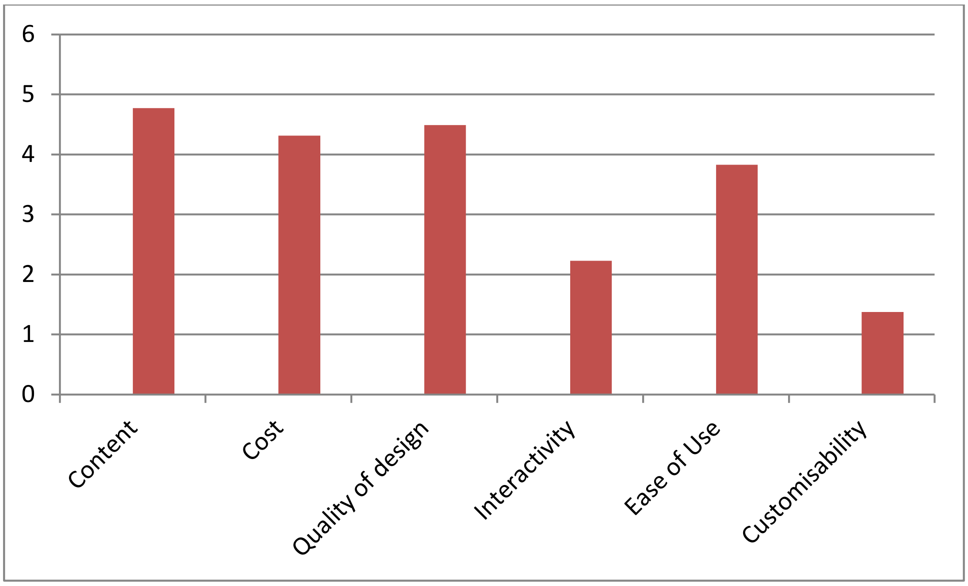

Figure 6.8 – Rank order of perceived importance of required features of business simulations

Interpretation of the data was assisted by reviewing open comments and from subsequent interviews with suppliers. There was general agreement that for the academic market the content base of the simulation must be accurate and must as far as possible reflect current theories and thinking on the subject. The suppliers are also aware of cost sensitivity when dealing with selling products to the HE market and comment on this was generally also qualified by comments on the difficulty of being able to meet the expectations of the market given the constraints on funding. Quality of design was also very highly ranked as to a lesser extent was ease of use of the simulation and further clarification from interviews confirmed that this was a perception which suppliers believed was shared by both academics and learners. The fact that customizability of the simulation was lowest in the ranking was seen to be tied to the issue of price and in particular the perception that in most cases the high costs of designing fully customized simulations for higher education was not something which would be attractive. A very low ranking was given to interactivity and interviews with suppliers clarified the issue. It was generally seen that interactivity was built into simulations as a matter of course and that the extent to which the simulation required user interactions (and the way that interaction was provided) followed a fairly standard pattern in terms of requiring students to feed in decisions on key variables which they had the ability to change. The use of new technologies as an alternative to keyboard input of results (e.g. voice recognition or touch screen manipulation of graphical data, as well as being reported as very costly, was also reported as being of use only in high end simulations such as flight simulators and not really relevant to business simulations. The point was also made in interviews that interactivity in use of the business simulation was also something which was largely controlled by the academic in terms of the freedom which could be provided to students when setting up the number of iterations of decisions they wished to implement and in the supporting guidance and feedback they would provide students. It was also noted from interviews that the suppliers' interpretation of what was meant by interactivity would almost certainly have been at a very technical level and not necessarily related to the more general interpretation of the term by the academic community where it is used more commonly to describe a range of aspects involved in student engagement with teaching materials.

6.5.4 Perceptions on benefits of using business simulations in Higher Education

As was noted in Chapter 3 of the thesis there are a significant number of claims about the benefits of using business simulations and a variety of these are put forward on the advertising material on the web sites of business simulation developers. In order to establish more clearly which of these developers felt were the most significant a range of potential benefits which had been previously identified from web sources (9 in all) were listed and developers were asked –

What do you believe to be the most important benefits which can be gained through using business simulations as part of the formal Higher Education curriculum?

It should be noted that in open comments in the survey several respondents (7) noted that this was an extremely difficult thing to do and that it was almost impossible to be absolutely clear about the order in which the different benefits should be ranked in terms of importance. It was also noted that some of the potential benefits ranked much higher in importance than others and they expressed some frustration at having to put the different elements into a ranked order. On reflection it was noted that it may have been better to provide a rating scale for each of the benefits which developers had to consider. In part this problem was moderated during interviews with developers and some of their comments are used to better understand this aspect of the survey. Despite this problem the ranking provided some useful results and also had the advantage that it was relatively easy to make a comparison between the perceptions of the developers and that of the academics (who were asked to undertake the same exercise).

Respondents were asked to rank the importance of nine potential benefits from using business simulations. The nine areas to be ranked are listed below:

Delivering essential facts and theories
Assisting learners to link theory to practice
Providing more effective engagement with learning
Facilitating experimentation in a ‘risk free’ environment
Enhancing employability skills
Encouraging reflective learning
Developing team working skills
Developing decision making skills
Gaining immediate feedback to support learning

The responses from the developers/suppliers are noted in Table 6.5 below:

Pedagogical benefits of a business simulation (Responses from developers)	RANK in order of importance (1most important – 9 least important)								
	1	2	3	4	5	6	7	8	9
Delivering essential facts and theories	9	8	8	4	4	2	0	0	0
Assisting learners to link theory to practice	13	8	2	2	3	6	1	0	0
Providing more effective engagement with learning	6	3	11	7	3	2	2	1	0
Facilitating experimentation in a 'risk free' environment	0	1	2	7	7	6	4	4	4
Enhancing employability skills	2	3	2	1	6	3	11	4	3
Encouraging reflective learning	1	0	0	6	2	3	6	8	9
Developing team working skills	4	5	6	3	3	3	4	4	3
Developing decision making skills	0	7	4	4	3	7	3	4	3
Gaining immediate feedback to support learning	0	0	0	1	4	3	4	10	13

Table 6.5 – Responses from Developers in response to perceived importance of features supported by Business Simulation products

The same method for analysis of the ranked scores as was used when considering supplier perception of the importance of different features of business simulations which influenced academic choice of simulations was used and the overall ranking is provided in Table 6.6 below and graphically in Figure 6.9

Table 6.6 Overall ranking of benefits of using business simulations

Benefits of using business simulations	Ranked Importance
Delivering essential facts and theories	7.23
Assisting learners to link practice to theory	7.11
Providing more effective engagement with learning	6.51
Facilitating experimentation in a 'risk free' environment	5.31
Encouraging reflective learning	4.89
Developing decision making skills	4.23
Developing team working skills	4.2
Enhancing employability skills	3.15
Gaining immediate feedback on actions to support learning	2.39

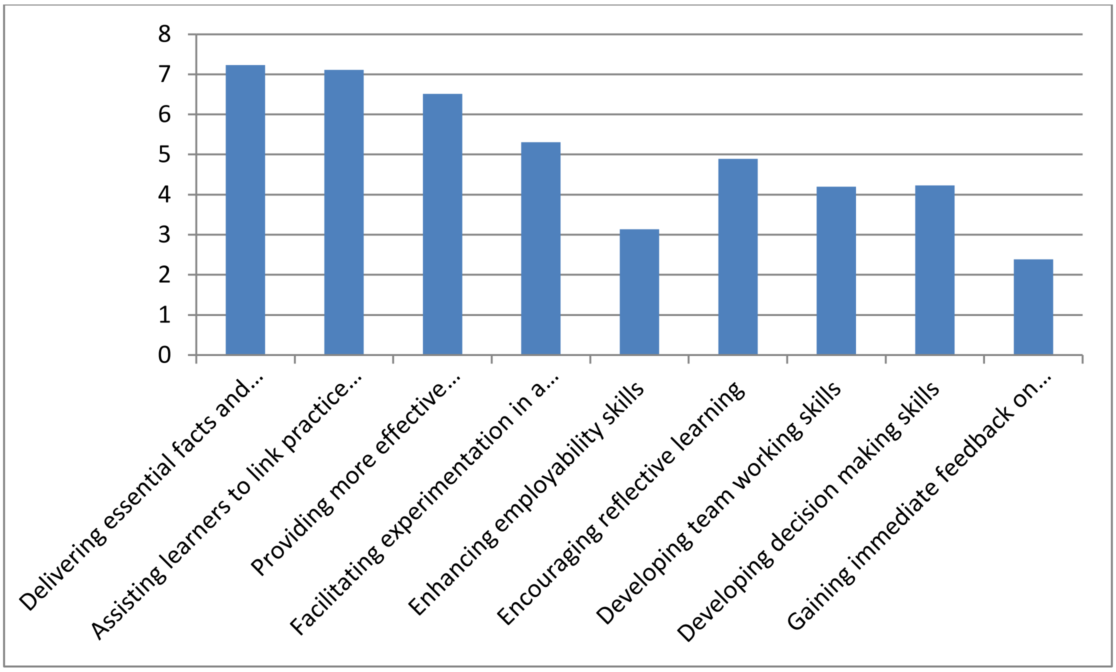

Figure 6.9 Ranking of pedagogic benefits of using business simulations

The results from the ranking exercise are not conclusive but demonstrate broadly the relative importance which developers attach to the pedagogical benefits of simulations which they are producing. Clearly there is a broad level of agreement on the importance of helping learners to link theory to practice and linked to this their engagement in practice in a risk free environment. Reflecting the need to ensure that this is supported effectively the relative importance of delivering accurate content in terms of facts and theories is the highest ranking criterion. The importance of engagement of the students using the simulation is also highly relatively highly ranked. Clearly the development of team working skills and decision making skills are less highly rated but this may reflect the fact that some of the ranking was provided by developers of products which are designed to be used in standalone mode.

The 2 final categories, however, relating to employability skills and gaining immediate feedback are clearly below the median averaged ranking and in discussions in interviews this was explored further. It was suggested that developers are probably less aware of the significance which these benefits have and the importance which has been attached to them by academics and in particular the increased importance which is placed on employability skills as part of the higher education curriculum. The low ranking of gaining immediate feedback may be a consequence of the fact that developers see this is largely dependent on the academic and how he chooses to use the system (in terms of cycles of decisions).

The final closed question in the survey asked suppliers to reflect on the potential future demand for business simulations for higher education. The question was asked to determine whether or not the suppliers were confident that this was an area in which they could see growth and the distribution of responses are demonstrated in Figure 6.10 (below). 34 suppliers responded to the question and none projected a decrease in size of their market while of the others 12 suggested it would remain stable and 22 projected an increase.

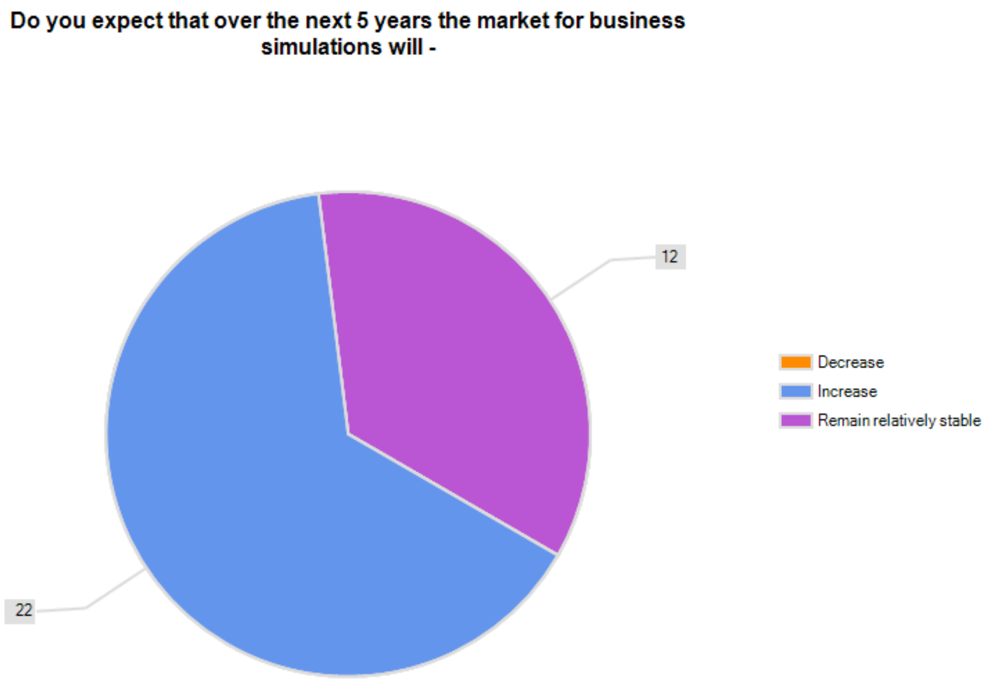

Figure 6.10 Supplier perception of market growth

6.5.5 Results from open comments and interviews

At the end of the questionnaire respondents were asked to provide any additional comments or observations on the development and use of business simulations in Higher Education. Many of these comments have been incorporated into the discussion provided above when considering specific aspects of use of simulations. Others are reviewed alongside the information which was discussed as part of the interviews with developers where the themes were often expanded upon. The interviews were generally used to check some of the findings from the questionnaire survey and again, where relevant, these have been incorporated into the discussion above. The interviews also provided the opportunity to gain a better understanding of some of the issues which had been explored in the survey in terms of providing additional evidence of some of the most important concerns and perceptions of the market for business simulations in Higher Education. The following points summarize these issues:

Technical considerations: all interviewees noted that technical considerations were, as one interviewee put it ‘a non issue’. The advances in technology and the supporting software and hardware that is available for development makes it increasingly easy to develop simulation packages which can be supported in any academic environment in which there is student access to what was described as a ‘basic computing hardware specification’. Suppliers uniformly expressed the view that their products were well tested and free from ‘serious errors’.

Design considerations: Discussions around design were generally more extensive and this was clearly an area which developers saw as being very important when producing simulation packages. There was general agreement that quality of design across almost all products (interviewees commenting not only on their own simulations but those of their competitors) was of a very high standard. As one interviewee noted ‘when demonstrating the products to academic staff we find almost all the time that academics are ;’blown away’ by the design of the simulations – not only the attractiveness of the graphical interfaces but also in the way in which the student can engage with the material provided’. However, a significant issue which was noted was balancing the design with the need to make the simulation as realistic as possible without making it impossible to use – a theme which recurs in the literature also (Wolfe and Roberts, 1993; Gold and Pray, 2001; Gold and Wolfe, 2012). In one of the telephone interviews there was an interesting discussion was ‘realism’ of the simulation and the difficulty of making sure (and assuring academics) that all the different factors were covered in analyzing students decision without ‘creating a monster which is so complex that it not usable’

Pedagogical considerations: Interview conversations demonstrated a very high level of awareness of pedagogical issues related to use of business simulations. Four of the five interviewees who discussed this in detail showed a very high level of awareness of the pedagogical debates around use of business simulations and in particular were able to link this to issues around experiential learning and encouragement of students to take an active part in their learning. When asked to comment further on how the interviewees knew that the simulations were effective the responses were that the only way they could measure this was in the willingness of the academics to continue with use of the package, some indirect feedback from academics on the benefits and student comments, and in one case, where the simulation was used to support a 'global challenge' competition, the direct feedback from students on how they had found the experience useful. Two interviewees noted that it would be useful to have some more formal communication one noting that 'apart from meeting up with some of these people at conferences and seminars (the academics) we hear very little from them so assume all is going well'. In an open comment on the questionnaire one respondent noted that 'if you want to know how they work in practice you really need to ask the academics and students and I'm sure you'll get a very positive response'.

Other considerations: The main issue which came out very strongly and unprompted in the case of the first two interviews held by telephone was around cost considerations. The suppliers were strongly of the opinion that academics were not aware of the considerable costs involved in developing business simulations and when prompted for an opinion on this other interviewees agreed that this was the case. One interviewee expanded on this noting that often academics would not make the link between asking for a high degree of customization of the materials and the amount of work and expense involved in doing this and suggested that they 'get real' in dealing with the financial environment in which we are operating. Concern was also noted by two interviewees about the length of negotiation time with academics to finalize contracts for use of simulations and surprisingly from one interviewee the comment that having gone through that lengthy process 'it is sometimes the case that the product is just not used (even when payment has been made for licenses). It was speculated that this might be the result of changes of staff who were responsible for integrating the simulation into the teaching.

Another interesting theme which was discussed was related to the enthusiasm of academics for the products being demonstrated and the way in which they could 'see the connections with what they trying to get the students to do right away'. It was noted that 'you can spot the enthusiasts right away though you'll always get the sceptics who want to nitpick over detail'.

6.6 Summary

This chapter has reported on the questionnaire survey of developers of business simulations and has provided some valuable insights into how they are addressing developing materials for the higher education market and their perception of issues which are important to academics who may wish to use business simulations in their teaching. It has also provided more evidence of the types of products available and the way in which they are designed to be used. This supplements and adds depth to the web based survey of products which was reported in Chapter Three of this thesis. The survey also supports the overall approach taken to the thesis which is to provide an holistic overview of development and use of simulations in Higher Education. It has confirmed some of the concerns noted earlier in the thesis about the extent to which academics and suppliers interact and provided some important insights into how the developers of simulations perceive what academics main concerns are when considering use of simulations. This will be explored further in the next chapter where suppliers' views will be contrasted with academics own views and opinions on the place and purpose of business simulations in the curriculum. It clearly highlights an issue around cost of business simulations which is a potential drawback to their wider use and the clear importance of design and content in business simulations which developers see as important in its own right and also perceive to be very important when marketing their products.

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Chapter Seven

Survey of Academics using Simulations in Higher Education

7.0 Introduction

A survey of UK academics was undertaken in order to determine the views of academics on development and use of business simulations and to gain more information on their views on the key drivers and demand for business simulation products in the academic sector. The survey was started in February 2010 and concluded in July 2010 to give the maximum opportunity to gain feedback from as wide a range of academics as possible – a re-issue of the survey to targeted individuals was done from September 2010 – end of November 2010 as it was not felt it would be profitable to send out the questions during academic vacations.

Unlike the case with the survey of developers of business simulations there have been a number of national and international surveys of academic staff involved in using business simulations. As previously noted, in the United States most of the significant work in this area has been completed by Faria et al. (Faria and Nulsen, 1996; Faria, 1998; Faria and Wellington, 2004). These surveys have been described previously when considering the development of business simulation and gaming from the perspective of their main focus which was around determining the size of the market and in particular charting the growth in use of simulations.

Surveys which were more extensive in terms of examining the use of business simulations are reported by Burgess (1991), McKenna (1991), Chang (1997) Lean et al. (2006), Liu, Ho and Tan (2009) and Pongpanich, Krabuanrat and Tan (2009).

Of these, the studies by Burgess and by McKenna which examined the use of simulations in the UK and Australia respectively are very dated and are mainly of historical interest and are therefore not considered in detail here.

Lean et al (2006) conducted a single institution study in the UK across a range of subject disciplines. This survey was not restricted to business simulations but collected data from 156 academics from a questionnaire delivered to 963 academics from 6 faculties at a UK University.

Chang's study in 1997 collected evidence from all local universities and polytechnics funded by the Hong Kong University Grant's Committee involved a total of 632 questionnaires targeted at academics teaching undergraduate degrees in business. His analysis was based on 142 usable responses. The study reported a moderate level of experience of use of business simulations, 35 respondents (29%).

Liu et al's study in 2009 surveyed the opinions of the top 30 universities in Australia and Taiwan (selected from the 'Webometrics Rankng of World Universities' and targeted 2500 professors in Australia and 1500 professors in Taiwan. A total of 274 completed questionnaires were returned (7.96% from Australia and 5% from Taiwan respectively). The main focus of the research was to examine comparatively use in the two countries but for this research the results are examined together. The results were categorized by those who had used simulations, those who had prior experience but did not use simulations and those who had never used simulations

Pongpanich et al discuss the use business simulations in Thailand and this is a comparative study with similar studies in the UK. A total of 700 questionnaires were sent to 35 universities in Thailand and specifically targeted at academics who taught an MBA programme. Like Liu's study this was subdivided into current users, previous users and those who had never used business simulations. As in this study the reasons behind the decision of former users to stop using business simulation games was investigated. Of the 163 responses provided only 24% .categorised themselves as current users, 15% former users and the remaining 61% had never used simulations in their teaching.

These surveys, however, use a variety of approaches and do not fully address all of the issues which are being explored in the current research and it was therefore deemed appropriate that a survey should be conducted as part of this research. In addition, it was possible to conduct the survey in parallel with the survey of developers and gain some valuable insights into the comparative views of both academics and developers on the key issues around the use of business simulations to support teaching and learning in the UK Higher Education sector. A comparison of results with other surveys is incorporated within the commentary relating to different sections of the current questionnaire results.

7.1 Selection of survey group

An initial list of academics who were known to be involved in using simulations (based on the literature searching) was compiled but the numbers were very small. It was therefore decided that in order to get as wide a range of views as possible the questionnaire should be sent to all business schools who were members of the Association of Business Schools, (118). the full list is available at http://www.associationofbusinessschools.org/abs-member-listing-view
and is reproduced in Appendix 4.

7.2 Design of the questionnaire

As noted above there have been several surveys of academics but these have not comprehensively covered the issues which this survey sought to address. However, these surveys provided useful background information and general guidance on how to structure the questionnaire. They also influenced the design of the current survey as some of the questions provided in earlier surveys were used in order to allow the researcher to draw conclusions about the way in which perceptions of academics have changed over time – determining whether issues which had been of concern to academics previously had been resolved or whether the same fundamental issues concerning use of business simulations were persistent.

A copy of the questionnaire is provided in Appendix 5.

The questionnaire was structured in 4 sections as follows:

1. The first section covered availability, suitability and subject coverage of simulations. To align with previous survey work and provide more an easier base for comparison of results a question was included in this section to establish whether the respondent was currently using business simulations as part of their teaching, whether they had used business simulations in the past.

If the respondent indicated that he/she had used simulations in the past but no longer used them a supplementary question was posed to determine the reason why the respondent no longer used simulations as part of their teaching.

2. The second section examined the manner in which business simulations were used by academics and how academics evaluated the benefits of using business simulations as part of the curriculum. There was a specific focus on two issues within this section which cantered firstly around the size of groups and the manner in which academics assigned learners to groups and secondly on the manner in which the simulation exercise was assessed as both of these had been identified from the literature as important factors which had a significant impact on the student learning experience.
3. The third section dealt with the academics' perception of what the important criteria were when selecting business simulations.
4. The fourth section dealt with the academics' perception of the benefits of using business simulations in higher education

7.3 Administration of the survey

As with the questionnaire to developers the questionnaire was originally created as a Microsoft Word document then issued using SurveyMonkey. The survey was e-mailed to a senior member of staff identified from the web site of each of the academic institutions identified from the Association of Business Schools web site. An instruction was provided in the e-mail to forward the e-mail link to any members of the teaching staff who were involved in using or had been involved in using business simulations or who may be considering deploying a business simulation.

After reminders were sent the final total number of questionnaires returned was 87. This represented responses from 56 institutions. Multiple responses (because more than 1 member of staff responded from the academic institution) were provided from institutions (31 institutions providing questionnaires from 1 academic, 13 institutions providing questionnaires from 2 academics and 10 institutions providing questionnaires from 3 academics). The overall response rate from individuals was not possible to calculate given the way in which the survey was sent to academic institutions. The response rate at an institutional level was (47.5%) 56 institutions from 118 e-mailed with the survey link.

In addition 6 interviews with academics who used simulations in their teaching were undertaken. From the literature UK academics who had published academic articles concerning use of business simulations were identified as potential candidates for interview. However, this list was not extensive (5 academics) Interviews were arranged with 3 of these academics (2 were from English institutions and 1 from a Scottish University). In addition 3 other Scottish academics were interviewed, 1 of these was one of the academics at Robert Gordon University who were involved in delivering the MikesBikes simulation which had been used as a case study to examine student perceptions of use of business simulations (described in Chapter 8. As with the developer survey described in Chapter 6 the interviews were semi-structured and their purpose was to confirm understanding of the results of the questionnaire survey and also to provide the researcher with the opportunity to examine in more detail the main themes which had arisen in the questionnaire responses.

A copy of the prompt notes for interviews is provided in Appendix 6.

7.4 Results

In addition to the diagnostic tools provided within Survey Monkey to summarise results of the questionnaire the third and fourth section of the questionnaire were analysed to compare the views of developers and academics on critical features of business simulations and their respective perceptions of the benefits of using simulations.

7.4.1 Current usage of business simulations.

The first question in this section was to determine how widespread the use of simulations was in UK business schools. As illustrated in Figure 7.1, 78 academics responded to this question and of those 57 (73.1%) noted that they currently used business simulations as part of the curriculum. 21 (26.9%) responses were provided from academics who noted that they did not currently use simulations, with 17 of these responding that they had used simulations in the past. It should be noted that because of the manner in which the questionnaire was distributed it was more likely that the questionnaire would have been directed to staff who currently used business simulations or who had been identified as having been involved in their use in the past (the questionnaire was not sent to all academic staff in an institution but was delivered to the Head of Department who then distributed it to staff who were likely to be interested or have experience in the area). Thus the results cannot be directly compared with some of the previous surveys reported in the literature which involved very large distributions of questionnaires to all academics teaching in the area of business/management. The bias in responses in the questionnaire is also demonstrated in terms of the very low number of responses (4 respondents) who had never used business simulations. Examining the responses at institutional level it could be determined that the positive response to current use of a business simulation was reported by 50 of the 56 institutions who responded to the survey (i.e. 89% of the institutions responding or 42.3% of all institutions surveyed). It can be concluded that at an institutional level the use of business simulations as part of the curriculum is widespread and this is consistent with findings in the literature.

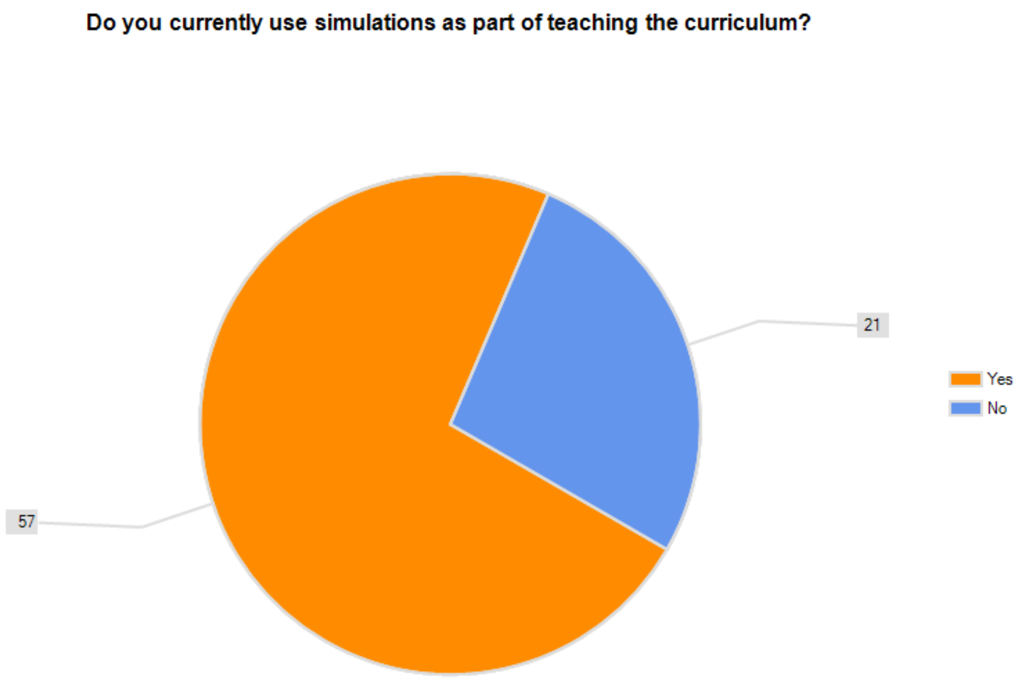


Figure 7.1 Use of business simulations

It was particularly interesting to note the responses from those academic staff who had used simulations in the past but no longer used them in teaching. Of the 21 who reported that they did not use simulations 17 academics reported in a supplementary question that they had previously used simulations but no longer did so. The reasons for discontinuing use of simulations were categorized and summarized and are provided below in Table 7.1

Table 7.1 Reasons for discontinuing use of simulations

Number of responses	Reason provided for discontinuing use of business simulations
5	Change in role or responsibility which meant that the academic was no longer involved in teaching the students using the simulation.
5	Simulation was too complex and time consuming to administer and assess in the time available to deliver the part of the curriculum covered
4	Simulation was not considered as being effective because the subject content and approach was no longer appropriate in the light of curriculum changes
2	Cost savings at a departmental level meant that the simulation license had to be discontinued
1	Simulation had been run on a pilot basis and a decision was taken that it was not suitable as a means for delivering the curriculum

Similar results were reported by Liu et al (2009) in their survey of use in Australia who cite the top five reasons for discontinuing use of simulations. These results are summarised and presented in Table 7.1b below.

Table 7.1b Liu et al (2009) Top 5 reasons for stopping using simulations

n	Reason
12	Changes in teaching assignment
5	Resources required were too high
4	Preparation time is too long
4	Changes in curriculum
3	Simulation models were not very good

(Liu et al, 2009p.404)

While it is understandable that changes in staffing may account for changes in teaching approach the above tables also indicates that there are some issues which are more importantly related to (a) the workload associated with the implementation of business simulations and (b) the cost of purchasing business simulations and (c) the fact that the simulation did not fit with the curriculum being taught. These were followed up in interviews with staff to get further clarification and are discussed in Section 7.5 of this Chapter.

7.4.2 Satisfaction with availability of suitable business simulations to support teaching

85 responses were provided to the question to rate availability of appropriate business simulations. Respondents were asked to rate this as either poor, adequate or excellent. The responses overall demonstrate that whilst there majority of academics find that this is adequate or excellent (47 respondents adequate and 15 excellent there are a significant number of academics who rate this as poor (23 or 27%). The results are illustrated in Figure 7.2 below. This contradicts more general findings reported by Lean (2006) and Faria and Wellington (2004) who cite lack of information on availability of simulations as a significant barrier to their use. Lean (2006) surprisingly notes a 60% agreement in his survey with the view that academics were not aware of simulation products and methods but it should be noted that the results may have been skewed because he was examining simulations across a wide range of disciplines rather than just in business and management.

To examine in more detail the difference between types of simulation this was investigated further by cross tabulating the results to distinguish between satisfaction with Total Enterprise Simulations and with Subject Specific simulations.

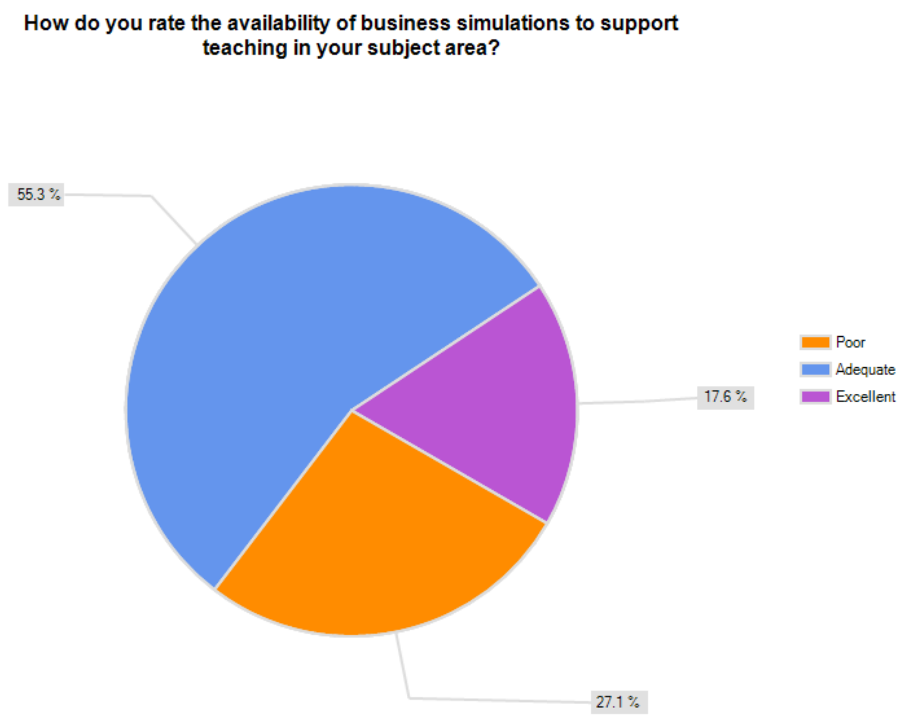


Figure 7.2 Satisfaction with the availability of business simulations

7.4.3 Subject areas in which business simulations were used

86 responses were given to this question but some respondents noted the use of both total enterprise simulations and subject specific simulations thus overall 92 uses of business simulation packages was reported. (See Table 7.2 below) –

Table 7.2 Use of different types of simulations

Simulation Use Reported	Number of cases
Total Enterprise only	58
Subject Specific only	22
Both	6

Thus 64 cases using total enterprise simulations were reported and 28 using subject specific simulations. (Figure 7.3)

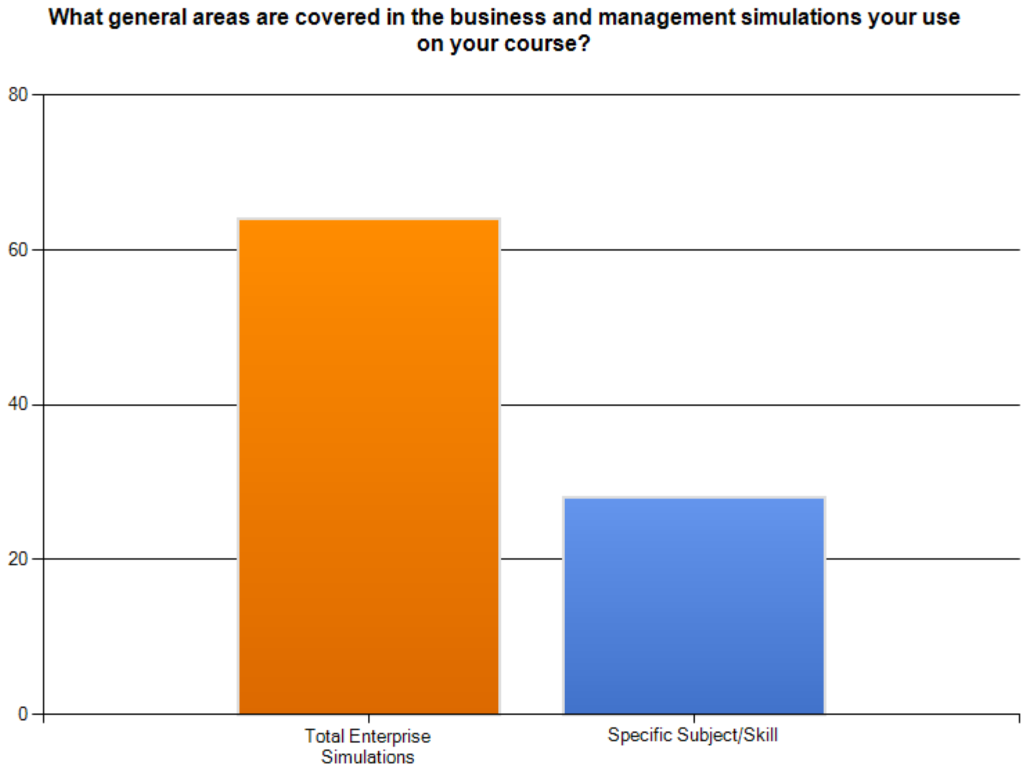


Figure 7.3 General subject areas covered in business simulations

7.4.3.1 Comparison of level of satisfaction

The data was also examined further by cross tabulating user satisfaction with the availability of suitable business simulations to support teaching and the result showed an interesting difference between the types of simulation. Looking only at those questionnaires where a response was given only for Total Enterprise Simulation or for Subject Specific Simulation (i.e. discounting the 6 questionnaires which referred to both) it could be seen that there was a significantly larger number of those reporting only on subject specific simulations expressing dis-satisfaction with the availability of suitable simulations. Of 22 respondents who rated availability as poor 10 related to reported use of 58 Total Enterprise Simulations (17.2%) and 12 related to 22 subject specific simulations (54.5%) The generally high level of satisfaction with Total Enterprise Simulations to support the curriculum was also confirmed in open questions and in interviews.

The range of subjects reported is provided in Table 7.3 below:

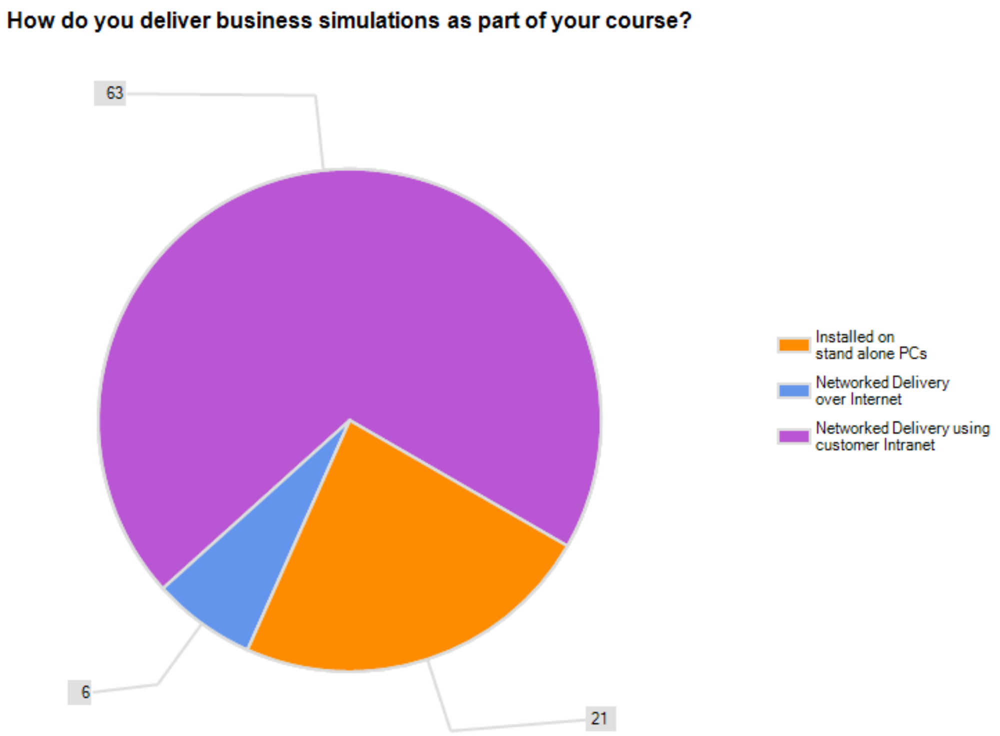
Table 7.3 Subject Coverage

Number of responses	Subject Area Covered
13	Accounting/Finance
6	Marketing
4	Operations/Logistics
3	Human Resource Management
1	Economics
1	Not specified

The data on individual subjects is consistent with the trends on use of simulations which was identified in the literature in Chapters 3 and 4 of this thesis.

7.4.4 Method of delivery

83 responses were provided in response to delivery mode of simulations (Figures 7.4 below). Delivery of the simulation was generally facilitated by having the software run over the institution's Intranet (75.9%) or installed on standalone personal computers (25.3%). Delivery on standalone PCs was almost entirely the method of use for subject specific simulations while intranet delivery was almost exclusively the method of delivering total enterprise simulations. The exception to this with respect to delivering total enterprise simulations was the use of networked delivery over the internet which was reported by 6 respondents – in two cases the respondents noted that this was a function of the manner in which the developer made access possible and in 4 cases it was noted that the simulation was one which was available for use by groups of learners across institutions who were participating in part of global business management game.



Figures7.4 Methods of delivery of simulations

7.4.5 Implementation and support provided for the simulation

The issue of how simulations are implemented is raised by several authors and in particular there is evidence in the literature that:

- the manner in which group work is used when delivering simulations;
- the extent to which the simulation is integrated into the overall delivery of the course: and,
- the manner in which use of the simulation is assessed

are all important factors which influence the student learning experience. These issues were therefore explored in the questionnaire and in addition respondents were asked through open questions to comment on any specific challenges or issues which they faced when using business simulations and also on the mechanisms which they used to evaluate the effectiveness of the business simulation.

7.4.5.1 Group Learning

81 responses were provided to a question which sought to determine the extent to which group work was used as part of the delivery of business simulations. The responses (Figure 7.5 below) show that it is very much an integral feature of using business simulations. 15 of the 17 responses which indicated that the simulation was used by individual users related to instances where the respondent had indicated that simulation was used to teach subject specific skills. (Generally delivered on a CD for use on a stand-alone PC) but for Total Enterprise Simulations all respondents reported that team work was involved.

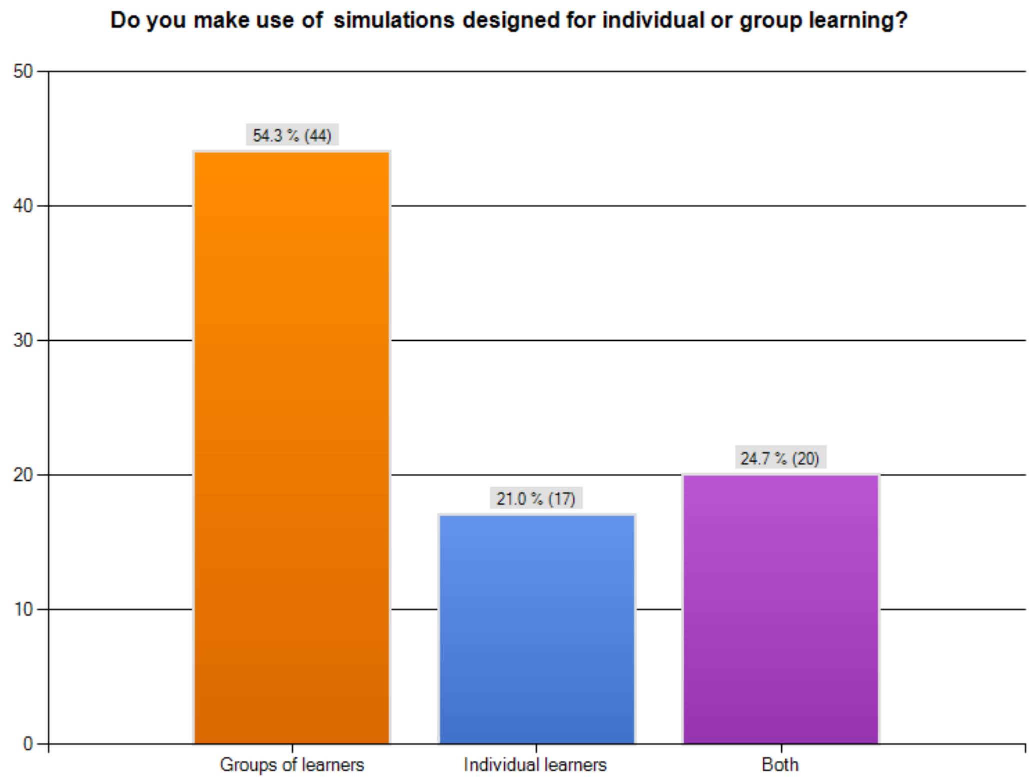


Figure 7.5 Comparisons of Group and Individual Learning

The relatively large number of responses (20) which indicate that both group work and individual use of the business simulation are accounted for by two reasons:

1. The number of responses in which it was indicated that the respondent used different business simulations both for teaching subject specific skills and total

enterprise simulations caused the respondent to indicate use of simulations by both individuals and groups, and

2. A number of responses which related only to use of total enterprise simulations but the respondents reported both group and individual use. However, it was assumed, based on open comment elsewhere in the questionnaire that in many cases this was because of practical arrangements related to re-assessment of students. Because of practical difficulties in identifying and assigning students to groups who were required to resubmit coursework the students were required to use the ‘single player’ mode of the simulation for re-assessment. This was clarified subsequently in interviews as being the reason for academics to make use of the same simulation both for group based exercises and for individual use.

The size of the group is also an important factor identified in the literature. Developers sometimes provide guidance on the ideal size of the group and most frequently recommend teams of between five and 8 users. The results from 65 valid response provided in the survey demonstrate that these recommendations are broadly followed. The most frequent category being reported is teams of 6-7 learners (55.4%) and overall within the range of 4-9 members per team the percentage of responses is 84.7%. (Figure 7.6 below).

Comments on effectiveness of the process of group allocation indicated that the most frequent reason for allocating larger team sizes were associated with the need to manage the simulation effectively with limited tutor support for groups with a smaller numbers (5 responses). 2 respondents expressed the view that a larger group size was pedagogically beneficial and allowed better group interaction. The main issue relating to group size was clearly the practical limitation on resources to support groups and one respondent reported that the size of groups could vary as the numbers of students enrolled on the course changed – the fixed factor which determined the size of the group was the number of staff available to support groups.

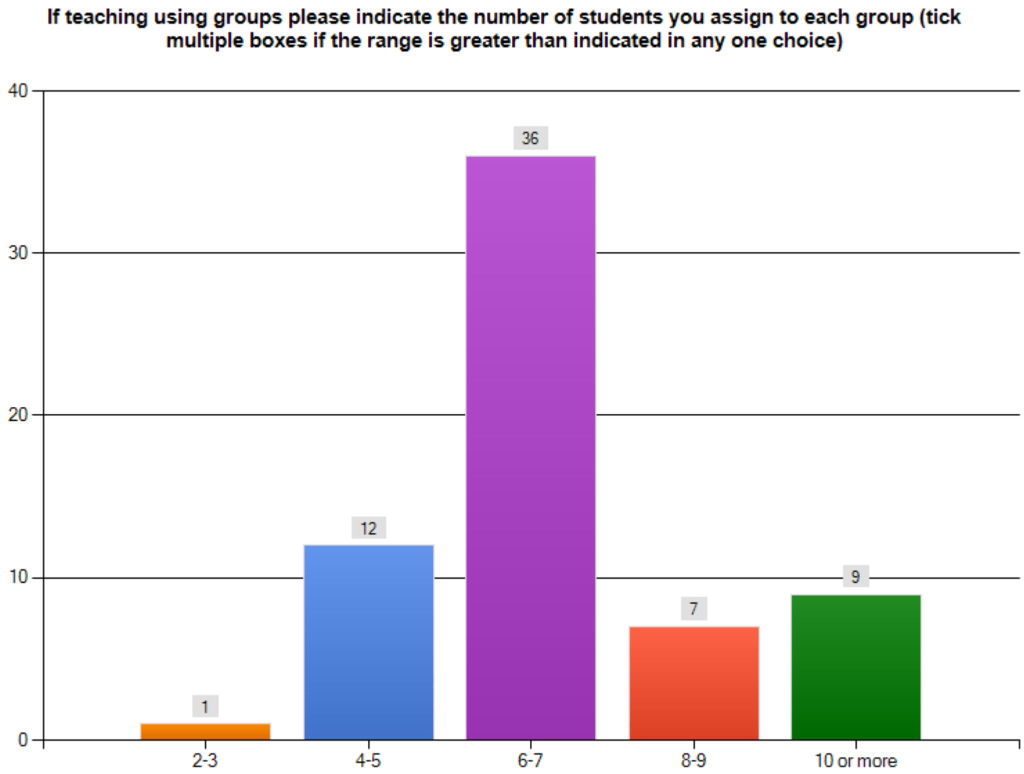


Figure 7.6 Size of teams using simulations

This section of the questionnaire also explored how teams were formed. There is considerable debate in the literature some of which discusses the potential benefits of careful group selection and profiling learners to allocate learners to teams. The reality appears to be that in the vast majority of cases (93.1% of 58 valid responses) this process is done by random assignment of learners to groups or allowing teams to self select members. (See Figure 7.7 below).

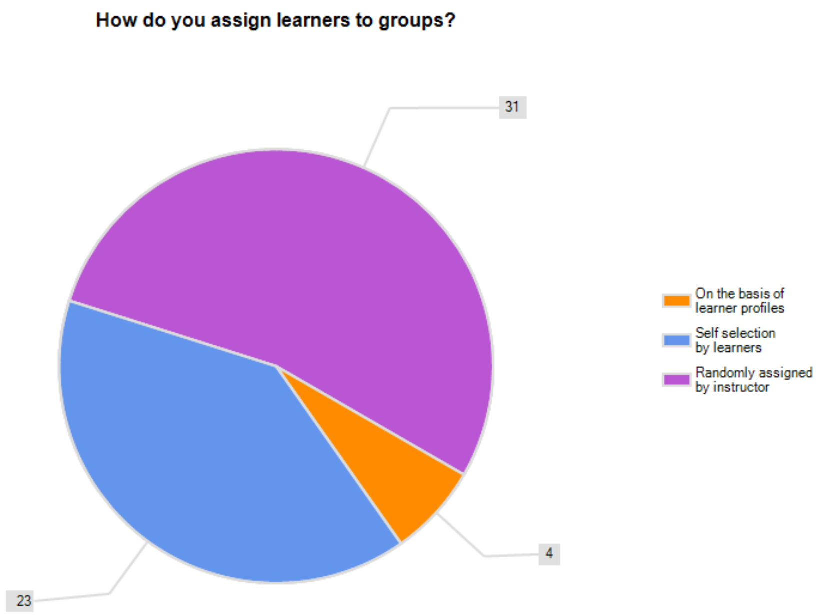


Figure 7.7 Methods of assigning learners to teams

18 comments were given in the section of the questionnaire where academics were invited to comment on how effective the process of group allocation worked. As is evident in the response to how students are allocated to groups only four respondents indicated that they used some form of profiling. 3 of these respondents commented in the open question on effectiveness that they used Meyers Briggs tests to do this and in the fourth case the group selection was based on the background knowledge of learners and prior study to provide each team with a blend of appropriate expertise). Commentary provided by 12 academics indicated that while random assignment to groups or self selection by learners to form groups was not ideal that it was the only practical way in which the process could be conducted. Again the reason for this was cited as practical considerations in terms of staff time which was available to administer the process.

There were also a number of comments (7) which were generally concerned with the use of group work in teaching and the problems and benefits of adopting the approach. As one respondent noted ‘this is probably the most contentious part of the simulation and I seem to spend a huge amount of my time sorting out group issues and problems and dealing with requests to move group’. Another respondent provided a more pragmatic approach noting that '… there are always problems, no matter how we try to sort out the allocation of teams – 'at the end of the day we just have to tell the students that these are the groups and they have to get on and work together – that's what real life is like.'

7.4.5.2 How students are introduced to and supported when using simulations

Another important factor to be considered in terms of the context in which simulations are used is the manner in which students are introduced to and supported while using the simulation. This was given as an open question in the survey and 27 respondents provided some information – this ranged from very basic statements on how the simulation was deployed to very detailed descriptions of exactly how the simulation was introduced to students and integrated with other parts of the curriculum and/or other teaching activities to support students when using the simulations. :

Almost all respondents reported that students were:

1. provided with the student manual (and 4 respondents noted that this was very detailed and easy to use)
2. given introductory sessions in laboratories to explain the simulation and its operation
3. provided with scheduled class times to input group decisions (which varied between 4 and 6 depending on how many cycles of the simulation were being run)

Only 3 respondents noted follow up meetings to review progress and surprisingly none of the respondents mentioned de-briefing sessions despite the fact that this is generally recommended in the literature and seen to be a very important part of the student learning from simulations (Fripp, 1993). Overall the impression given from the responses was that students were introduced to the mechanics of how to use the simulation and then left to their own devices. Again surprisingly given the fact that most staff reported problems in dealing with team interactions, only 1 respondent noted that a specific session was arranged to 'initiate the first team meeting and provide guidance on how teams should function'.

7.4.5.3 Assessment of Learning from the Business Simulation

The assessment of learners when using simulations is believed to be an important factor in contributing to the learner perception of the value of the simulation and can be an important motivational factor in determining the extent to which learners interact. (Entwhistle and Marton, 1984) In particular there is some debate on the value of directly assigning grades, or a percentage of grades, to team performance in terms of 'winning the simulation game or competition'. (Pellegrino et al. 2001, Draper, Cargill and Cutts, 2002).

Rather than ask a closed question to examine the issues of how learning outcomes from use of the simulation was measured the questionnaire suggested 3 methods (all of which had been identified in the literature) and also provided a fourth option for other comments. 26 respondents completed this question. It was usual for respondents to note more than one method of assessment and in 9 cases respondents also provided the relative weighting for each assessment. (This varied between 10% of the final grade and 30% of the final grade). The format of the question is provided in Table 7.4 (below). When assessment was made on the basis of performance in the simulation no respondent reported more than 10% of the grade being allocated to this, though one respondent did note that he was of the opinion that the entire grade should be awarded on that basis but that he would 'never get that agreed through the University'. More than half of the response (15) noted use of reports/essays which in a few cases (6) incorporated an element in which the learners should reflect on their performance when using the simulation. Responses under 'other' were mainly (8 responses from 12) to note that the examination tested all the learning outcomes which were developed in the simulation though again some respondents noted in this section that they would ideally prefer to use alternative types of assessment but that in their institution all fourth year undergraduates were assessed primarily by examination. Overall the impression is certainly that despite the fact the simulation is viewed as an important part of student learning this is not reflected in the value which is placed on it in terms of formal assessment.

This is not unusual and is fairly consistent with results reported in the literature. Chang (2003) for example reports grade weightings of between 10% and 20% in Hong Kong but also noted that the cultural perspective in Hong Kong places more emphasis on final examinations. Decker, Bibb and Likins, (1993) report between 10 and 30% with Faria reporting an average of 25% in the United States and McKenna reporting an average of 40% weighting for use of business simulations in Australia (McKenna, 1991).

Table 7.4 Methods used to assess outcomes of using a business simulation

Which of the following methods do you use to assess the outcomes of student use of the business simulation?		
Method	Response Count	Open comments given
On basis of performance in the simulated exercise	10	5
Through performance in other assessments which allows the student to demonstrate learning	16	
Through self reflective analysis on use of the business simulation	8	4
Other - Please Specify	12	12

As Pongpanich et al note:

> *To further add contribution into this field of research, there is a need to investigate appropriate student evaluation tools when adopting simulation games in the classrooms. Traditional evaluation approaches i.e. reports, presentations, exams etc. are still the norm of evaluation that might not be sufficient measurements when using simulation games in classrooms'*
> *(Pongpanich et al. 2009 p. 328)*

7.4.6 Evaluation of effectiveness of using the business simulation

Staff were asked about how they evaluated the effectiveness of using the business simulation. The purpose of this open question was to get staff to discuss any procedures they had in place not just to assess student performance but to determine student reaction to using the simulation as a teaching method but some respondents clearly misunderstood this and re-iterated information about how students were formally assessed.

There were relatively few responses given to evaluation of effectiveness (in comparison with numbers of responses to other open questions in the questionnaire. 16 academics provided information but as noted above 7 of these simply repeated information on assessment. Others responded that the assessment was done through standard student evaluation questionnaires for the module on which the simulation was used and only one respondent noted that there had been a formal evaluation of the simulation though qualified this by noting that this was mainly to justify the expenditure on licenses for the software.

7.4.6.1 Problems/challenges faced when using business simulations

In contrast to the response rate given for the previous question a large number of academic staff (44) provided further information on problems/challenges faced when using business simulations. In retrospect it was noted that the question was rather biased in asking only about negative aspects of using the business simulation and 5 respondents commented on this, one noting that 'you have to understand that there are a lot of good things about using the simulation – yes it is hard work and can be frustrating at times but the positive benefits for students more than compensate for this'.

Comments related to the difficulty of managing group work were made in a large number of responses (20) and a number of respondents (7) suggested that the simulation exercise may be better used if its scope was narrower and students could work independently on the simulation. One respondent noted that 'it is very difficult to see whether or not all of the members of the team are benefitting from the learning and anecdotal responses [from students] would seem to suggest that the brighter students learn a lot but those who are not able to cope with the concepts somehow coast along' and may in fact not take part in the exercise at all'.

There were also a high number of responses (17) which referred to the very positive feedback from students who had used the simulation though 5 of these also noted the fact that students felt they should be rewarded better for their effort. (In one case it was clear that the institution awarded a small prize to the best team but as the respondent commented students clearly felt that their work should also be recognized more the grade they achieved).

A relatively large number of responses (11) were received which clearly indicated that the member of staff administering the use of the simulation had not been involved in the decision to integrate it into the course and noted their concerns about the content which students had to learn which did not appear to be fully developed in other areas of their studies.

Many of the respondents clearly wished to repeat and emphasize the work load involved in using simulations but most of these were not entirely critical about this but rather seemed to wish to point out that there needs to be recognition of this in their institutions.

What comes through very clearly in most of the response, however, is the enthusiasm of staff. Despite the fact that there were many criticisms about the work involved staff were generally enthusiastic and expressed the view that the effort was worthwhile because they felt that the simulation provided a really good learning opportunity.

7.4.7 Basis for selecting a specific business simulation

The third section of the questionnaire attempted to determine the main features which academics took into account when selecting a business simulation and respondents were asked to rank the following features in order 1 to 6 (1 being the most significant and 6 the least significant). It should be noted that the same question had been asked of developers although in that case the question was phrased to determine what their perception was of what academics viewed as important criteria when selecting simulations.

This was a closed question with 6 possible responses. Again in order to ensure that any bias in the ranking which was caused because of the order in which the choices were listed was avoided the order was randomly generated using a function in the

SurveyMonkey software to do this. The criteria which academics were asked to rank were:

- Accuracy and currency of content of the simulation
- Cost
- Quality of the interface
- Degree of interactivity provided for learners
- Ease of use of the simulation
- Ability to customize simulation

The results are presented in Table 7.5.

Table 7.5 Ranking of important features of business simulations

	RANKING OF IMPORTANCE (1 most important - 6 least important)					
QUESTION	1	2	3	4	5	6
Content	40	28	8	9	2	0
Cost	28	17	27	10	4	1
Quality of design	10	24	19	26	8	0
Interactivity	2	6	8	28	39	4
Ease of Use	2	12	24	11	32	6
Customisability	5	0	1	3	2	76

In exactly the same manner which was applied when considering the parallel question asked of suppliers, the overall ranking order from the collective responses was achieved by calculating a ranking score. This score was derived by examining each return and summing the inverse ordinal ranks (between 1 and 6 – least important to most important) given to the category by all respondents and dividing this by the total number of respondents. This created a ranking score in a range between 1 and 6 Providing this ranking score in the results shows more clearly the different emphasis (rank score 1 least important and 6 most important) given by the respondents to the significance which they (the academics) place on the different criteria. (See below Table 7.6 and Figure 7.8)

Table 7.6 Overall ranking of important features of business simulations

Criteria	Overall rank
Content	5.09
Cost	4.60
Quality of design	4.02
Ease of Use	3.11
Interactivity	2.76
Customisability	1.41

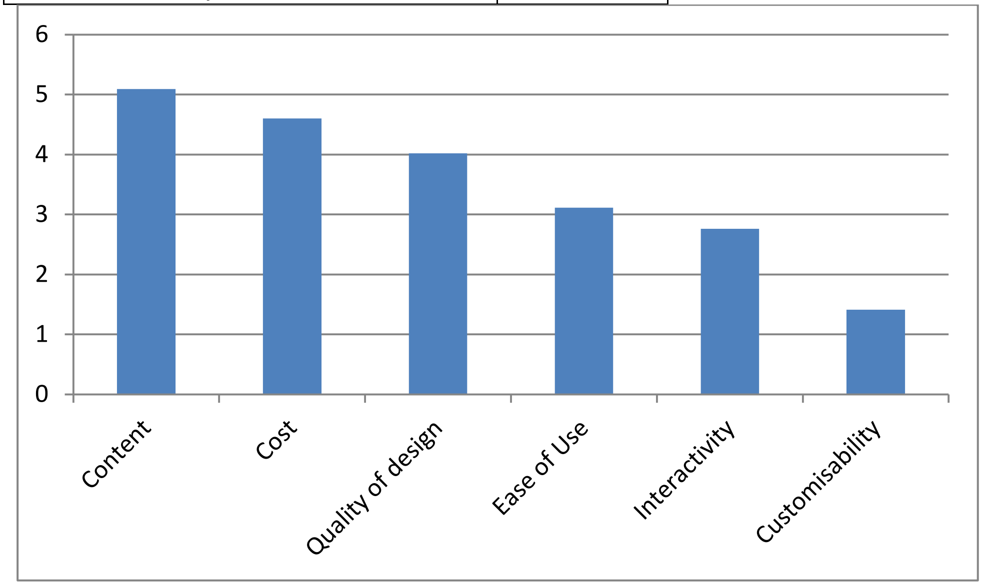


Figure 7.8 – Academics rank order important of required features of business simulations

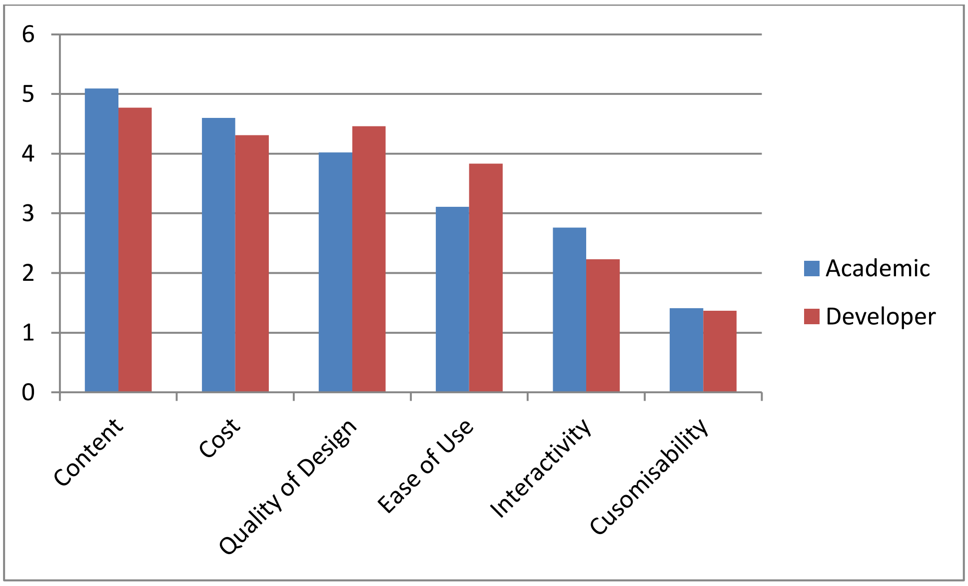


Figure 7.9 Comparison of ranking order of criteria between academics and developers

The results were compared with the results which were provided by developers of simulations (in Chapter 6 of the thesis) in order to determine whether there were any significant differences in the perceptions of the two groups. (Figure 7.9 above)

Generally there is broad agreement between what suppliers believe academics are looking for when selecting simulations and the relative priorities as reported by academic staff themselves. There are only slight differences in emphasis about the relative importance of the features which they were asked to rank in order of importance and the only point at which there is a marked difference is in the ranking of the last 2 features – interactivity and customizability. As noted in Chapter Six the different interpretations placed by academics and developers on the use of the term interactivity may explain why there appears to be a difference in perception of the value of interactivity. The low ranking given by academics to customizability is mainly because of 2 factors

1. the costs associated with getting a completely tailored system which has previously been discussed in the literature review, and
2. the work associated with customization at the level of delivery (this fact was confirmed in interviews with academics)

7.4.8 Pedagogical benefits to learners

The final section of the questionnaire was to determine the perceived benefits of using business simulations as part of the academic curriculum. Respondents were asked to rank the following:

- Delivering essential facts and theories
- Assisting learners to link theory to practice
- Providing more effective engagement with learning
- Facilitating experimentation in a ‘risk free’ environment
- Enhancing employability skills
- Encouraging reflective learning
- Developing team working skills
- Developing decision making skills
- Gaining immediate feedback to support learning

As was the case when examining responses from the parallel question which was asked of the developers of simulations, some respondents reported that this was a very difficult thing to do. The results are presented in Table 7.7 and in more detail in Table 7.8 and illustrated in Figure 7.10 below.

Table 7.7 Overall ranking of pedagogic objectives using business simulations (academic staff)

Benefits of using business simulations	Ranked Importance
Assisting learners to link practice to theory	7.67
Providing more effective engagement with learning	6.55
Encouraging reflective learning	5.39
Delivering essential facts and theories	5.20
Developing decision making skills	5.03
Facilitating experimentation in a 'risk free' environment	4.66
Developing team working skills	4.33
Enhancing employability skills	3.63
Gaining immediate feedback on actions to support learning	2.54

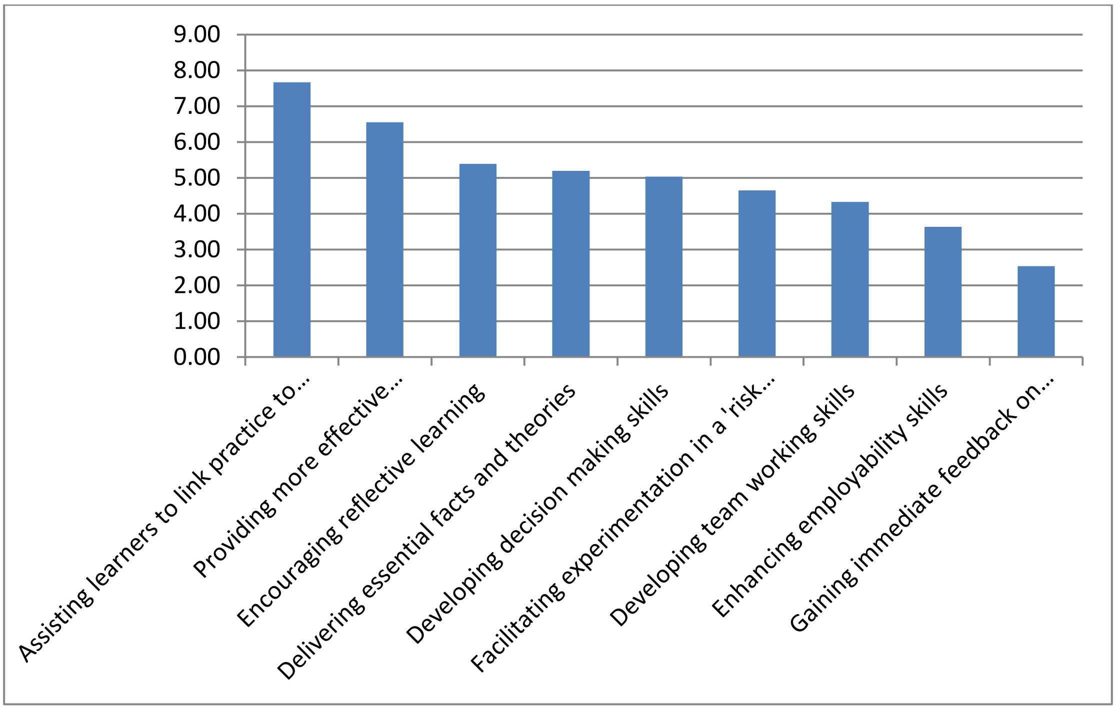


Figure 7.10 Academic ranking of relative importance of pedagogical benefits of using business simulations

Pedagogical benefits of a business simulation (Responses from academics)	RANK in order of importance (1most important – 9 least important)								
	1	2	3	4	5	6	7	8	9
Delivering essential facts and theories	3 3.4%	16 18.4%	16 18.4%	11 12.6%	9 10.3%	6 6.9%	7 8.0%	10 11.5%	9 10.3%
Assisting learners to link theory to practice	31 35.6%	25 28.7%	15 17.2%	10 11.5%	3 3.4%	1 1.1%	1 1.1%	0 0.0%	1 1.1%
Providing more effective engagement with learning	21 24.1%	9 10.3%	20 23.0%	11 12.6%	11 12.6%	6 6.9%	6 6.9%	3 3.4%	0 0.0%
Facilitating experimentation in a ‘risk free’ environment	0 0.0%	7 8.0%	9 10.3%	15 17.2%	17 19.5%	13 14.9%	12 13.8%	9 10.3%	5 5.7%
Enhancing employability skills	3 3.4%	3 3.4%	2 2.3%	4 4.6%	12 13.8%	18 20.7%	19 21.8%	12 13.8%	14 16.1%
Encouraging reflective learning	15 17.2%	9 10.3%	11 12.6%	11 12.6%	6 6.9%	9 10.3%	7 8.0%	13 14.9%	6 6.9%
Developing team working skills	4 4.6%	7 8.0%	3 3.4%	8 9.2%	12 13.8%	14 16.1%	23 26.4%	15 17.2%	1 1.1%
Developing decision making skills	10 11.5%	11 12.6%	8 9.2%	14 16.1%	4 4.6%	10 11.5%	8 9.2%	14 16.1%	8 9.2%
Gaining immediate feedback to support learning	0 0.0%	0 0.0%	3 3,4%	3 3.4%	13 14.9%	10 11.5%	4 4.6%	11 12.6%	43 49.4%

Table 7.8– Responses from academics on importance of pedagogic objectives supported by Business Simulation products

It is interesting to note that academic staff tend to favour a higher ranking score for those benefits which they are associated with acquisition of higher order learning skills (in educational objective taxonomies such as Bloom's taxonomy). There is a surprisingly close degree of agreement between developers and academics on almost all of the potential benefits of using business simulation/games and though there are slight differences in emphasis they broadly agree on the relative importance of the different pedagogic benefits which are cited in the literature.

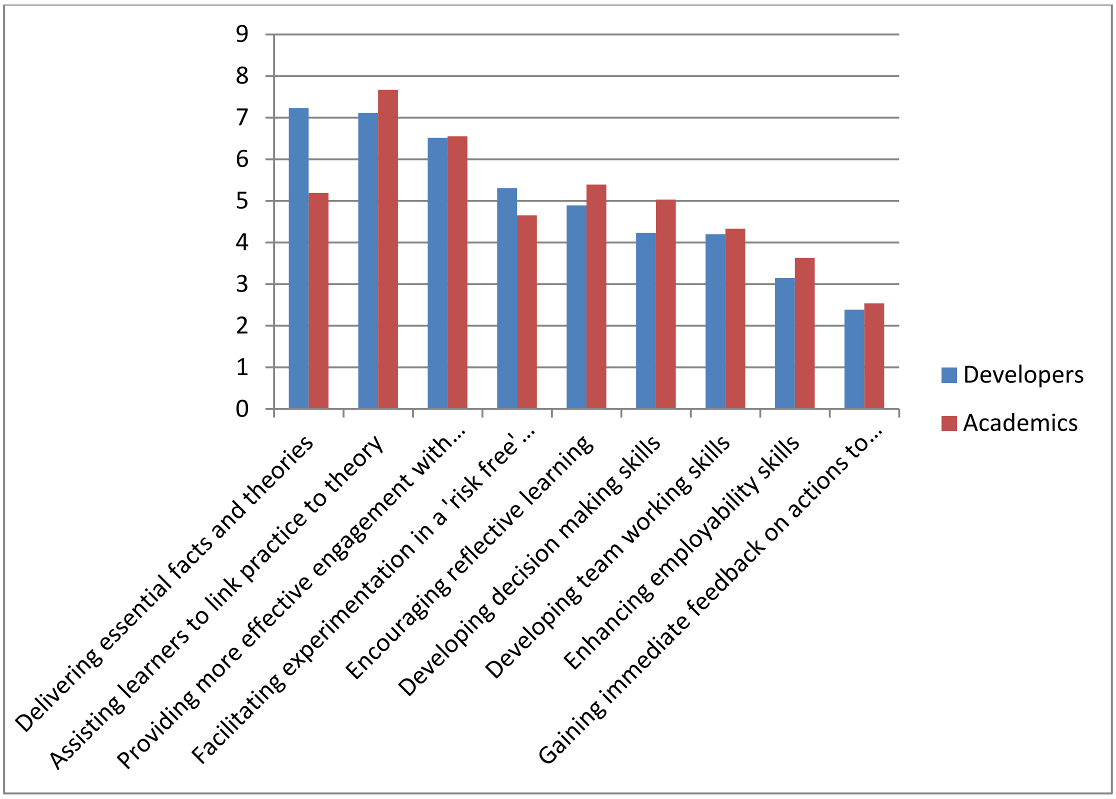


Figure 7.11 Comparison of academic/developer perceived importance of pedagogical benefits

The overall picture which emerges is of general agreement between academics and developers on the pedagogic value of simulations and an agreement that the main benefits are providing an engaging learning environment which motivates students and the opportunity provided to enhance the development and application of higher cognitive skills.

7.4.9 Interviews and responses to open question

The final question was an open question to allow respondents to provide any additional comments or observations they would like to make on the development and use of simulations in Higher Education and 39 responses were provided. This is a very high response rate for an open question and, from an examination of the responses, it is possibly because the respondents felt that it was important to convey more detail than they could provide in closed response questions. Many of the open question responses, however, were very much the same as those responses which were provided to the open question on problems/challenges in using business simulations and a substantial number of them (12) were actually used to emphasize the considerable work involved in using business simulations (and in some cases the lack of recognition of this). These comments are taken together with the responses from the 6 academics who were interviewed as part of the research and the discussion is provided below.

Technical issues were not really brought up either in open comments provided at the end of the questionnaire or in the interviews. Academics who were interviewed did not believe that there were any serious technical issues in using simulations other than those which may impact on the whole of the institution's IT system when 'servers fail' or what interviewee states as 'we have the usual unexplained issues around slowness of the system and access to centrally held data'. The comments made both in open questions and by interviewees on adequacy of the design of business simulations again showed this was clearly not a problem and in fact respondents often pointed out that the attractiveness of the design and the fact that students could access a wide range of useful material independently was very much a positive feature of modern business simulations. The open comments and interview responses have been analyzed and are discussed below in terms of two broad themes on which there was considerable comment i.e. pedagogic considerations and implementation issues).

Pedagogic considerations

One respondent noted that an important point which did not come out clearly in the questions was related to active learning. He noted that in his view the key benefit of business simulations was that they are active learning environments which involve students using the course material but also going through carefully constructed activities. In general he commented that ‘getting the students to do things – performing and taking action – is so much better than traditional face to face lecture methods and really engages students more in the learning process’

Grisoni (2002) reports a qualitative research finding that suggests that the uncertainty felt by many academics about experiential learning approaches contributes to its lack of use but the findings from this qualitative survey appear to contradict this. Certainly there is no support for her suggestion that academics feel experiential approaches are ‘non academic’ and less well suited to university education than theoretical approaches. The difference in finding perhaps suggests a change in the acceptance of new teaching methods over the last decade. Indeed, a comment from one of the interviewees was very direct in terms of pedagogic benefits when he stated that ‘really the case for learning from simulations is proven beyond doubt and it’s time to move on and stop debating whether or not these help students to learn and start thinking more about how we get the students to get maximum benefit out of using them’. This was repeated in a slightly different way by another interviewee who noted that ‘we know they [business simulations] if used properly can have a huge impact on giving students good skills and they can do this in a way which really makes the students want to learn but the challenge is getting them to see this and to engage fully in the learning opportunities’.[16]

Most of the open comments and comment from interviewees were very positive, and some were very enthusiastic. Reporting on evaluation by students and their reactions to using the simulation it was noted that as with other teaching methods the ‘good’ students who were willing to engage with the simulation were the ones who really benefitted most. In an interview the researcher followed up this point asking what was done to encourage the weaker students to engage with the simulation. A fairly long discussion which followed clarified the interviewee’s belief that as with any learning the student had to want to learn. He suggested that if the assessment was clearly tied to the learning from the simulation this in his view helped enormously to get students to work seriously on the simulation. He also made the observation that

[16] *This explained one of the comments which was given as an open response in the questionnaire which simply read ‘You can lead a horse to water …’*

people should not make the assumption that just because we [meaning academic staff] think the business simulation is motivating and designed to help students to learn in an enjoyable way does not mean that we can assume that it will motivate the students. He concluded his remarks by noting that ‘as with any other teaching method you really have to work hard to get results – and as in everything else it’s the good teacher who will always get the best results’

Only one interviewee noted a slight reservation about use of business simulations in terms of meeting appropriate pedagogic objectives and that was related to the degree as he put it ‘it is the right approach for all students’. In particular he questioned whether or not, based on his experience,’ international students got as much out of the simulation as they could.’ In discussion, he noted that this was part of a wider question in terms of how we prepare international students to take part in learning in the UK Higher Education system which can be difficult for students who have been used to very didactic approaches cantered around rote learning and preparing for assessment almost exclusively by examinations.

Implementation issues

Some of the observations above dealt not only with pedagogy but with implementation issues and this was a very frequent theme which was brought up in both open questions and by interviewees.

In 16 of the open responses in the questionnaire survey academic staff returned to the question of the amount of time and effort involved in running the business simulation. In slightly more than half of these responses the staff also qualified their comments by stating in different ways that it was not simply the workload involved which was the issue but the lack of recognition which they felt was given to the work which they did. During two of the interviews it was clarified that the recognition which staff were seeking was not necessarily financial but was more often tied up with getting remission from other teaching or administration in order to give their full attention to dealing with administering and guiding students in using the simulation.
Lean (2006) notes that:

> *'it is not unusual in any organizational context for time and resource limitations to be cited as factors encumbering progress and higher achievement' (Lean, 2006 p.238)*

Keefe et al. (1993) reported on user dissatisfaction with administration and logistics as being a demotivator for staff (25% of respondents in their survey expressing this view) and Chang (1997) whose survey included respondents who did not use simulations reported that a barrier perceived by them was their perception that it involved 'lengthy preparation time' and 'high start up costs'

The main workload issue which was noted was administrative issues and 'fire fighting' which were associated with running the exercise with a large number of teams. This was true not only of on campus use of simulations but also noted by two respondents who were involved in dealing with 'virtual teams' using the simulation as part of a distance learning programme. This is in line with reports in the literature which examine use of business simulations more widely. Faria and Wellington (2004), for example, note that 37.4% of academics in their survey report 'lack of preparation time as a major factor. Chang (1997) also notes that this is a significant barrier to use.

Time available to run the simulation exercise was also an issue raised by 4 respondents. One interviewee questioned whether really the use of simulations was better when dealing with corporate clients or in executive education where the exercise was run over a very intensive period at a weekend. Another, however, appeared to contradict this and suggested that the simulation needed to be run over a long period of time but also acknowledged that it was difficult to get students to stay focused on the simulation when there were many other subjects which were being taught and assessed at the same time. As the respondent noted 'a looming deadline for assessment in another module would play havoc with the team getting together and seriously considering the decisions they were going to make in the simulation exercise'.

Finally in terms of implementation there were a number of respondents who noted that there were frequently problems in teaching using the simulation because the content was either not relevant (3 respondents) or far too complex for students to handle (5 respondents) or based on wrong assumptions and theories (3 respondents). To gain more detail on these issues the researcher discussed this in the interviews which were conducted after the questionnaire survey was concluded. The interviewees all acknowledged that these were important issues but were divided in their views on what the cause of the problem was or how to easily resolve the problem. Two of the interviewees suggested that lack of relevance was something which should be tackled when selecting a business simulation and much more detailed investigation should be done when academic staff evaluated a simulation for use with their students. Contradicting this, another interviewee suggested that sometimes academic staff were just 'landed with' a simulation and expected to teach using it so the problem was not simply inappropriate selection of the simulation. This interviewee commented 'I've taught using two business simulations now and in neither case have I had any say on what simulation I would be using – its simply been a case of this is what you use and get on with it'. All interviewees acknowledged that there could be problems because some of the material was too complex for learners and four of them noted this was particularly true of financial aspects which were embedded in simulations. One interviewee suggested that the only solution was either to ensure that the students had a sufficiently high level of financial background studies or to manage team allocation to ensure that at least one member of each team had this background knowledge. Two others suggested that the solution had to be careful guidance for students to ensure that at the point they needed more detailed teaching on particular areas of study which were required to fully engage with the simulation that these should be timetabled in the planning process for delivery – though both were clearly aware that this added considerably to the workload involved in using the simulation. Finally on the question of the material not being appropriate in terms of using different theories or business models which were being taught in other parts of the student's course of study, again two interviewees responded that this had to be managed by academic staff highlighting this to students and providing more detail to them on the conflicting theories. One interviewee was very critical of this approach noting that 'the whole point of the simulation is that students learn in a real life situation and in real life you are always going to get different theories and approaches to model how a business is conducted'. He went on to note that far from being a problem 'this should be embraced by the learner and it should help to develop their critical thinking skills and not always feel that there is right answer which is the one which fits with a theory they have been taught … I think academic staff should see this as an opportunity because if it gets students to question what they have been taught and think more about it this is always a good thing'.

Clearly, therefore, there are a number of issues around implementation and the way in which this has to be handled. The important point, however, is that in all cases the solution seems to be to provide much more input and 'scaffolding' for students when they are learning using the simulation and from the responses given in the survey about the amount of direction provided to learners this does not appear to be happening in practice.

7.5 Summary

The current study validates many of the previous findings in the literature and adds to the overall picture of academics' use and perception of value of business simulations. As noted above it is impossible to exactly correlate the findings from the survey with previous studies because the questionnaire was targeted very much at gathering the experience and perceptions of current users of simulations. It was expected, given the very positive attitude to use of business simulations in teaching which is evident in the literature that the reported outcomes from the study would be very positive. However, the questionnaire and subsequent interviews raised a number of significant issues. The main issue was clearly around staff views on the amount of work which was involved in administering the business simulation and integrating this into the course - and to a lesser extent the issue of dealing with teams in a group working situation. The issue of group work raised a number of critical comments but while there appears to be general agreement that it is good practice and beneficial for the students the actual manner in which it should be used leaves many unanswered questions.

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Chapter Eight

Student Perceptions of the Value of Simulations

The objectives of this chapter are:

- To describe and analyze the case study evaluating the perceptions of learners using a business simulation in order to identify the critical success factors which contribute positively to their learning experience
- To synthesize the findings of the case study with the factors which have been identified in the literature review concerning students perception of the values of using business simulations
- To discuss the implications of the work with particular reference to how business simulations should be used in Higher Education and the mechanisms to evaluate the impact of their deployment on student learning.

8.0 Introduction

As with other aspects of researching the use of business simulations is necessary firstly to clarify the terminology this is being used. In the literature the term evaluation is used to cover a whole range of activities including ensuring that the technological basis of the system itself performs according to specification, that the simulation itself is based on an accurate interpretation of how changes to different variables will have an impact on the outcome which is reported to the learner in terms of how the decision affects the overall business environment. As noted above the term validity is also used to describe evaluation activities. The framework for evaluation described in Chapter 5 of this thesis has clarified how these terms are defined and how different types of evaluation should be used when considering use of business simulations by students.

The important questions which need to be very clear in an evaluation are:

- What is being evaluated?

and

- Is the method for evaluation consistent with measuring the educational objectives which are stated or being claimed for the system?

The methodology chapter of the thesis (Chapter 2) provides the rationale for adopting qualitative evaluation tools and in the discussion of methodologies for evaluation of student learning (Chapter 5 of the thesis) the researcher has justified the reasons for taking an illuminative approach to conducting the evaluation.

Illuminative evaluation is a method which can be applied to a rigorous investigation of the learning experience of students when using business simulation as part of their studies and needs to be supported by a very careful consideration of how to use appropriate research tools to ensure that the views and perceptions of the learners are fully taken into an account. Illuminative evaluation refers to an approach which stresses the need to take into account the opinions, pre-conceptions, and perceptions/misperceptions of students when engaged in any learning activity as these are central to explaining how learning is facilitated. It is clearly outlined by Parlett, who introduced the term, and it is particularly important because it draws attention to the fact that the focus for evaluation must be based not only on the outcome of a particular test but on the manner in which students engaged with the learning material (Parlett & Dearden, 1977; Parlett & Hamilton, 1987). The approach can be seen to be very closely linked to phenomenographic approaches the conceptual framework of which focuses on the experience of learning from the student's perspective.

As Marton notes:

> *'our task is thus to describe more clearly how learning takes place in higher education and to point out how teaching and assessment affect the quality of learning. From these descriptions teachers should be able to draw their own lessons about how to facilitate their students' learning' (Marton, Hounsell & Entwistle, 1984).*

Thus the application of illuminative evaluation revolves around the need to understand the approaches taken by students to learning with business simulations rather than simply the results they achieve. Illuminative evaluation does not replace formative and summative evaluations which are also important in determining if a learning intervention fulfils its objectives. However, it is particularly valuable because it allows us to examine in more detail the mechanism by which students learn using the simulation and provides useful information on the processes involved in learning. In particular illuminative evaluation is a tool which is useful in enabling the evaluator to learn and make judgements about the starting assumptions, implementation processes and outcomes of the learning intervention (Stern, 1990, quoted in Jackson, 1990, p.22). In addition it should be noted that illuminative evaluation is most powerful when used in conjunction with integrative evaluation. An integrative evaluation explicitly recognises the importance of conducting evaluation in an authentic learning environment – in this case a study of the use of a business simulation by students as a part of their course of study.

The study undertaken as part of this research involved Masters level students at the Robert Gordon University, Scotland. The key research tools for conducting the evaluation were individual interviews with students, interviews with groups who constituted teams working together using the business simulation package and focus groups. To help clarify the processes followed a calendar of these is provided below and gives a useful reference point for clarifying the range and scope of the application of the research methods. From the literature it has been established that while a number of small scale surveys of students using business simulations (often looking at very limited parts of the overall learning experience) there is no comparable study on the scale in which this investigation has been carried out. The data collection methods used are described in the following sections.

8.1 Data collection Methods

Table 8.1 Schedule of interviews/team meetings/ focus groups with students

Individual Interviews	N	Simulation Team Meetings	N	N	N	N	N	Focus Groups	N
March 2009	18	March 2009	4	5	3	3	4	March 2009	15
April 2009	12	April 2009	3	4	4	2	3		
February 2010*	15	February 2010	3	4	3	3	4	March 2010	12
		April 2010	3	3	3	4	3	March 2010**	11
July 2011***	12							July 2011***	10
August 2011****	30								
Total Interview	87 student interviewed -								
Total Group Interviews			20 team interviews (involving in total 68 students)						
Total Focus Groups								4 focus group meetings (involving 48 students)	

*The participants in these interviews were students who had enrolled on their course in January

**The participants in this focus group were restricted to UK or European students in order to investigate what appeared to be a difference in perception of some of the issues discussed in relation to use of the business simulation
***The participants in these interviews and in the focus were students who had failed the course at first attempt and were therefore engaged in resubmitting their assessment. It is important to note that these students engaged with the simulation as individuals (using the product's single player option) rather than as part of a team.
****The participants in these interviews had successfully completed the course and were asked to reflect on the value of the simulation to their overall understanding of business management and the skills they had gained across the whole course and were also invited to complete a short questionnaire.

The empirical work with students was carried out over a 3 year period between 2009 and 2011 and, as the courses on which students were engaged were 1 year Masters courses this involved 3 separate cohorts of learners.

In 2009 the intention of the empirical work was to interview a large sample (30) of the students undertaking the module to provide data on their individual experience of using the simulation and to collectively interview 10 of the groups of students engaged as a team in using the simulation. Individual students to be interviewed and the simulation teams interviewed were selected at random. Focus group meetings allowed the researcher to corroborate these perceptions with a separate group of learners. However, as the research evolved it was realized that additional interviews and focus groups were required to provide a fully representative sample of the users of the business simulation.

In 2010 the intention was to repeat the empirical work to provide further corroboration of student perceptions using a different cohort of learners (which could potentially highlight any significant differences in perception because of external factors impacting on the student learning experience in a particular year – although it was confirmed that the course teaching team and the curriculum itself had not changed significantly). Because of changes in the overall balance of numbers of international and home students on the course it was also decided that it would be useful to run an additional focus group for home students only to determine if there were any significantly different issues arising between international and home students – noting the comment from one respondent in the academic survey who suggested that this may be the case. In addition a set of interviews was undertaken with students who had commenced their studies in January 2010 because, as explained below the researcher had previously been unaware than an important contextual factor in investigating student opinions and perceptions was that students enrolling on the course in January were taught alongside students who had enrolled in September (though clearly they did not have the prior experience of business and management which September start students had gained during the previous semester of their studies).

In 2011 the researcher only conducted interviews and these were conducted after the students had completed the module and their results announced. Two sets of interviews were conducted – one with students who had failed the module and were engaged in re-sitting the module but using the single player version of the simulation package and the other with students who had successfully completed the module. The focus of the latter interviews was on gaining views on how the use of the simulation had contributed to the overall learning of the students and to allow them to reflect on whether they could successfully transfer their learning into a workplace setting. At the conclusion of these interviews students were also asked to complete a brief questionnaire which effectively acted as a student evaluation of their learning experience specifically with regard to how they perceived it had prepared them for ‘real life’ working experience.

Interviews with individual students were scheduled to last for approximately 30 minutes and in practice varied between 15minutes and 30 minutes. Discussions with students who were allocated to specific teams to work together on the simulation were scheduled for 20 minutes each and in practice the length of the discussion varied between 20 and 40 minutes. Finally focus groups were scheduled for 1 hour each and in practice were generally concluded within 45 minutes. The researcher took detailed notes during the focus group meetings but these were not recorded in order to maintain the confidence of the students and to encourage them to speak freely during discussions. However the notes of the meeting were e-mailed to the participants in order to confirm their accuracy

To provide as broad a range as possible of student perceptions when using the simulation, students who had been interviewed as individuals were not invited to participate in a focus group (though an exception was made in the case of students who were interviewed in July 2011 who had failed the module at first attempt and were undertaking the module using the single player mode of the simulation when 5 students who had been interviewed also attended as part of the focus group and it was felt that this was acceptable given the relatively small number of students who would otherwise have constituted the focus group).

The schedule of individual interviews (and the composition of these), group interviews, focus groups for specific purposes is complex and in order to make clear how they collectively contributed to providing data to support the research the following summary is given.

Individual interviews

30 interviews were arranged in 2009 and students randomly selected from the whole cohort. To provide more specific information on the learning experience of particular groups of students, in 2010 individual interviews were arranged with students who started their studies in January (and so had very limited prior learning experience). In 2012 individual interviews were arranged with students who had failed the module at first attempt and also individual interviews were arranged with students who had successfully passed the module at first attempt.

Purpose of individual interviews

The purpose of these was to allow student to the opportunity to provide comment on their overall experience of using the business simulation and to explore differences between particular groups of students. The purpose of the interviews which were arranged specifically with students who enrolled in January (15 students) was to determine whether they had a different perception of the use of the business simulation as it was thought that their lack of prior knowledge may negatively impact on their overall assessment of the value of using the business simulation. The purpose of the interviews arranged with students who had passed the module at the first attempt (12 students) was to allow the students to comment in retrospect on their learning experience and in particular explore issues related to transfer of learning. The purpose of the interviews arranged with students who had failed the module (30 students) was likewise to give students the opportunity to reflect on their learning and examine whether there were any issues related to the teaching method which they felt contributed to their ability to transfer the learning to other educational settings.

Conduct of individual interviews

The interviews were scheduled in a vacant classroom in the Aberdeen Business School. The researcher took careful notes during the interviews. The interviewer experimented with different methods to collect the views of participants. Initially some of the interviews were recorded using an audio recorder but experience of this was that it inhibited some of the discussion and some students were reluctant to air their views frankly. The researcher, therefore, switched to using notes only and to facilitate this Livescribe® software was used to allow notes to be quickly converted to Microsoft Word format. This assisted the researcher in subsequently reviewing comments and ensured that the comments were accurately recorded. (The comments were noted as individual quotes from students which the researcher subsequently e-mailed to the participant to confirm they were accurate). It is important to note that in order to gain a completely unbiased record of the interviewees' perception of using the business simulations the interviews were as far as possible completely unstructured. The interviewee was simply asked to give his/her views or opinions on their experience of the teaching method. Because the interviews were conducted in this way it meant that the researcher had little control over what issues or topics the student may wish to bring up. So while the researcher was particularly interested in the development of skills which were particularly stated as module learning outcomes a great deal of other commentary was collected which was not central to these outcomes (decision making skills and ability to integrate learning from across a range of subject areas). This could be viewed as being vey wasteful because many of the comments were not specifically directed at the research questions which the researcher was investigating. In particular while there were a number of comments generally on use of the business simulation/game many of them were not specifically related to the learning outcomes which were specifically identified by teaching staff for the module. In the subsequent analysis of the results, while these were interesting, the researcher restricted himself to looking specifically at comments related to development of decision making skills (both individually and as teams) and how successfully the students managed to integrate their learning across a range of sub disciplines in business and management commenting only on other observations from learners which could be directly related to these.

Data collected from individual interviews

The data finally collected was in the form of verbatim quotes which related to student perception of the use and effectiveness of the teaching method. These were coded using a method described in Section 8.4.2 of this thesis and were the basis for the analysis and discussion provided there.

<u>Team Interviews</u>

Students used the business simulation game as part of a small team – normally 4 or 5 students being allocated to each team. In total between 2009 and 2010 the researcher interviewed 20 teams. The number of team members who attended particular interviews varied between 2 and 5.

Purpose of team interviews

The purpose of the team interviews was specifically to look at how learners viewed group working. Team working was clearly a very important feature of the context of student use of the simulation and the fact that of the pedagogical objectives which were set by academic staff in terms of learning outcomes involved collective decision making was also important. The literature review notes that group working has a significant impact on how students view the overall learning experience when using simulations. The interviews with the teams was thus primarily to explore in more detail this aspect of using the business simulation which could then be compared and contrasted with the views expressed by individuals.

Conduct of team interviews

The interviews were held in a vacant classroom in the Aberdeen Business School with the small groups who constituted a team when using the business simulation. The researcher took careful notes during the interviews again using Livescribe software to record these. Unlike the individual interviews the team interviews were more structured in order promote discussion around some of the key themes identified in the literature relating to 'problems' with teaching methods which involved learners working as teams. To help to facilitate the discussion the researcher issued each member of the team a very brief questionnaire prior to the start of each team interview (described in detail in Section 8.4.1 of the thesis).

Data collected from team interviews

The data collected was in the form of brief notes of the meeting. The researcher organised each of these notes into sections relating to particular aspects of team working which had been discussed and in the analysis provided in section 8.4.4.1 used this to discuss the results of the team interviews.

Focus Groups

Two focus groups comprising a sample of students from across the entire cohort were held in 2009 and 2010 respectively. In addition it was decided to look in more detail at issues from the perspective of Home/European Union students a focus group would be held in 2010 and finally a focus group meeting was held in 2010 and that group was made up of students who had failed the module on their first attempt.

Purpose of Focus Groups

The main disadvantage of using interviews as the only instrument to gain student opinion is that the researcher cannot quickly corroborate comments taking into account the views of others. Following on from the interviews it was decided therefore that to gain richer data of student perceptions the researcher would arrange a series of focus groups at which students would be given the chance to respond more broadly to issues which they felt were important

Conduct of focus groups

The focus group meetings were held in a vacant classroom in Aberdeen Business School. The group meetings were conducted using a pre-defined list of prompt questions to initiate discussion. Therefore questions were designed prior to the focus group meetings and this help to ensure a smooth and structured flow the discussion making best use of the time available. Questions were framed in such a way as to begin with general questions and building on responses leading to more the specific questions addressing issues in detail. As such, the focus groups were semi-structured as the researcher allowed the groups to explore additional questions or issues as they arose from the discussion. A copy of the focus group questions is provided as Appendix 7, noting also variations which were introduced when dealing specifically with the focus groups which comprised Home/EU students and students who had failed the module respectively.

Data collected from focus groups

As with the individual and team interviews the focus group meetings were not recorded but the researcher took notes of the meeting and highlighted the main issues which were discussed. A copy of the notes from each focus group was e-mailed to participants to ensure that the points in the discussion had been accurately captured. The focus group notes were used as the basis for discussion and analysis of the students view on the implementation of the business simulation and their perception of how useful it was – particularly in assisting them in achieving the learning outcomes it was designed to develop.

8.1.1 Data Collection - Questionnaire Survey of Students

In May 2009, after students had completed the postgraduate diploma stage of the module in which the business simulation was used but prior to their overall assessment for the module being provided to them a short questionnaire was issued to all students who had undertaken the module.

Table 8.1b Questionnaire Survey

Date issued	N (Issued)	N (Returned)
March 2009	148	92

Purpose of Questionnaire

The purpose of the questionnaire survey was not to provide hard statistical data on which definitive conclusions about the effectiveness of the use of simulations as a teaching method (which as has already been pointed out is a flawed basis on which to derive meaningful conclusions to support or refute the effectiveness of simulations). Its purpose rather was to provide a high level overview of the extent to which the simulation had achieved the objectives which are frequently cited claims for the benefits to be gained from using simulations which were previously identified in the literature review and survey work conducted with developers and academics. The rationale for such an approach is provided by Gold and Pray who refer to this as a ‘quick and dirty’ approach to ensure that there are no major issues which need to be considered prior to undertaking a detailed qualitative study (Gold and Pray, 2001). In total 148 questionnaires were issued and 92 were returned – a response rate of 62.2%). In addition the purpose of the questionnaire was to determine whether there were any significant differences in responses based on gender, whether or not the student was international or home/EU, prior learning experience and preferred learning style. These individual differences are discussed in Section 8.4.1 of the thesis

Conduct of questionnaire

The questionnaire was designed to be as simple as possible to complete and required students to complete and return by e-mail responses to 4 questions to assess the ease of use of the simulation, achievement of the 2 learning outcomes, and enjoyability of using the simulation (which as noted in the literature review is closely linked to motivation to learn). Students recorded their response by ticking the appropriate box for each question on a 5 point Likert scale. In addition the students were provided with an online version of the Gregorc Learning Style delineator which were later analysed by the researcher to determine their preferred learning style.

Data collected from questionnaire

The data returned from the questionnaire was used to identify if there were any significant issues which faced students in terms of usability of the business simulation or understanding its purpose. In addition the responses could also then be analysed to determine if there were any significant differences in the responses between the different groups of learners identified above.

Analysis and discussion of all the empirical work is provided in the discussion in Sections 8.4. Prior to that, as noted in the framework for evaluation which was developed in Chapter 5 of this thesis a careful description is given of the context in which the business simulation was used and a careful examination of the learning outcomes which it was intended to achieve. These are addressed in Sections 8.2 and 8.3 below.

8.2 Context of the evaluation

In discussion on the framework for evaluation the importance of integrative evaluation was pointed out. In order to evaluate the learning system being used it is necessary to look at the overall context in which the learning takes place and ideally to conduct the evaluation in an authentic environment.

8.2.1 The student population

Aberdeen Business School is part of the Robert Gordon University in Aberdeen, Scotland and is one of the leading providers of professional business education in Scotland. It offers a range of undergraduate and Masters level programmes. The focus for this case study was the use of a business simulation (MikesBikes) which is integral to the teaching of a taught module (Performance, Planning and Decision Making) to students undertaking the School's MSc in International Business or the MSc in Management (described in more detail below). The Masters programmes at the Robert Gordon University attract a large number of international students and very few UK or European students. During 2008 and 2009 more than 90% (90.73%) of the students registered on the Masters programmes in which the business simulation was used were international. In 2009 steps were taken by the Aberdeen Business School to attempt to change the balance by using fee incentives to make the course more attractive to home and EU students, and although the student population is still predominantly international there were significantly more home students enrolling on the courses in 2010. The international students are mainly from Nigeria and India with a smaller number from other parts of the world – notably China and the Middle East. It is important to recognize this because of the different background in terms of educational systems in which the students have been previously studied at undergraduate level. Specifically international students have previous experience of a very didactic and tutor driven learning environment while UK and European students have had much more exposure to student cantered and resource based learning.

The gender balance of the students is also a potential influencing factor when considering the perception of value of using business simulations. The number of female students enrolled on the courses which used the business simulation has typically been low (across the 3 years of the survey being done the percentages were 4.3% (2009), 3.6% (2010) and 4.0% (2011). In addition it should be noted that the proportion of international as opposed to UK or European students who were female was broadly the same as the statistic for the overall cohort (i.e. more than 90% of the females undertaking the course were international students).   The value of illuminate/integrative evaluation as opposed to strictly quantitative evaluation of the student learning experience was that it was possible to gain useful data on the specific experience of this group of learners which may not have been reported in studies which rely purely on being able to provide and report on statistically significant conclusions because the comparative number of responses are not sufficient to allow manipulation by standard statistical tests to determine significance.

8.2.2 Degree courses on which students were enrolled

The students who undertake the module (Performance Planning and Decision Making) which makes use of the business simulation were all enrolled on three different degree programmes – MSc Management, MSc International Business and the MSc in Project Management. It was decided that because the course structure of the MSc in Project Management was very different from that of the other courses, students on this course would be excluded from consideration in the evaluation. . The MSc Management and MSc International Business courses are broadly similar and both aim to provide a rounded education in all aspects of business and management for students who have already gained an undergraduate degree in any discipline. They are thus termed 'conversion' courses and as such the student population is diverse in terms of background experience and knowledge of management theory. Through other modules which comprise their Masters course of study students are introduced to the whole range of business functions and theories.

The two courses being considered when evaluating use of the simulation share a large amount of common teaching – including Financial Decision Making, Business Environment, Managing People and Marketing. The Performance Planning and Decision Making module is viewed as a general introduction to the subject and develops and integrates many of the skills and knowledge which students enrolled on these courses are expected to achieve. In particular it builds on the Business Environment module and is intended to give the students a real life experience of using some of the theories which have been developed in that module. The students all therefore have the same general teaching during the Masters programme. However, the course is delivered in the second semester of the programme and it may be the case that those students who have enrolled on different programmes have been provided with different prior teaching on some of the skills and knowledge which have to be mastered when using the business simulation and it is important therefore to investigate whether there are any differences in perception of usefulness or performance when using the business simulation across the different MSc courses.

The courses themselves are structured in 8 taught modules (and having successfully completed these, the student can complete the named degree by undertaking a dissertation).

Table 8.2 Course Structures

COURSE STRUCTURES		
Semester Taught*[17]	MSc Management	MSc International Business
1	Finance for Managers	Finance for Managers
1	Managing People	Managing People
1	Business Environment	Business Environment
1	Marketing	Marketing
2	Policy Planning and Decision Making	Policy Planning and Decision Making
2	The Economics of Business	International Business
2	E-business systems	Elective choice
2	Research Methods	Research Methods
3	DISSERTATION	

[17] *Typically Semester 1 runs from September till end of January and Semester 2 commences in February and is completed by the end of May.*

The order in which the course modules are delivered is the same for all students enrolled on the courses. However, it is important to note that students can enrol on the courses at two points during the year – September and January. The students enrolling on both dates are taught together and the starting date of their studies is not considered when assigning students to teams to undertake the business simulation exercise. In order to ensure that this factor was taken into account separate interviews were arranged with students who started their studies in January (and were therefore engaged in doing the business simulation not yet having undertaken four taught modules which it could be argued provide an underpinning for being able to successfully engage in understanding and using the business simulation effectively).

8.2.3 Context of delivery

Information on how the module was delivered was provided by one of the four tutors who were responsible for supporting the students who were undertaking the module.

The Performance Planning and Decision Making module is taught and assessed over a period of 15 weeks. Students are allocated to teams at the start of the module. The teams are allocated by an administrative member of staff who simply uses the lists of enrolled students for each course and divides this into teams comprising either 4-5 students. Students were assigned to teams with others who were enrolled on the same course. While there was there was no attempt to take into account individual choice in the allocation process students would often decide to re-assign themselves to different teams. The overall number of teams for each of the two courses varied across the 3 academic sessions in which the empirical work was undertaken was 40 (2009), 32 (2010) and 26 (2011)[18].

Students were collectively given an introductory lecture and introduced to the main features of the simulation package and this session also covered how to access and use the student manual. The students were also given an introduction in a series of

[18] *Note that one of the courses on which the module was taught (MSc in Project Management) was revised during academic session 2009/10 and the module was withdrawn from the programme which explains the drop in the number of students undertaking the module. The reason for the module being discontinued for students enrolled on the MSc in Project Management was not related to issues arising from the use of the simulation in teaching the module.*

computer laboratory sessions. The purpose of this was to ensure that the students were able to access the software and deal with any questions relating to procedures for inputting the team decisions into the system and interpreting the results. Other than this the students were expected to use the system independently. They were given a period of 8 weeks in which to complete the business simulation and during this time they were also expected to attend lectures and tutorials which dealt with theoretical aspects of the subject but which were not directly related to the business simulation.

This process for delivering a business simulation is one which is generally followed and is diagrammatically demonstrated by Fripp (Figure 8.1). The diagram demonstrates a number of critical interventions which provided a framework for investigating the overall learning experience and which were explored in more detail in interviews with both students and academic staff.

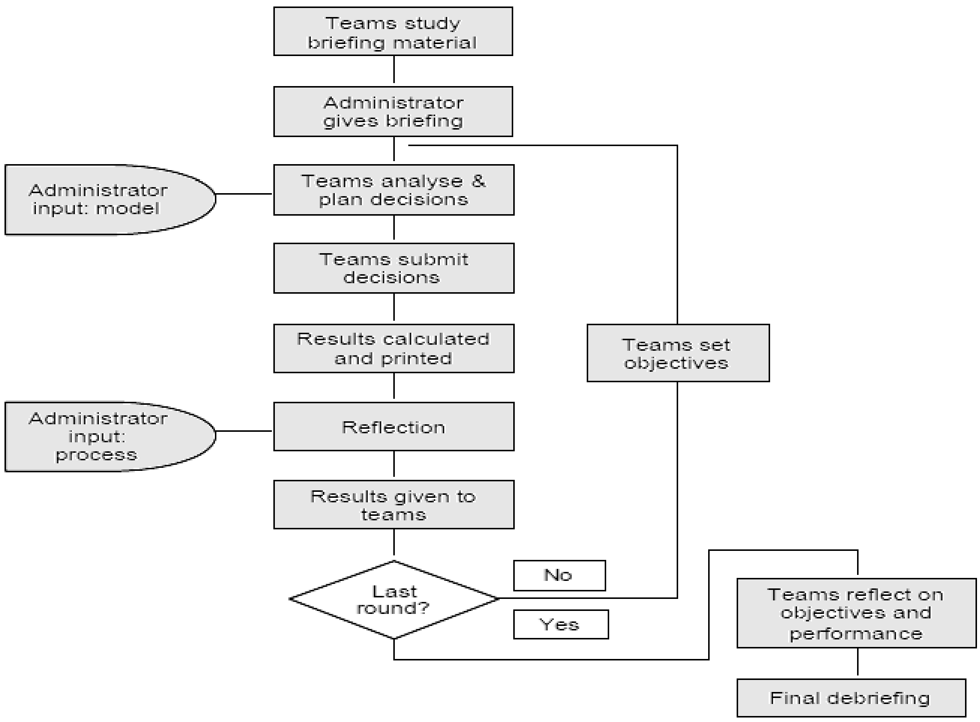

Figure 8.1 Delivery of Business Simulations (Fripp, 1993)

Significantly, interviews with the instructors revealed that very little attention was paid to what Fripp refers to as 'administrator inputs' into the process to encourage student reflection on their learning (by which it is taken to mean interactions with module tutors). After initial inputs on the system itself and the mechanics of how to use the system the tutors who were administering the business simulation expected students to work in their teams and engage in self reflection on their decisions and adjust their decision making strategies in the light of the impact of previous decisions on their overall performance.

Debriefing is generally considered a very important part of the learning experience in using simulations. As Peters and Vissers note, this activity helps students to make a connection between the experience they gained from the simulation and experiences in real life. (Peters and Visser, 2004). Debriefing should ideally be engaged in by means of gaining a collective team response – either orally or in writing. Petranek (2000) argues that students learn considerably more from providing a written de-briefing than engaging in oral debriefing. In the case of the business simulation used to support the Performance, Planning and Decision Making module students were required to provide a brief reflective analysis as part of their individual written reports. The quality of the report itself was used as the sole basis for determining the overall student grade for the module and no consideration was given to how well or badly student teams had actually performed in achieving a successful outcome in terms of their team performance in the simulation.

8.2.4 The Mikes Bikes Simulation

MikesBikes is a business simulation game developed by Smartsims and is a state of the art internet based learning simulation. The simulation deals with a bicycle manufacturing industry with market segments, distributors and companies who are competing to maintain and increase market share. The students play the game either individually or as part of a team who manage a particular company and who aim to maximise the wealth created for their stakeholders. The game allows students to make decisions on product development, manufacturing, marketing and finance in a dynamic business environment. It seeks to teach cross functional disciplines in business and uses a competitive element to engage students with the learning materials. The simulation is set up in stages to progressively take on more complex roles and responsibilities. Students start as Advertising/Brand Managers of a Bicycle Manufacturing company and get hands-on experience making Pricing, Marketing and Production decisions and as each round of decisions is undertaken the student progresses through the simulation gaining more control over their company and taking on responsibility for distribution, operations, product development and more complex financial decisions. After each decision cycle students are expected to analyse financial reports and develop a strategy to increase shareholder value and return on investment. Students compete against each other in teams and the simulation uses a set of algorithms and an underlying model to replicate a dynamic marketplace in which the impact of other team decisions is taken into account in changing the marketplace.

Considerable support is provided for instructors. This not only includes full instructions manuals (both for instructors and for students) but is also provided by an online help desk which instructors can use on a 24/7 basis. The online advisor can be contacted via e-mail and can give guidance on both technical issues and also on the ideal method of implementing the system which supplements the help files which are always accessible when using the simulation. Teaching materials are supplemented by other online sources and these include presentations, mini-assignments and quizzes. A series of help files are available for instructors and students. When discussing the support available with the instructors it was noted that they made little use of this facility and it was also confirmed that students were not made aware of the facility and tended therefore to rely completely on the manual, systems help files and advice provided by the instructors themselves.

The company producing the simulation (Smartsims) has a considerable history of dealing with development of business simulations and it was anticipated that there would be few, if any problems, relating to either the design or factual content of the simulation. Figures 8.2., 8.3 and 8.4 below are provided to give a general impression of the design interface.

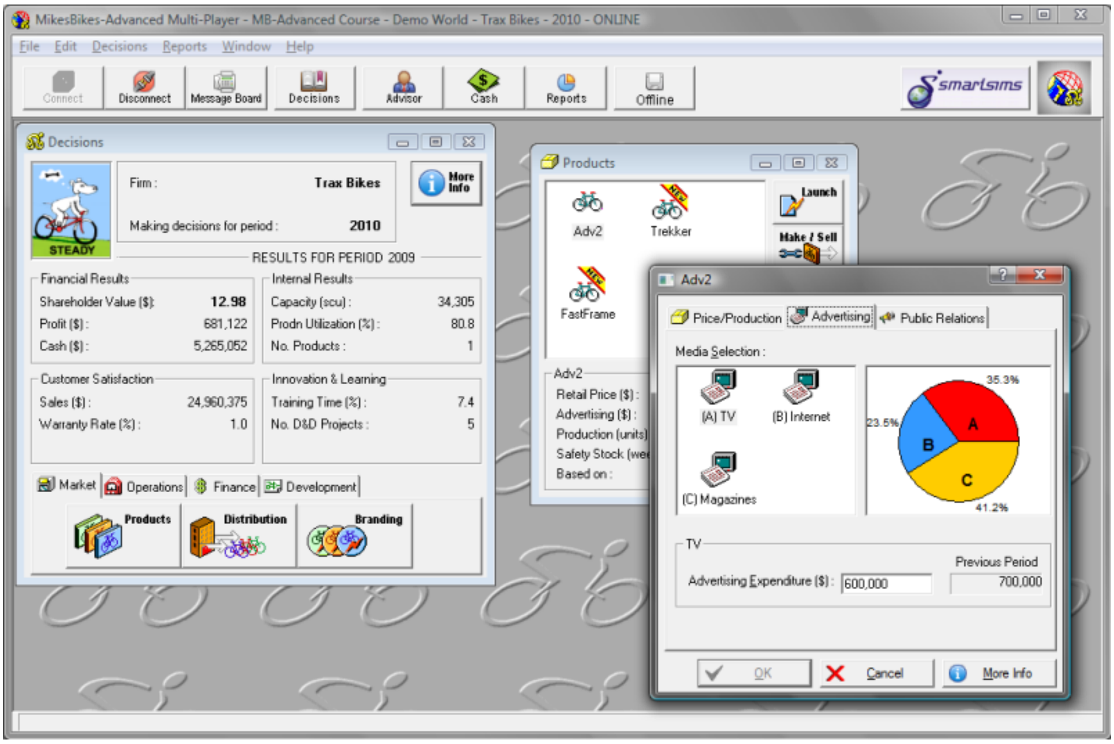

Figure 8.2 General workspace for advertising

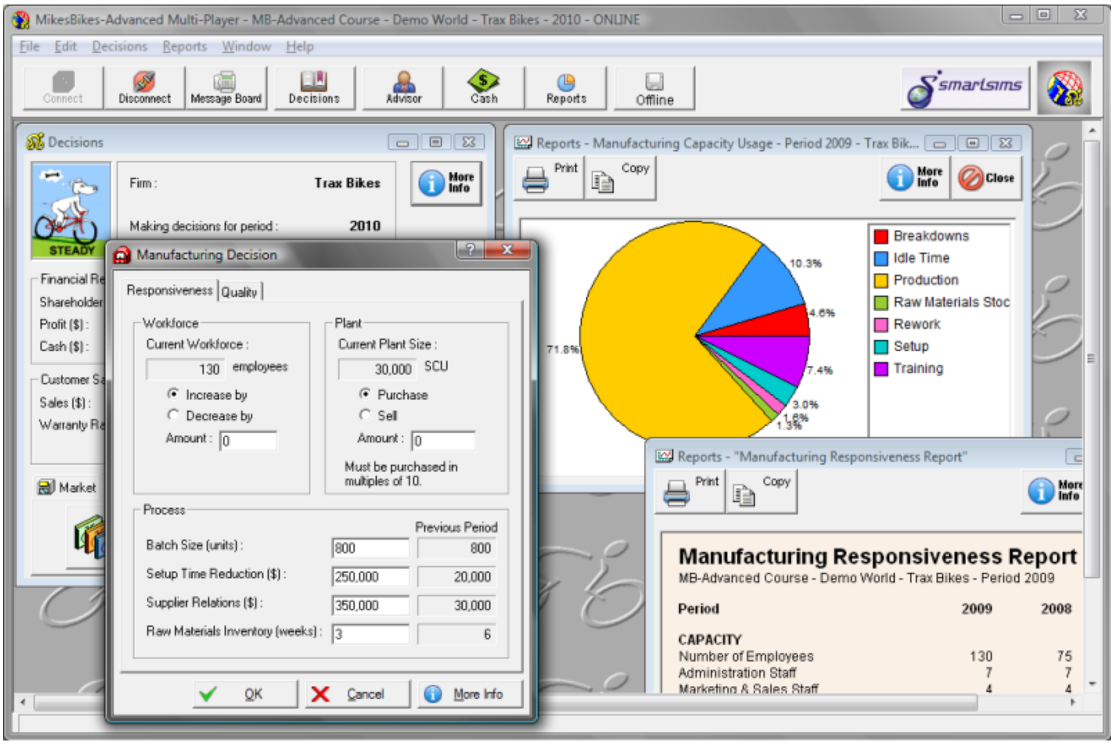

Figure 8.3 Workspace for Manufacturing

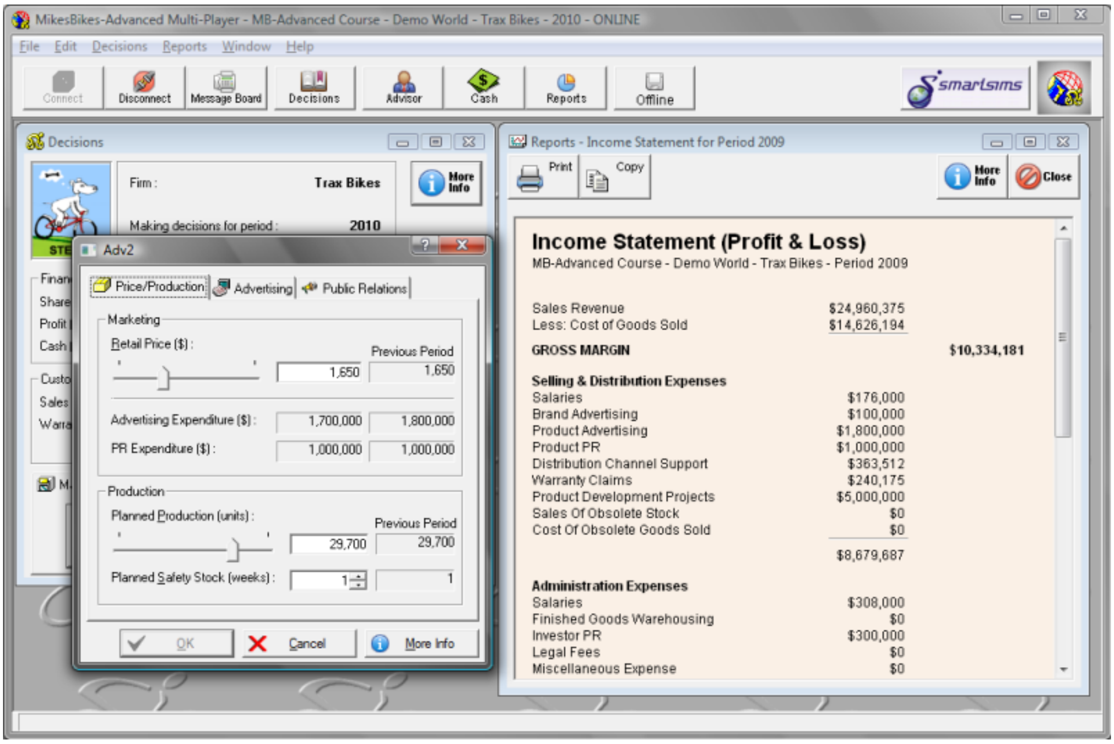

Figure 8.4 Workspace for Pricing

The system is extremely complex and the manufacturers stress that is important to carefully read and understand the manual before starting to play the game.

8.2.5 Discussion of Contextual Issues

The following issues were noted in terms of the context in which the simulation was delivered. These issues it was felt merited further investigation when evaluating the overall learning experience of students.

1. The first, and arguably the most significant of these, was the fact that the team of learners did not all have the same background experience in terms of their progression on the course on which they were enrolled. In particular students who were undertaking the simulation who had enrolled in January rather than September had not yet studied the Business Environment module nor had they studied Marketing or Financial Decision making – all of which provided important background learning to help them to use the simulation. As noted above the Masters courses are conversion courses so students who enrolled on the course in January who did not have a relevant first degree in business and

management would have been at a significant disadvantage in terms of using their prior learning experience.[19]

2. The interaction with instructors appeared to be very limited and in particular there was very little engagement by instructors in supporting and encouraging students to reflect on their learning and decision- making after the initial introduction to the simulation. This focussed mainly on the mechanics of how to use the software and interpret the outputs provided and how the decisions they made had an impact on the overall strategy which they were adopting. In addition it was noted that the students were not made fully aware of the support mechanisms available to them when using the simulation.
3. The manner in which teams were assigned and the flexibility permitted in permitting students to change their teams required further investigation to determine the impact it could potentially have on group cohesiveness and team working which, as identified in Chapter Four of this thesis, is a complex variable which can affect the overall learning experience.
4. The performance of the team in terms of the result they achieved when using the simulation was not taken into account when grading student performance in the module being studied (which was assessed through a final report). As noted in Chapter Four of this thesis assessment is an important part of extrinsic motivation and the impact of the manner in which the module was assessed should be examined closely to determine how it influenced the student learning experience.
5. Finally, it was noted that 4 instructors were assigned to deliver the module. Each was allocated a number of teams with which to work. Differences in approach or accessibility of tutors is thus another factor which could have an impact on the student learning experience. None of the instructors had any

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[19] *It should be noted that the researcher was only fully aware of the fact that students who enrolled in January undertook the module 'out of sequence; after the first sets of interviews had been done.. In discussions with staff after the first year of empirical work had been undertaken he was informed of this but was initially led to believe that these students were allocated to groups in which most of the group had enrolled in September. This would have meant that the January start students would still have been at a disadvantage but could at least have taken advantage of the prior experience of their group colleagues. However, subsequent investigation in discussions with students revealed that this was not always the case and there were several instance in which the group set up to work together on the simulation comprised only students who had enrolled in January.*

input into the selection process when the decision was taken to use the simulation to support teaching the module.

From previous studies on computer based learning, the individual differences which may have an impact on evaluation of the learning experience are: age, gender, cultural background, degree of comfort in dealing with technology based environments, and individual learning styles. These are discussed in more detail in Section 8.4 of the research in which the results of the questionnaire survey are analysed in relation to individual differences.

8.3 Aims and Objectives associated with use of the Simulation

This was identified in the evaluation framework as being important in order to ensure that the questions explored in an evaluation specifically addressed the pedagogical objectives which learners should achieve. It is further stressed by Wenzler as one of his 'Ten *commandments for translating simulation results into real-life performance'* when he states that:

> *Without knowing what is to be achieved, we will not know if we have achieved it. The first part of the challenge is to define a limited number of clear specific, and measurable objectives. Failure to do so will prevent measuring what has been achieved, and if something has been achieved it would be very difficult to project it back to the objectives themselves. Lack of clarity and meaningful metrics also increase the risk of objectives developing their own dynamics and starting to grow, shrink or change direction throughout the project' (Wenzler, 2009 p. 102)*

Thus, while use of the simulation may in fact have had a number of other positive impacts on student learning, failure to achieve these objectives ultimately should result in a conclusion that the use of the simulation was not successful. .

8.3.1 Aim of using the business simulation from perspective of developer

An examination of the literature provided by the supplier of the business simulation provides a background to the overall aim of using the product in a learning context. As noted on the simulation web site it is stated that

> *'Through our interactive interface students will be taught the cross-functional disciplines of business, and how the development and implementation of strategy involves these disciplines. The competitive element of MikesBikes encourages students to understand these principles and have fun doing it!'(Smartsims: http://www.smartsims.com/simulation/mikes-bikes-intro)*

In addition the developers of the simulation make specific claims concerning the benefits of using the simulation in terms of both retention of learning and providing learning in a risk free environment noting that:

> *Students using a simulation are 80% more likely to retain the information as students are actually implementing principles learned rather than solely listening or just reading about it. (Smartsims: http://www.smartsims.com/simulation/why-use-sims)*

and that:

> *Students learn in a no-risk environment*
>
> - *what would happen if I implemented this strategy in a real-world company?*
> - *what unexpected effects will these decisions have?*
> - *what are the consequences of different strategies?*
>
> *. (Smartsims: http://www.smartsims.com/simulation/why-use-sims)*

8.3.2 Pedagogic objectives associated with the business simulation as defined by academic staff

The aim of the module as stated in the course specification module descriptor is:

> *'To provide students with the tools and analytical skills to evaluate firm and business performance and develop*

performance measurement systems that can guide managerial decision making.'(RGU Course Module Descriptors, Revision 4, 2009)

The overall pedagogic objectives can be determined from an examination of the learning outcomes which students are expected to achieve. The learning outcomes are clearly provided in the module descriptor for the courses. It is important to examine these carefully as (consistent with the observations made in Chapter Five of the thesis) these are the basis on which the course team has determined what students should achieve in undertaking the module and this will have a direct impact on how the use of the business simulation should be evaluated.

As stated in the course documentation the learning outcomes which students are expected to achieve are as follows:

1. Identify, analyse and synthesise information to evaluate the performance of a business.
2. Appraise and evaluate the inter-relationship between business functions and firm performance
3. Evaluate different aspects of business risk and develop plans to manage the risk **(RGU Course Module Descriptors, Revision 4, 2009)**

Because of the importance of clearly establishing the expected learning outcomes the researcher spoke with three of the four teaching staff who were responsible for delivering the module. Discussion with teaching staff clarified the point that the main objectives of the module were to ensure that students were able to integrate learning from across different disciplines (Learning Outcome 2) and that they developed high level decision making skills which were demonstrated in their ability to achieve Learning Outcome 1 and Learning Outcome 3.

These objectives are consistent with those of a number of other implementation of business simulations in academic environments. E.g. Faria and Wellington (2004) produced the following table of results when asking staff what their objectives were when using business simulations

Table 8.3: What are your teaching objectives with regard for the simulation you use? (from Faria and Wellington (2004)

Objective	Number of responses	%
To give students decision-making experience	162	48.8
To integrate theory with practice	120	36.1
To introduce students to planning	88	26.5
To have students experience teamwork	65	19.6
To have students engage in critical thinking	49	14.8
To measure comprehension and understanding	48	14.5
To have students experience business competition	31	9.3
To interest and motivate students	20	6.0
To have students experience uncertainty/pressure	14	4.2
To have students develop writing/communication skills	8	2.4
No objectives	7	2.1

The important point to note is that in terms of a formal evaluation in accordance with the framework for evaluation established in Chapter 5 of this thesis the evaluation of the simulation in the context in which it was used should centre around achievement of these learning objectives. Of course a number of other claims for the enhancement of the learning experience which is provided by use of simulation/games have been made and these will also be examined when discussing results in terms of how they contributed to achieving the central objectives which were set out for this particular course of study.

8.3.3 Discussion of contextual aims and objectives of the evaluation

The following issues were noted as arising from an examination of the outcomes which were identified for using the simulation.

1. The claimed benefits for using the simulation made by supplier are not fully evidenced in the literature – in particular the claims on retention of learning (refer Chapter 5 to the discussion on Dale's Cone of Learning). With respect to integration of learning, however, they are closely aligned to the learning

outcomes which were clearly articulated by the academic staff involved in teaching the module.

2. Importance of decision making skills was highlighted as was the ability of students to integrate their learning from a range of other subjects in order to appraise and evaluate the importance of the relationship between different aspects of the business environment when formulating and pursuing a strategy for business success. Thus the critical questions to be evaluated are:
    a. Are students able to integrate their learning from across disciplines, and
    b. Are students decision-making skills enhanced by using the simulation

8.4 Case Study

8.4.1 Initial Questionnaire Survey

The initial survey conducted as part of the research was a questionnaire to all students undertaking the Purchasing and Supply chain module and making use of the MikesBikes simulation. The questionnaire was issued to students in May 2009, a point when they had completed their use of the MikesBikes simulation but prior to any feedback of results. It was felt that the responses may otherwise have been influenced by issues related to student satisfaction with their grade for the module. Students were required to complete the questionnaire and provide their response as individuals and without consultation with any other members of a team to which they had been assigned. In total 148 questionnaires were sent by e-mail to students enrolled on the MSc International Business and the MSc Management courses. 92 were returned – a response rate of 62.2%).

The questionnaire asked four closed questions and respondents were asked to provide their response using a Likert scale (values 1 to 5). The questions were designed to find out whether the students agreed with the claimed main benefits to learners which were previously identified by suppliers of simulations and academics in relation to the aims of using the simulation. Two of the questions were also designed to determine whether the learners found the simulation easy to use and whether they were motivated to learn using the simulation. The questions asked are outlined in Table 8.4

below and effectively acted as what as previously noted Gold and Pray referred to as a 'quick and dirty' questionnaire.

Table 8.4 'Quick and Dirty Questionnaire'

QUESTION	LIKERT SCALE (1-5)	
How easy was it for you to use the simulation?	Extremely Difficult Moderately Difficult As expected by me Easy Very Easy	1 2 3 4 5
Did using the simulation help improve your decision making skills?	Not at all Not very much Not decided To a small extent Definitely	1 2 3 4 5
Did using the simulation help you to see the connections between different subjects you had been taught	Not at all Not very much Not decided To a small extent Definitely	1 2 3 4 5
Did you enjoy using the business simulation	Not at all Not very much Not decided To a small extent Definitely	1 2 3 4 5

The data collected was analysed for the whole group of respondents but it was also considered useful to use the results of the questionnaire to examine the impact of different variables related to the sample which may have influenced responses.

As noted above the cohorts of students at whom the questionnaire were targeted were predominantly male overseas students. All of the students had recently completed their undergraduate degree and thus age was not deemed likely to be a significant variable. Degree of comfort with using technology was not considered relevant given the obvious familiarity with use of technology which all students have and which is now a pre-requisite for anyone engaged on a course of study at higher education level this was not considered important. The importance of technology acceptance has been commented upon as an a feature of using simulations (Agarwal and Prasad,

1999) but given the high level of use of technology by contemporary students there did not appear to be any significant issue related to this which would have an impact on student perception of benefits.

It was considered useful, however, to examine the issue of

1. learning style, (which is cited in a number of publications as being an important variable when examining use of new technology in education;
2. gender;
3. whether or not the respondents were Home/EU or International students; and,
4. the impact of prior learning (identified subsequent to the data being collected as potentially important)

1. The importance of learning styles is noted by Gregorc and Ward who state that:

    > The instructional materials and techniques used by teachers have a direct effect on many students...If the approach fitted the preferred learning mode, the learner usually reacted favourably. If, on the other hand, the methods were mismatched, the student "worked hard to learn", "learned some and missed some material", or "tuned out." *(Gregorc and Ward, 1977 p. 5)*

    Thus, when completing the initial questionnaire survey which formed part of the research, students also completed a learning style inventory which allowed the researcher to determine their learning style. There are many instruments which can be used to measure student learning style including Myers Briggs, Kolb's Learning Style Inventory, Honey and Mumford's Learning Style Questionnaire, the Barch Learning Style Inventory and Gregorc's Learning Style Delineator. The instrument for determining learning style was the Gregorc Learning Style Delineator based on practical considerations as it is a simple to use inventory. The test provides good discrimination between learning styles and is easily administered. The Gregorc Style Delineator is a self-scoring battery based on Mediation Ability theory which states that the human mind has channels through which it receives and expresses information most efficiently and effectively (Gregorc, 1982). According to Gregorc

(1982), the term 'mediation abilities' describes a person's capacity to use these channels.

The Style Delineator focuses on two types of mediation abilities in individuals: perception (the means through which one is able to grasp information), which is viewed as either concrete or abstract, and ordering (the means in which one arranges, systemizes and uses information) and which can be categorised as sequential or random.

Gregorc combines these abilities to create four mediation channels of mind styles: concrete sequential (CS), concrete random (CR), abstract sequential (AS) and abstract random (AR) Gregorc (1979). Although every individual he tested demonstrated use of all four styles, 95 percent expressed a preference in one or two areas.

Thus the questionnaires were coded to indicate learning style using the results of an analysis of the Greogrc Learning Style Inventory which students completed and submitted at the same time as they completed the questionnaire. (These were categorized as AS, AR, CS or CR).

2. A single demographic question in the questionnaire asked students to identify if they were male (M) or female (F) in order to check whether gender was an important variable (again having been cited in the literature as a potentially important factor).

3. Using admission data each of the questionnaires was coded on receipt to indicate whether or not the student was an international (I) or a home student (H), the latter category including students from the European Union. (It was decided that it was not appropriate as part of the questionnaire to ask a question on ethnicity which may have been interpreted as being inappropriate in terms of the purpose of the questionnaire).

4. As noted above at the time of the questionnaire being issued the researcher was unaware that students who enrolled on the courses in January were

integrated with the cohort of students who had enrolled in September. On identifying that was the case it was considered important also to examine this in terms of its importance as an indicator of prior learning which again is noted in the literature as a potentially significant factor in differentiating results when researching the application of new technology in education. To do this the questionnaires were reviewed retrospectively and coded as January (J) or September starts (S).

Results and discussion of the questionnaire survey

The descriptive statistics giving the response to each of the questions is presented below. Data is summarised for each response and the summarised data is also presented graphically. (Table 8.5 and Figure 8.5 below)

Table 8.5 – Likert scale responses to survey of students

	Likert Scale 1-5				
	1	2	3	4	5
Ease of Use	5	12	5	22	48
Decision Making	3	15	13	20	41
Integration of learning	9	18	7	30	28
Enjoyment	0	6	6	22	58

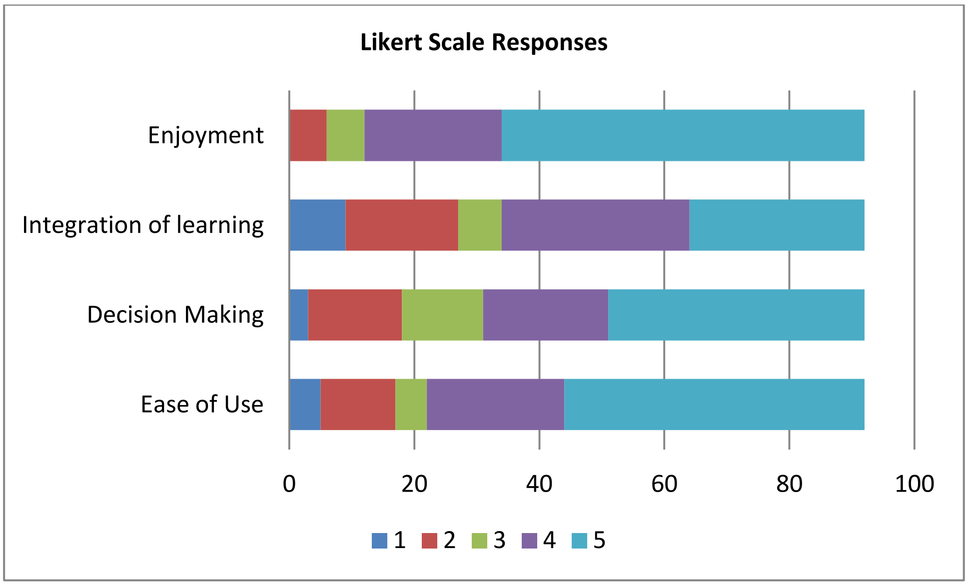

Figure 8.5 Likert scale responses to ‘quick and dirty’ questions

The two most important results from those presented above in terms of the aim of the evaluation concern student perception of the contribution of the simulation package to students' decision making skills and to their ability to integrate their learning across different functional areas of a business.

The results were very positive for these questions and the responses to ease of use and enjoyment were even more so. In a purely quantitative study this supported by additional statistical inferences would appear to confirm the simulation had successfully achieved its objectives. Above average satisfaction (responses 4 or 5) can be noted as follows:

Ease of Use	76%
Decision Making	66%
Integration of learning	63%
Enjoyment	87%

However it should be stressed that the results need to be unpacked more through a qualitative study and the results of that are discussed below.

It should also be noted however that the results also demonstrate a significant difference in student responses. Comparisons were conducted using the variables, learning style (as derived from Gergorc Learning Style Inventory), gender, ethnicity and prior learning (as defined by when the student enrolled on the course). The only one of these in which a significant difference could be determined was prior learning (as indicated by date of course commencement).

Learning style

The learning styles of the students are reported below:

Learning Style (Gregorc)

LEARNING STYLES		Frequency	Percent	Valid Percent
Valid	Abstract Random	28	30%	30%
	Abstract Sequential	24	26%	26%
	Concrete Random	20	22%	22%
	Concrete Sequential	20	22%	22%
	Total	92	100.0	100.0

An ANOVA test was performed on the statistical data to attempt to find any significant correlation between learning styles and positive responses to the questionnaire. The test was a one treatment experiment. It was found there was no significant difference (p=0.736)... On reflection it was realised that the issue was much more complex as students worked in small teams when using the simulation so a much more important issue to be examined was the student perception of and capacity to engage in group working.

Gender differences

Because of the very large difference in number between male and female respondents (Male 89 responses: Female 3 responses) it was impossible to perform any statistical test which would have given significant results

Difference between International and Home/EU students

Likewise because of the very large difference in numbers between International and Home/EU students (International 86 responses: Home/EU 6 responses) it was also impossible to perform any statistical test which would have given significant results.

Prior learning

Restricting the analysis of the Likert scale data to those students who started the course in January and had limited prior knowledge of the subject content of simulation the data shows a quite different picture as illustrated in Table 8.6 and Figure 8.6 below.

Table 8.6 – Likert scale responses to survey of January start students only

Ease of Use	3	6	3	4	5
Decision Making	2	8	5	2	4
Integration of learning	6	5	5	2	3
Enjoyment	0	3	5	5	8

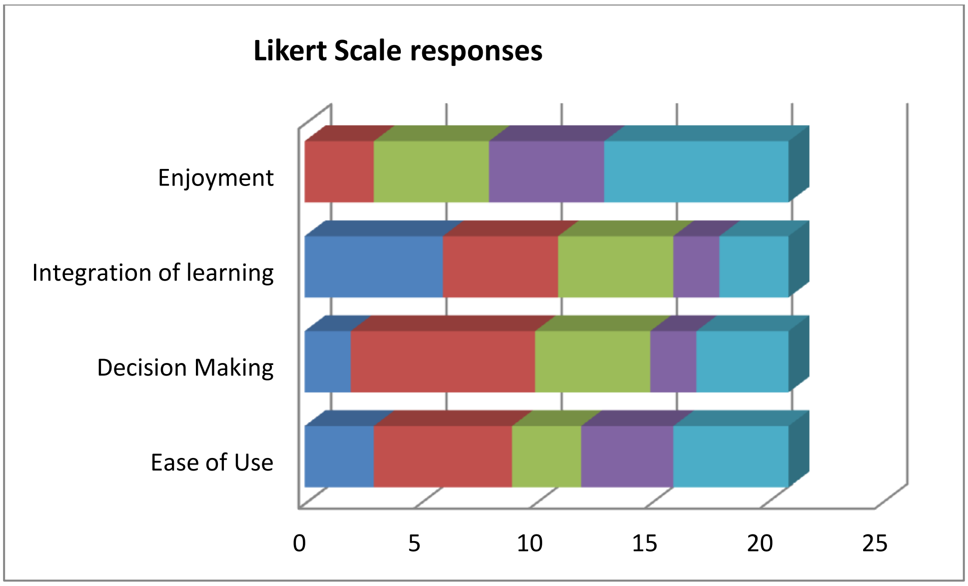

Figure 8.6 Likert scale responses of January start students only

Students who started their course in January (21 students) and were immediately required to undertake the module were therefore were considerably less satisfied and the results appear much more negative than in comparison with the results where the total cohort responses are reported together. Satisfaction rates for these students is reported as follows:

Ease of Use	43%
Decision Making	29%
Integration of learning	24%
Enjoyment	62%

A statistical test was performed on the data to compare the results reported by January start students and September start student. The null hypothesis was that the means for both groups were the same. A T-test assuming unequal variance between the groups was performed. The result provides a p value of 0.00951012. Since the p-value is less than 0.05, this provides evidence to reject the null hypothesis of equal means and conclude that there is a significant difference between the level of satisfaction when using business simulations between January and September start students.

Summary of results

The results of the questionnaire survey demonstrate a generally high level of satisfaction with the business simulation. Overall students were satisfied that it was easy to use and that they enjoyed using the simulation. In addition the results also show that the students were satisfied that the use of the business simulation assisted them in achieving the key learning outcomes for the module. However, a more detailed examination of the results demonstrates that there was a significant difference in levels of satisfaction depending on the students' prior knowledge. The results overall also serves to demonstrate the limited value of using statistical data when attempting to evaluate student learning experience and the need to be very cautious when interpreting results.

The next sections will consider in more detail the results from the qualitative data which was gathered from the Case study which involved the use of individual and team interviews and focus groups.

8.4.2 Case Study Interviews

A – Initial interviews (randomly selected students from across cohort)

An initial set of 30 interviews were conducted with students in academic year. The interviews were held during the period in which students were actively engaged in using the MikesBikes simulation and students for interview were selected randomly from the overall cohort enrolled on either the MSc Management or the MSc International Business course and undertaking the Performance, Policy and Decision Making module.

Also in 2009/10 and a further 15 undertaken in academic year 2010/11 (these being restricted to January start students. Again these were conducted at the point when students were actively engaged in using the MikesBikes simulation.
In academic year 2011/12 two further sets of interviews were conducted, 12 with students who had failed the module at first attempt and were engaged in resits using single player mode of the simulation package, and 30 with students who had

successfully completed the module. The interviews for both groups were held after the students had been given their grades and feedback for the module. The main purpose of these interviews was to gain a better insight into how students perceived their overall learning experience and asking them to reflect on the overall learning experience from a perspective of having completed the module.

The interviewer began each interview by asking the interviewee to make some open observations or comments on use of the simulation. This was done in order not to lead the conversation and to gain an impression of what the key issues were from the student's point of view. An exception to this was that in order to facilitate more focussed discussion around transfer of learning when interviewing students who had successfully completed the module (in 2011/12) the interviewer gave broad prompts about the general areas on which the student may wish to comment. However, the interviewer was careful not to lead the interview but to allow the interviewee the freedom to bring up any issues which he/she thought relevant. This means that approach taken which for the illuminative study was based on the same approach when conducting phenomenographic interviews and as a consequence was very time consuming and as some commentators suggest 'wasteful of data' (Parlett and Hamilton, 1987). However, the purpose of the interviews is to gain student perceptions without leading the student. Thus a great deal of 'rich data' is collected but much of this may not be particularly relevant to the focus of the evaluation being conducted.

Results and discussion of interviews

After completion of each set of interviews the researcher examined the notes and input the record of student comments into an Excel Spreadsheet. The researcher determined whether these were positive or negative comments (or neutral) relating to the student learning experience and categorised them into broad headings related to the issues being commented on.

Use of qualitative data analysis (QDA) software for the analysis was considered. NUDIST, N_vivo and Atlas/ti were all examined but found to be too cumbersome to use and the researcher concluded that balancing time between becoming expert in one of the systems and conducting the analysis manually it was preferable to conduct the analysis manually. Had the data to be analyses been more complex or of a far greater volume then it would certainly have been worthwhile using QDA software. It may also have been worthwhile if the data gathered was more diverse or had a range of material which it was difficult to classify, however, the categories were fairly constrained and were all ones which had already been evidenced in the literature. A total of 86 comments were extracted from the 30 interviews conducted during the first year of the research and involving a random sample of students from across the cohorts undertaking the module.

The comments were then further analysed within the different categories and a summary of key issues was then derived – taking into account relative importance of the different issues based not only on the frequency with which they were cited but also in terms of the strength with which comments were expressed. A brief summary of the categories and the criteria used for determining inclusion of particular comments within the category is provided below. Comments were coded as follows:

1. A code to indicate the interview date
2. A code to indicate the general category to which the comment related. The following codes were used and broadly followed the list of perceived pedagogical benefits discussed in Chapter 3 of the thesis, and are generally the categories which recur in the literature as being important considerations when discussing the impact of business simulation/games on the student learning experience:

    C – Content – comments on knowledge and skills
    P – Practice in application of theory
    I – Integration of learning across subjects
    G – Group Learning
    M – Motivation
    D – Decision Making
    X – Communication and interaction with tutors

3. A code to indicate whether the comment was positive (P), negative (N) or neutral (O). Assigning whether or not a code should be positive, negative or

neutral was done by the researcher as soon as possible after the interview because of the importance of capturing not just the words used but the tone in which things were said which gave a good indication of whether the intention of the student was to be positive or negative.

4. The comment made by the student. This was using the students' exact words (and only changing some of the offensive language which was sometimes included). The comments had been recorded using the Livescribe software which captured them exactly.

Thus for **example**: MARCH09GN**'Our team is just a mess – no-one seems to know what we are meant to be doing'**

In many cases comments were coded under two or more general categories as the statement clearly made reference to multiple perspectives on the students learning. Thus for example:

APRIL09GP **'The best thing is the competition – our team is pretty focussed on what we are doing and it seems to be working as we are well ahead of the rest of the companies even if one of the team never turns up when can be really annoying'**

APRIL09MP '**The best thing is the competition – our team is pretty focussed on what we are doing and it seems to be working as we are well ahead of the rest of the companies even if one of the team never turns up when can be really annoying'**

The 86 comments were distributed over the different categories as follows:

C – Content – comments on knowledge and skills	12
P – Practice in application of theory	8
I – Integration of learning across subjects	10
G – Group Learning	18
M – Motivation	10
D – Decision Making	15
X – Communication and interaction with tutors	13

The data was then analysed by category and for the purposes of the evaluation the focus was very much on providing a detailed analysis of comments made which related specifically to **Decision Making (15 comments)** and **Integration of learning across disciplines (10 comments).** The reason for restricting the analysis mainly to these categories was that these were the issues which the module was intended to develop in terms of learning outcomes. As has been previously when discussing evaluation it is a common mistake for evaluators to examine a range of other issues when evaluating the impact on learning of business simulations but it is crucial that the evaluation should be restricted to examining the extent to which the aims stated for using the business simulation have been met.

Decision Making

In general the comments provided by students on decision making skills were positive and there was a clear indication from several of the comments made by students that they felt the business simulation provided a means for them to enhance their skills in this area. In particular there were some comments which demonstrated that students were learning progressively from the business simulation and that previous experience in early cycles of decision making were helping them to understand the process better and to improve on their performance. Examples of comments are:

Comment 1: **There's a lot to learn but it is good to see how everything we've done fits together and it's good to be able to decide things then see what effect that has**

Comment 2 **We started slowly but once we got used to it we could see how the decisions we made changed the performance of the company**

Comment 3: **The group had fun arguing about the decisions – good that it wasn't assessed as well but we could just have a go and not worry about the decisions so there wasn't any real pressure**

These clearly give a positive picture of how the students saw that their decision making skills were being enhanced. Even some of the negative comments contained a suggestion that the students at least understood the importance of decision making and were learning despite difficulties which they experienced in reaching decisions.

Comment 4: **We could never agree so I think it would have been better if we could have done this on our own – but I suppose we could at least see why we went wrong though we had to try hard not to say 'I told you so'**

Comment 5**: Well I certainly learned a lot about how you shouldn't make decisions**

Where there were strongly held views that decision making was not developed when using the business simulation this was almost always linked with problems with group working and in a few cases with some initial difficulty in understanding how to use the simulation and uncertainty on how different decisions would impact on performance.

Comment 6: **We worked out too late that the thing to do was to be consistent in the kinds of decisions we made – I suppose that's what following a strategy is all about but our group could never agree on anything**

Comment 7: **We could have done a lot better if we had read the manual more carefully – the system wasn't really intuitive – and the group should really have spent less time arguing and more time listening but when we got used to playing the system we got pretty good on the decisions**

There were also comments which strongly suggested that students perceived that their decision making skills would have been better enhanced if they had been provided with more time to practice using the simulation. Clearly the facility was available in the business simulation to do this but the factor which prevented students from making use of this was time and pressure of other work which had to be completed at the same time as they were using the simulation.

Comment 8: **There really isn't enough time to play around with the simulation - it's frustrating because our team really wants to do well but with so many other things to do and the problems for us in getting together we end up just rushing our decisions and hoping for the best – I suppose that's life though and the simulation might not be real but is real enough to make no difference.**[20]

The remaining 7 comments provided in this category essentially repeated or amplified the comments made and discussed above**.**

Integration of Learning

The comments on integration of learning (10) were less direct than those made on decision making skills and frequently were linked with comments about the amount of work and volume of material which students had to master across a range of different disciplines.

Comment 1: **The simulation is really well designed and much more interesting to use than sitting in lectures and tutorials and you can really see how things fit together but there really wasn't time to do it all**

Comment 2**: The simulation is good in letting you see how all the different bits from HR, Marketing and Finance fit together**

Comment 3**: We all took on different roles depending on the subjects we were strong in and could help one another out.**

Comment 4: **I think it gives a really good sense of how you have to work with a knowledge of all the subjects**

Comment 5**: It's like the real world I suppose (though I know it's not) – you have to understand how all the different pieces fit together to make sense of them**

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[20] It should be noted that this comment is consistent with some of the claims made in the literature in relation to realism. Gopinath and Sawyers (1995) on realism note that a surprising outcome of their study was that overall the realism of the simulation did not appear to be a factor which was students felt had an impact on their successful use of the simulation. However, the analysis of their results demonstrated that in fact those students who were successful in achieving the goals of the simulation in fact reported a more positive attitude to the realism of the simulation.. They suggest that this may be because those students who are successful in using the simulation are more positive about the realism of the simulation because they can see the link between the decisions which they make and the likely impact in a 'real life situation'. They further suggest that much more careful specification of the meaning of this variable is required to inform future research.

Some of the comments also clearly show that the students appreciated the fact that using the business simulation gave them a good overview of all the different subjects they had previously studied**.**

Comment 6**: It was really only when we did the simulation that I saw how things that any decision you make can affect a whole range of other things.**

Comment 7**: We all took on different roles and I think I learned more about how every one of the subjects we studied was important.**

A number of comments, however, are also directly related to the fact that the teams were failing to work as a group and thus had problems in collectively integrating their learning**.**

Comment 8 **We rely heavily on [NAME OF STUDENT WITHELD] because he seems to be the only one who really understands the finance stuff.**

Comment 9 **I know we are meant to do this as a group but really it's just a couple of us who do it all – it would be good to have some more input from the others especially as I know one of them has done a degree in finance**

Comment 10: **Our team was non-existent so I had to do it all my own – I suppose I ended up learning a lot about all the subjects and how they fit together but it was really hard work.**

Some of these comments were clearly linked to group work and reflected the fact that the students did not fully manage to integrate their collective knowledge of the different functional areas of business management as a team rather than having to do this as individuals. This was interesting as, while the overall objective of using the simulation to help students understand the inter-relationship of different areas of business and management (and reflect this in their decision making) the way in which the simulation was used clearly supported this on the basis of the team as a whole. However, given some of the comments made it was questionable whether the team benefitted (or even saw it as important to benefit) from each other's knowledge which would have help develop all members of the team. Frequently it appeared that for some decisions for the team were taken by a single member of the group who the others assumed had specialist knowledge – comments most frequently related to the reliance of the team on individuals who understood financial aspects of business practice. This is reflected in the literature on group working generally in which the problem of determining how much individuals contribute to the work is difficult to establish and has led some authors to question the value of group work. On the other hand one of the key benefits of business simulation (as noted in Chapter 4) and the most important reason cited for growth in popularity of business simulations (as noted in Chapter 3) is the fact that they reflect modern business practice. This as Bachen et al. note is much more focussed around a business practice model in which:

> *Driving* flattening hierarchies*, globalization, technological change and an increased need for organisational flexibility which in turn necessitates the need for more distributed teamwork. (Bachen et al., 2012)*

Overall the analysis of integration of learning shows that generally students are satisfied that the use of the business simulation can contribute positively to this and that most of the concerns around achieving this aim when using a business simulation are centred around the fact that the learning is done in teams.

Other Pedagogic Benefits

It is not possible given the scale of the research to report in detail on all of the other comments which were made which were not directly related to student perceptions of decision making skills development or integration of learning. The purpose of this section is to briefly discuss the manner in which other considerations may have had an impact on student perceptions on the two main pedagogic objectives which were set for the module.

It should be noted that there were almost no negative comments about the system itself and only one observation was made on the technology which was actually coded as being a neutral observation given the manner in which the view was expressed.

Comment 1 **The simulation is a bit 'clunky' although everything is there once you know where to look for it.**

However, there were a relatively large number of comments (13) about the support provided when using the simulation and they were all negative expressing clear dis-satisfaction in particular with regard to the role of academic staff in supporting students. For example,

Comment 2: **Our lecturer is really invisible**

Comment 3. **The answer always seems to be just go away and read the manual**

B Interviews in 2010 (15 January start students only)

The interviews generated 39 comments which were coded as described above and analysed. The interviews themselves did not provide any additional positive comments which were specifically concerned with decision making but did give a number of negative comments. There were a number of comments which directly related to student ability (or inability) to integrate their prior learning and this was not surprising given the analysis provided above of the questionnaire survey undertaken with a full cohort. This section not only draws upon the comments on decision making and integration of learning but notes other comments which clearly arise out of problems faced by these students in dealing with the business simulation.

The same categories were applied and the number of comments in each category is listed below:

C – Content – comments on knowledge and skills	
P – Practice in application of theory	0
I – Integration of learning across subjects	5
G – Group Learning	10
M – Motivation	10
D – Decision Making	4
X – Communication and interaction with tutors	6

Decision Making

The comments in respect to this almost ‘speak for themselves’. Apart from a fairly neutral comment (Comment 4) the others all demonstrate a lack of ability to understand or even to participate in the decision making process.

Comment 1**: some of the guys clearly know what they are doing and I'm happy just to go along with that**

Comment 2**: don't really understand what is happening so can't comment on the decisions– everyone else seems to know what they're doing but I really don't see the point of it**

Comment 3**: just have to let others do it**

Comment 4: **for some of the financial decisions I felt I could help out in the group but I really didn't know much about the other things**

Integration of Learning

The comments in respect to integration of learning are also very negative and clearly reflect the fact that the students were not adequately prepared to undertaken the module.

Comment 1: **There is just too much to learn all at once**

Comment 2: **I don't really know very much about any of the subjects yet**

Comment 3**: I really rely on the others in the group – they already know what to do and seem to have a pretty good handle on things**

Comment 4**: I think I understand what is going on but I really don't know enough to go along and contribute to the group – that's why I have missed so many and I don't think it's only me that feels that way**

Comment 5: **The guys in my group told me I was going to deal with the HR side of things blue I haven't a clue about HR**

Other Pedagogic Issues

Apart from comments which clearly indicated an enthusiasm for the teaching materials themselves and the way they were presented in the simulation (all 4 comments were very positive) comments made on other aspects of using the simulation were generally more critical of the process and demonstrated that the business simulation did not appear to be achieving the benefits which are associated with use of simulations as a teaching method as described in the literature. In particular motivation of students to learn did not appear to be enhanced through use of the simulation. The first comment categorised as being about motivation gives a good example of how motivation was very negative.

Comment 1 **I gave up on this pretty early on – there's no real direction on what is expected**

Related to this there were also frequent comments about assessment and the role of the group work in assessment.

Comment 2 **We could do with a lot more discussion – we seem to have a lot of passengers – in our group we've never had a meeting where everyone has turned up – but in the end they get the same grade as us if we do well and I've really struggled to understand the thing**

Comment 3 **not sure why we need to bother if we're not going to get marks for it.**

This group of students were also very much more critical of the way in which they interacted with staff and one student even voiced the opinion that there was unfairness of treatment because as a 'new student' he didn't really know the tutors.

Comment 4: **The most annoying thing is not get any help – I've tried to contact [NAME OF TUTOR WITHELD] but never get any response**

Comment 5 **the other people in our group all know the teachers but a couple of us don't so it's a bit unfair on us**

Comment 6 **this isn't really teaching me anything – don't respond – don't seem to be interested – certainly not value for money**

The general negativity of the responses needs to be viewed in association with the fact that these students were relatively new to higher education study in the UK and this was not only their first exposure to using business simulation as a teaching method but also their first experience of the general environment in which teaching and learning is delivered in the UK.

C Interviews in July 2011 with students undertaking the simulation in single player mode (having failed the module at a first attempt)

These interviews were more focussed and were targeted more specifically at gathering perceptions of learners who were not working in a team. The interviews generated less useful commentary (21 useful responses) and students tended to focus more on providing reasons why they felt they had failed to achieve a pass in the module. In contrast to the interviews discussed above the students interviewed in this group were given more prompts to encourage them to reflect on the learning process.

C – Content – comments on knowledge and skills	2
P – Practice in application of theory	1
I – Integration of learning across subjects	3
G – Group Learning	3
M – Motivation	4
D – Decision Making	3
X – Communication and interaction with tutors	5

Decision Making

The comments on decision making were all positive or neutral and this perhaps reflects the fact that the students had already had time to 'practice' using the simulation and also that they were more comfortable in taking decisions independently.

Comment 1: **I find I actually preferred to work on this on my own – it's certainly a lot easier to make decisions.**

Comment 2**: It is actually a lot easier to make the decisions second time around**

Comment 3**: Knowing what the wrong thing to do last time makes it a whole lot easier to make the right choices this time to get the sort of data you need.**

Integration of Learning

Having experienced the way in which they were assessed none of this group of students appeared to be enthusiastic about doing the exercise again but clearly saw it was necessary to get data to support writing their evaluative report. There was no real sense in the first two comments that the students saw this as anything but a necessary exercise.

Comment 1; **There's little point in playing the game again other than to get some data to include in their report [which was the basis on which the students were graded]**.

Comment 2: **You don't need to understand how it all fits together – you just have to say the right things in the report**

Balancing this there was one positive comment

Comment 3**: I wasn't sure about how all the different subjects fitted together but having to it again has made me think about it and it is all a lot clearer now**.

Overall from the interviewers the researcher concluded that the re-assessment was not particularly effective in getting students to engage with learning from the simulation as 1 student noted;

Comment 1: **You just have to go along with it and do it again but it doesn't really count for anything**

And as another very honestly reported (having been assured confidentiality)

Comment 2: **I'm just going along with it and getting one of my friends who passed to tell me the right figures to put in then I can get on and write the report**.

D Interviews in August 2011 with students who had successfully completed the module

These interviews were again more focussed and targeted specifically at examining the extent to which students having successfully completed the module could reflect on the benefits of undertaking the module and specifically their views on the way in which they could transfer that learning to real life situations. These interview comments were not coded as the main purpose of conducting the interviews was to explore with students how much they felt they had benefitted from the using the simulation. Despite the fact that a large number of interviews were conducted (30 in total) there were only 17 useful comments and the comments themselves tended to be very repetitive.

While there were some comments which indicated that students had given some thought to the question they found it difficult to give concrete examples, though clearly reflecting back on using the simulation they were more positive in general than during the period in which they were using the simulation. Significant comments are provided below.

Comment**: I think the best thing I've learned is how to work with others and get on with them**

Comment 2**: It does help you learn to stand on your own two feet**

Comment 3: **I didn't think I was learning much when we did the simulation but I can see now how a lot of what we were doing works out in practice and its helped with other modules**

Comment 4: **Why ask us now? It would have been useful if someone had bothered to do this when we were playing the game**

Comment 5: **I think we could have got a lot more out of it – it's a pity we can't go back and do it again knowing what we know now**

The more positive attitude reflected in comments from these interviews perhaps reflects the fact that the students had successfully passed the module.

Overall, reflecting on the interview comments and discussion given in all of the sections above it is fair to point out that there were many positive comments about aspects of using the simulation and there was a generally positive attitude to learning using the simulation. In fact, this was reflected in the questionnaire which was issued to students and which if subject only to a quantitative analysis would have given an overall very positive result about the benefits to learners. In part the interviews can be seen as having been interpreted by some of the students as an opportunity to voice their concerns. To provide some balance a selection of these comments are provided below:

Positive comments from interviews

1. *The simulation is really well designed and much more interesting to use than sitting in lectures and tutorials and you can really see how things fit together*

2. *The simulation is a bit 'clunky' although everything is there once you know where to look for it.*

3. *The system is really good with lots of useful information and all the material you need. I wish we had this for all the modules*

4. *I think it's great but you really have to want to make it work*

5. *There's a lot to learn but it is good to see how everything we've done fits together and it's good to be able to decide things then see what effect that has*

6. *The best thing is the competition – our team is pretty focussed on what we are doing and it seems to be working as we are well ahead of the rest of the companies*
7. *The simulation is good in letting you see how all the different bits from HR, Marketing and Finance fit together*

8. *It's hard to get everyone to agree on the decisions but when we get there it's fun to put these into the system and see what happens*

9. *I do a lot of game playing and I have to say this would not be one of my favourite ones but it's fun to try to beat the system and outdo the other players*

10. *It's good to get together as a team because I think we learn a lot from one another and I certainly understand much better now why we were doing a lot of the stuff we were taught last semester.*

11. *It's a great way of teaching – I never really understood the financial stuff till we started using the simulation*

12. *I really like the fact I can just log in to system and do my own thing exploring all the different options – I think everyone needs to take a bit more time to play about with the system and then it can be really fun to use.*

13. *It's as good as going on placement without going on placement if you see what I mean.*

8.4.3 Focus Groups

Four focus groups were conducted. For the first two of these (conducted in 2009 and 2010 respectively) students were selected at random from the cohort of students studying the Planning, Processing and Decision Making module. An additional focus group was conducted in 2010 but in this case the attendees were restricted to home students only in order to view issues specifically from their perspective. The literature often points to difference in experience between home and international students – not primarily in the subjects which they have studied but in the teaching methods to which they have been exposed. In general the international student's exposure to teaching and learning prior to admission to a course in the UK is seen to involve more didactic methods and there is a stronger focus on rote learning and examinations. Home students generally come to postgraduate study with a greater experience of student centred learning and it was noted that some of them (4 students) had already had experience of using simulations in their undergraduate courses. A final focus group was conducted in 2011 to deal specifically with the learning experience of students who had failed the module on their first attempt and identify any issues which were related to the delivery of the module using the simulation package.

It was decided that in order to manage the group discussion it would be best to give some broad structure to the group rather than leave the group to have a completely open discussion. This was done by using a pre-set list of prompt questions to initiate discussion. Therefore questions were designed prior to the focus group meetings and this help to ensure a smooth and structured flow the discussion making best use of the time available. Questions were framed in such a way as to begin with general questions and building on responses leading to more the specific questions addressing issues in detail. Originally it was planned that the focus groups should involve a group of approximately 10 students. This is a slightly higher number than is often recommended in the literature. (Krueger and Casey for example suggest focus groups of between six and eight participants and Rabiee suggests between six and ten (Krueger and Casey, 2000; Rabiee, 2004). However, to give as broad a representation as possible it was decided that this number would be exceeded. (This was also partly because of an enthusiastic response from student who were asked to volunteer to take part). For the four focus groups conducted numbers were respectively 15, 12, 11 and 10.

Finally in connection with the focus group studies it is important to note that some of the research methods literature comments on some problems of potential bias which this situation may give rise to. There is the potential for the researcher to become more of an advocate for the views of the group rather than simply a recorder of these views or to attempt to refute views which are obviously based on wrong assumptions. The researcher thus took care to ensure that a clear and factual record of the meeting was taken and this was sent to attendees to check for accuracy. Member checking in this way helped to ensure that the researcher did not confuse or misinterpret the data gathered while conducting the research and put his own particular bias on what is said.

Results and discussion of outputs from focus groups

A General Focus Groups with all students (2 focus group meetings – 15 and 12 students)

The two focus groups which were held with representatives from all students in part balanced the negative responses which were apparent in the interviews – particularly with respect to group working. The discussions in both focus groups have been taken together as many of the issues were similar and where there was disagreement on the issues this has been noted. It should also be noted that the second focus group meeting was considerably more vocal in criticisms which they raised. This was perhaps a reflection of the fact that there were several very strong personalities in the second focus group and the researcher had to handle this very carefully in order to ensure that the group meeting was not dominated by the views of a small minority of individuals.

The researcher began each focus group by asking a direct question on whether or not the students would prefer to be taught in the same way they were taught in other modules or whether they felt the business simulation game was a good way of teaching. In both cases the response was generally positive. There was a suggestion in the first focus group that really what was needed was a variety of ways of teaching and that you couldn't run all the modules the same way – some lecturers were extremely good and the best way to learn was to get the basic facts from the lecture and have interactive discussions in tutorials. This met with general agreement. Both focus groups were also broadly in agreement that they found using the business simulation game was an enjoyable and interesting way of learning. The groups were both very enthusiastic about the quality of the materials provided and in particular several students suggested that the best thing about the simulation was that all the material was all provided and you could use it when and where you felt like it. There was a brief discussion in the first focus group meeting about the extent to which the manual was useful but the conclusion of the discussion was that those who felt they needed more help were not making full use of the manual. One person in the first focus group commented 'who uses a manual nowadays' but others who had clearly found it helpful argued that because the simulation was so complex you couldn't really get started without taking some time to look at the rules. In the second group, to corroborate this, the researcher asked about their opinion of the manual and after some discussion they were in general agreement that the manual for students and the online help was really good. The students in both groups were all satisfied that the simulation was easy to use but (again in both groups) concerns were raised about the pressure of time and in particular one participant in the second focus group voiced considerable concern about the fact that he felt there was too little time to really use the simulation to best advantage. The student commented that 'there is little point in giving us the simulation if we don't get time to use it – it's a bit like giving someone a book on how to learn a language and telling them that they only have a day to read it all and learn it, then it will be taken away'. This prompted a general discussion in the second focus group on how much pressure students were under to complete all the learning and assessments for their course (not simply discussing the business simulation). The researcher had to close down the discussion as it was not relevant.

The discussion in both focus groups on general problems which students faced when using the simulation raised a number of issues and students in both groups were very vocal in raising some of their concerns. A significant number of students were much more critical about staff support and particularly they were unhappy that there was no real feedback given on why during each of the cycles of decisions their results had a negative impact on the overall business performance. One student in the second focus group suggested that this was not really an issue and that he had found that his tutor was very supportive and gave a good deal of help and several others agreed with him. He further went on to note that perhaps it was because students weren't really asking for help. This caused some heated discussion around the fact that it was unfair that different tutors were either more or less supportive to their groups of students. The student who had originally suggested that there was no real feedback was obviously very aggrieved that it seemed to being suggested that he was not trying to get support which he needed commenting that 'the blame can't be passed on to the students if members of staff are too idle to do their job and help students'.   Again the researcher had to close down discussion on staff support – particularly in the second focus group where comments concerning individual staff members were becoming very personal. Other issues which were noted in the focus groups were:

> Focus group 1: the complexity of the language used in the simulation, the very American bias of the materials and the difficulty of scheduling enough time to have meetings. One student in the group raised an issue about whether or not the way students were assessed in the module was fair but after considerable discussion there was no agreement with the student's suggestion that performance in the simulation exercise itself should be given a mark which contributed to the student's overall final grade
>
> Focus group 2: also raised the question of scheduling suitable times for meetings adding that it was also difficult to arrange spaces to meet and suggesting that staff should be more helpful in setting up classrooms for this. The second group also raised the issue of the introduction to the business simulation and that a much more detailed explanation of why and how they were to use the business simulation would have saved their teams a great deal of time. The second focus group also returned to a brief but heated discussion on the extent of staff support generally.

On being prompted to discuss working in a group on the simulation there was a surprisingly positive reaction from the students in both focus groups – while in individual group discussions (discussed below) there was a large degree of comment on the groups not working well together. The students realised that the amount of work involved really needed a team effort and even where there were cases where the whole team did not work particularly well together comments were made in both groups to the effect that at least you ‘weren’t on your own’ and it was good to have someone else to discuss things with. The researcher prompted the groups to discuss group size and allocation to groups. Both focus groups expressed a preference for group sizes being bigger – the first settling on a figure of 6 or 8 people in each team and the second suggesting that up to 10 would be workable. There was also some dis-satisfaction expressed in the second focus group on how the composition of the teams was decided. However, it became apparent in the discussions between students on this point that it would not be feasible to take into account everyone’s different preferences. The problem was mainly cantered around when different individuals were available to meet as a group because of different external commitments for part time work. There were several comments from students in both groups on the fact that some students just ‘ducked out’ of doing the simulation and in a few cases some quite emphatic comments about how this should not be allowed. However, when the researcher invited the groups to discuss whether or not it would be better to assess students on the work they put into playing the simulation (which could penalise students who did not participate) the students were mostly against this suggestion. The students were of the opinion that it would be unfair to assess them on their performance in the simulation game itself because they felt it would make the exercise ‘too serious’.

When the researcher raised the question of whether or not the students felt they were able to achieve the learning goals for the modules there was initially some confusion and discussion of what these actually were. The researcher clarified for both groups that the main learning objectives for students was for them to develop their decision making skills and to be able to integrate what they had learned from different modules. In both groups there was general agreement that it did help considerably in making them think carefully about strategic management decisions. Though not as generally supported students also agreed that using the simulation did help them to better understand and apply the knowledge which they had gained from other parts of their course.

Overall despite the fact that particularly in the second group there was considerable discussion on staff interaction (or lack of it) the focus groups presented a very positive view on the teaching method and it was clear that the main concern of students was about the way the simulation was used rather than the teaching method itself.

B Focus group with home/EU students (11 students)

The focus group did not reveal any essential differences or add to the discussions on general aspects of using business simulations which had already been aired in the first two focus groups. One student did pick up on the issue of differences in expertise and commented on the fact that some of the students in his group were clearly unable to make any sense of what they were expected to do and another actually put forward the opinion that he himself appeared to have done all the work for the group. However, overall the students expressed the same concerns about lack of direction when doing the simulation but also gave the same positive comments about the materials themselves. There was a consensus in the group that they were able to assist their particular groups in understanding and using the business simulation (noting that the teaching method was often something which the international students in the group had ever come across) but did also note the fact that perhaps the task of doing this should probably be something which was the responsibility of the academic staff.

C Focus group with students who had failed the module and were resubmitting using single player mode

The first question asked in the focus group was again to ask students to reflect on whether they felt the business simulation game was a good way of teaching the subject and as in the general focus groups the response was very positive in favour of using the simulation. In terms of general responses to questions raised in the other focus groups concerning the usefulness of the materials, the extent to which they felt it was an appropriate way to be taught and the problems they encountered the students who had failed the module were in general agreement or voiced the same criticism. As was the case when these students were interviewed individually the focus group generally tended to spend too much on time on student complaints about why they had failed. In addition there was considerable discussion on the value of them having to repeat the exercise. Most of the students agreed that it was much easier to use the simulation in single player mode but it was noted that the simulation was being used just to help them get data to re-write their report which they saw as their main task. One student commented that ‘the results don’t really matter so long as you have the data from playing the game to write up in the report’ and there was general agreement with this view.   Asked to reflect on why they did not pass the module it was evident from the comments that this was not a problem because of lack of engagement with the simulation game – any more than a more general problem of not engaging with their studies as a whole. Again as one student suggested we haven’t failed because we didn’t get a good result in playing the game it’s just that we didn’t write a good report or complete the report the way in which they [the academic staff] wanted it done.

The researcher closed the focus group by asking students to talk a bit about what they felt they had learned. The first response from one student was ‘Nothing – and that’s why we are here!’ However, as the discussion progressed it was clear that several of the students felt that they had missed a good opportunity to learn a lot and several students commented that they were only now beginning to realise just how useful the simulation was. One student who had failed the module noted that he had in fact done a lot of work with the group on the first attempt but – because of illness – had not been able to make the deadline for submitting the report.   Other students noted that in their groups they spent too much time trying to win and were really focussed on that when really they should have been thinking more about why they were making the decisions ‘because that’s clearly what the assessment was all about’.

Overall, despite the fact that the students had not passed the module the comments were generally positive and showed some reflection by the students on how they could learn from their mistakes.

8.4.4 Simulation Learning Teams

Given the fact that team working was clearly a very important feature of the context of student use of the simulation it was decided to conduct a number of group interviews with a sample of the teams who were undertaking the module. The importance of examining this aspect of delivery of the simulation was also supported from the point of view of the pedagogical objectives which were set by academic staff in terms of learning outcomes. Team working would be expected to make a major contribution both to assisting students to integrate their learning by taking advantage of the shared prior experience of the students and decision making was ultimately a team decision.[21]

As was the case with individual interviews the teams selected for group interviews were randomly selected. 10 groups were interviewed in 2009 (25% of the total number of teams using the simulation) and 10 groups in 2010 (31.25% of the total number of teams using the simulation).

Immediately prior to the discussion each team member was asked to complete a short questionnaire which was designed to provide information about their own experience of working in a group and their interactions as part of the team. The purpose of this was to give students an opportunity to present issues or air views which they may not have felt comfortable with discussing as part of the team. It also provided the participants with the opportunity to reflect on their experience prior to engaging in the discussion. The researcher collated these questionnaires after their completion but did not use them as part of the discussion. The collective questionnaires from each team were useful in helping to analyse and identify any major issues which related to the discussion and may have had an influence on some of the comments provided by the students during the discussion. They were not, however, formally analysed as each set of questionnaire responses was unique to the different teams being interviewed and could only be used as additional data to support an understanding of the discussion which had taken place with the team.

In general the discussions with the teams were very frank and open and the researcher had on 3 occasions to close down a discussion and move on to another topic because some of the remarks being made and the manner in which they were being made were fairly aggressive and clearly aimed at particular individual members of staff. Also the

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[21] *With the exception in cases where students were being re-assessed and undertaking the module using its single player mode.*

researcher had to ensure that he remained objective at all times and was not drawn into discussions which were seeking his own opinion on whether or not certain aspects of the delivery and assessment were fair or reasonable.

The brief questionnaire issued to students in paper form asked 6 closed questions as follows. In each case students were asked to comment on Likert scale of 1 to 5 indicating low to high involvement/satisfaction

Section 1 – Decision making (commenting on a Likert scale of 1 to 5)

To what extent were decisions were made by team
To what extent were all decisions made or led by a single individual
To what extent were decisions made individually by different team members

Section 2 – Group Performance (commenting on a Likert scale of 1-5)

To what extent do you feel the group worked together well?
To what extent did you feel you could make a positive contribution to the team?
How satisfied were you with the performance overall of your team?

Results and discussion of meeting with student learning team

The team interviews were difficult to keep focussed and at times tended to be quite animated and accusatory with very strongly expressed views on problems caused because of what has been referred to in the literature as ‘free riders’. In 3 of the team meetings there was clearly a sense of engagement with the business simulation (with some reservations about why it ‘didn’t count for much in terms of how grades were calculated) and a clear sense also of the seriousness with which the team took the game and their determination to do their best to ‘come out top’ or ‘beat the competition’. In one of these cases in fact the students showed that they had clearly divided out responsibilities and were very much engaged in the role and responsibilities which had been allocated to them within the group. In three of the team group meetings, (as also discussed in the focus group), there was a suggestion that there must be a better way of putting people into teams but discussion on how to do this did not really reach a conclusion on what this was.

Again groups were very positive about the simulation itself and the materials were almost always rated as very high in terms of quality and the content provided which as one student commented ‘was better than they got in all the other modules’. The simulation exercise was seen to be very useful but there was considerable negative opinion on the amount of work which was involved expressed in five of 10 team meetings. Despite the fact that the teams operated in a competitive environment in playing the game it was obvious that there was a considerable amount of discussion between groups. Again, however, in 6 of the group interviews there were negative comments on the involvement of tutors. Despite the fact that almost all of the groups (7 of the 10) made some comment on problems with the group functioning they were all of the opinion that it was better to play the game as a team rather than as individuals. In 2 of the groups there was comment on the fact that it was difficult to understand why their decisions had a negative impact and they were clearly still confused about why their strategy was not working. The group members were firmly of the opinion that this would not be the case in real life but as one member of the group commented ‘it’s just a game – you can’t expect it to be exactly like real life.’ Full attendance of the group at the team interviews was only achieved for two of the groups and comments from the group members present indicated that this was generally a problem because they could never get full attendance at any of their planned meetings.

Finally it is interesting to note that on reflecting on the questionnaires which groups completed prior to the meetings the results were consistently aligned to the way in which the group itself interacted in the interview. Where the collective responses of the group indicated that decisions were not collectively taken this was reflected in the bias in leading the interview discussion and responding to questions which could be dominated by two or on one occasion only one group member.

8.5 Summary

Senge (1990) commented that management simulations may have more entertainment than educational value. The results of the above investigations with students would strongly refute this remark. However, what is also clear is that unless management simulations are introduced and integrated into the curriculum then students will not be able to take full advantage of their potential to provide an engaging and rewarding learning environment.

The ideal picture of business simulations encouraging teams to work together and learn together is not supported by the results of the investigation of the perceptions of students about the value of using the simulation. There is certainly some support for Miesing's view that highly cohesive teams perform better than less cohesive groups (Miesing, 1982) but overall there was no real evidence from the learners that the process of determining the allocation to groups or the way they worked as a group encouraged learning. .

Overall the conclusion has to that the potential of using business simulations has not been achieved in the case study investigated as part of this research. Clearly, there is the potential for much more research to be done not only on motivation to learn (focussing on students) but also on learning how to motivate (focussing on staff). This case study has exposed a clear deficiency in terms of the context in which the simulation has been used and in particular the result indicates that a significant part of the learning group (those who began their studies in January) were at a clear disadvantage as they were not prepared with either the knowledge and understanding or learning skills to take advantage of using the simulation.

Transfer of learning and reflection on learning needs more encouragement and this can only be achieved by additional input from teaching staff. This disagrees with Mayer's findings on transfer of learning (Mayer et al, 2011). However this again serves to emphasize the importance of fully describing the context in which evaluation studies are done and it is impossible to tell from Mayer's research the context in which the research was conducted to reach his very positive conclusions. In addition, as Mayer et al note.

> *'While it is believed that learning is improved through use of a simulation we know little about how to structure the use of the simulation in the classroom in order to enhance transfer' (Mayer et al. 2011 p.66)*

The qualitative approach used in this case study involved a great deal of work and interpretation of qualitative responses from learners. Ultimately, however, it would not have been possible to get a full picture of the issues involved in implementing a business simulation from the perspective of the learners without adopting this approach.

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Chapter Nine

Discussion and Conclusions

9.0 Objectives

The objective of this chapter of the thesis is to reflect on the findings of previous chapters and use these to provide a comparison between the current situation with respect to development and application of business simulations in Higher Education and the ideal model of how business simulations should be developed and used.

Specifically the objectives of this chapter are to:

- review the aim and objectives of the thesis to discuss how these have been met with respect to holistically examining the issues related to the development of simulation/gaming packages which can be used specifically to achieve the learning objectives required in higher education (particularly the type of learning outcomes which are consistent with delivery of education at Masters level)
- summarise the findings of the thesis integrating the findings from the literature review and the empirical work undertaken with developers, academics and students
- present a model of the critical success factors which impact on development and application of business simulations in the higher education sector in the United Kingdom.
- discuss the relevance of the current research to future developments and a possible future research agenda for developing and implementing simulations in higher education

9.1 Introduction

The thesis has reviewed a wide range of literature and has involved extensive empirical studies with students. A number of important themes have emerged which it is contended represent the key critical success factors when using business simulations in the higher education environment. The purpose is of this chapter is to summarize these themes, discuss how they are inter-related, and examine how business simulations can be used more effectively in order to ensure that students gain optimum advantage in terms of the specific educational benefits which use of such tools can provide. The chapter will discuss how effective evaluation techniques can be designed to provide assurance of learning.

9.2 Re-statement of Aims and Objectives

It is important to begin the concluding chapter be reflecting on the original aims and objectives of the research and to assess the extent to which these have been achieved.

Aim

The aim of the research as stated in Chapter One of the thesis was to provide a critical appraisal of the effective development and application of simulations in business and management in UK Higher Education.

In order to do this it was noted that the following objectives would support achievement of the aim. The objectives were:

- critically review the literature related to the development and application of simulation based training/educational software
  This has been achieved largely in the discussions in Chapters 3 and 4 of the thesis which collectively provide an analysis of the development and implementation of business simulations/games from the perspective of both developers of the software and the published literature by academics who use simulations to support different areas of the curriculum.
- critically review the pedagogical basis for claims which are made for simulations being effective in supporting learning in higher education
  The discussion in Chapter 3 of the thesis examined the claims made by developers but these are often provided in a very general context. The main

focus for discussion of pedagogical objectives is provided in Chapter 4 of the thesis.

- conduct an empirical survey to examine the development of simulations products particularly in the context of developing products to support teaching and learning in higher education

  The manner in which this survey was conducted and the analysis of the results is provided in Chapter 6 of the thesis.

- examine the use of simulations across a sample of business schools in higher education institutions to determine the manner in which academics are implementing simulations in teaching and learning and the manner in which they are evaluating the impact of use of simulations on learning,

  The manner in which this survey was conducted and the analysis of the results is provided in Chapter 7 of the thesis.

- conduct an empirical investigation of the use of simulations using sample groups of students who will be involved in using simulation software as an integral part of their programme of study (this will be a case study based on students enrolled on the MSc Management and MSc International Business courses at the Robert Gordon University, Scotland, who use the MikesBikes™ simulation as an integral part of a taught module on Performance, Planning and Decision Making)

  The investigation is discussed in Chapter 8 of the thesis which reports on the methods used and the results of a very extensive qualitative investigation of student learning when using simulations. The discussion of methodology in Chapter 2 of the thesis underpins the rationale for adopting a qualitative approach when conducting the investigation.

- Determine and apply appropriate evaluation techniques to provide an analysis of perceived and actual benefits of the use of simulations in business education;

  This is developed in Chapter 5 of the thesis where a model is proposed for evaluating business simulations which is derived from a discussion and analysis of pedagogical approaches which business simulations can support and also by a comprehensive discussion on the importance of establishing clear aims and objectives and the context in which the simulation is being

used. The model also considers different methods of evaluation, the specific context in which they should be used and the way in which these collectively contribute to an overall evaluation.

- Analyse all data collected to provide a model which clearly outlines the current situation with respect to development and application of simulations in business and management education
- Use the results of the analysis to explain the critical success factors which impact on the development and application of simulations in business and management education.

  The last two objectives are met in this final chapter of the thesis (Chapter 9) which provides a summary and discussion of findings through an examination of the key findings of both the literature review and the empirical studies conducted as part of this research (Section 9.3) and presentation of critical success factors (Section 9.4)

9.3 Summary of findings

As noted in the introduction to the thesis the ideal model for development of educational interventions is for developer and academic to work closely together to ensure that the software which is developed meets the objectives which have been set by the academic. It is particularly important that the academic is clear specifically what the objectives of using the simulation package are. If this is not clear there is no basis for measuring whether or not the use of the simulation has been effective. As discussed above the reasons for using the business simulation in teaching may be diverse and include considerations such as: making the teaching more cost effective; providing the students with a learning environment in which they can engage more effectively, improving the knowledge of students about a particular subject or process, promoting independent learning, encouraging team working, or developing critical and analytical thinking. Having determined which of these objectives (or others) are the reasons for using a business simulation as part of their teaching the academic must ensure that the learning objectives for students are clearly communicated to learners. In addition the academic must be confident that any pre-conditions for being able to achieve these objectives are clearly understood and have previously been developed in other parts of the curriculum or, at the very least, are supported while the simulation is being used. The academic has a crucial role in both assessing the suitability of the educational package to be used and in ensuring that the material is used effectively. An additional role which is also important is for the academic either to be able to directly customize the learning material or be able to feed back to developers of material any changes which are necessary in order to ensure that the pedagogical purpose of using the material is achieved. A review of the findings from both the literature and the empirical studies conducted as part of this research demonstrates that there are clearly areas in which improvements are required.

Evaluation of business simulations has been undertaken in an holistic manner and thus three main themes have been developed in the thesis to reflect an overall picture of the manner in which business simulations are currently developed and used. This was done in order to fully reflect the inter-dependence of all aspects of the area. The observations which are presented are the outcome of data collection within the three stages which collectively need to be considered to provide a full evaluation of the potential for using business simulations to support delivery of the curriculum in Higher Education. These can be summarized as:

Development: the robustness of the system itself and the adequacy of the interface which has been provided for supporting students in interacting meaningfully with the content of the learning package. The primary source of evidence for this is collected through a review of the literature and practical survey of business simulation developers

Implementation: the manner in which the material is used and integrated to achieve learning outcomes. The primary source of evidence for this are reports of academic experiences in implementing business simulations/games as reported in the literature and a practical survey of their perception of the manner in which business simulations have been selected and used. This allowed parallels to be drawn both with the perceptions of the developers on how business simulations should be used and the benefits of using them and the academics practical experience of implementation.

Impact on targeted learning groups: the manner in which students perceive the use of the business simulation and in particular how it contributed to their learning experience. The primary source of this has been an exhaustive examination of student perceptions of their learning experience. The case study used provided an authentic setting in which to situate this research. Evidence about

> the manner in which students interact with the business simulation and use it to support their learning is of paramount importance. This is particularly important if inferences about a causal relationship between the use of the business simulation and ‘improved student performance’ is to be established All of these activities are important in supporting an evaluation of the usefulness of any educational intervention but they are particularly important when examining use of business simulations as, while it is clearly the case that their use has great potential in learning it is important to understand the mechanisms by which their use impacts on learning and to objectively analyze the positive and negative aspects of the design and use of the systems on student learning.

A complete evaluation must take into account the method of delivery, the students and the nature of the learning task rather than being concerned with the technology used to deliver the teaching. Tergan notes, ‘the subject matter, the learner, the instructional methods and the technology all need to be evaluated’ (Tergan, 1997). In examining the outcome of any evaluation it should be clear that an assessment of all of these factors has contributed to the results reported. Thus it is important to investigate the learning process itself and to do this in an authentic setting to ensure that the observation of learning can be accurately correlated with any learning effect which is reported. In doing this the focus of the evaluation needs to be the aims and objectives which were the basis for introducing the simulation and the context in which the learners were supported in achieving stated learning outcomes – both directly through use of the simulation and through any supporting activities.

9.3.1 Development of Business Simulations

Unlike other educational developments the academic community is clearly very dependent on the skills and knowledge of the developers of business simulations in order to supply them with products which meet the educational requirements or deliver learning objectives which they are seeking to meet the needs of their learners (Stainton, 2010, Summers, 2004). While the production of print media and to a certain extent the early developments involving the use of technology in teaching were areas in which development of materials was within the direct control of the academic community the development of business simulations for teaching is an area in which the complexity of the technical skills involved means that academics have much less direct control over the production of suitable materials. The history of developments in educational technology demonstrate that it is often the case that the pattern of ‘diffusion of the technology’ means that in the early stages of new technological innovations there is a phase in which the responsibility for development is clearly led by the technologists. (Surry and Farquhar, 1997; Regis, 2003) For example, this was previously the case in relatively recent developments in the production of computer based multimedia learning resources where the technical demands on integrating different media and designing fairly sophisticated learning packages was outwith technical capability of academics, or groups of academics within higher education institutions. The literature on multimedia developments provides many examples, however, which demonstrate how the academic community itself was later able to use the software tools available to them to design their own customized materials Similarly the design of web based teaching materials provides many examples of where academics and academic support staff have been able to engage in the development of sophisticated learning materials and take advantage of the advances in communications technology and computing hardware technology to translate learning materials into a format in which it can be attractively presented and widely disseminated. This is not to say that academics can have no input to the development of business simulations and indeed there are some very successful examples of business simulations which are currently in use and which started life as developments which were initially designed by academics or educational developers based in academic institutions (notably BUSINESS STRATEGY GAME, 2002). However, the commercial exploitation of business simulations requires a much greater resource base than that which is typically available in academic institutions in UK – particularly in terms of design expertise, software development skills and technical expertise which can be used to develop and support large scale business simulation. The most significant implication of this is that a much closer collaboration between academics and developers is necessary. The reports from the survey of academics described the relationship as much more typical of a ‘seller to customer’ relationship and there are also indications from interviews with both suppliers and academics that the amount of feedback on use of simulations and suggestions for improvement is very limited. The issue is also evident less directly in what developers see as unrealistic expectations by academics with regard to the cost of business simulation products and in particular the high additional costs which are associated with customization or tailoring business simulations to meet specific contexts for use.

9.3.2 Implementation of Business Simulations

The implications of the above separation of roles also have an impact on the manner in which academics select simulations and the care which they must take in ensuring that the product which they select is fit for purpose in terms of the educational objectives which they are seeking to achieve when using the simulation. It is clear from the literature, and supported by the researcher's web based survey of business simulation products, that there is an extensive range of business simulation products (Stainton, 2010). The range available and the quality of simulations applies both to total enterprise simulations which are designed to assist students to integrate their learning across a number of business/management sub disciplines and subject specific simulations to support teaching in accounting and finance, human resource management, operations and supply chain management (though academic perceptions of availability of good subject specific simulations is less favourable). .There is also a body of published material which can assist academics in selecting appropriate educational material and a body of literature on establishing the suitability or fitness for purpose of general educational software is sufficient to provide guidance in assisting academics in their selection of business simulations (Adoba and Daneshfar, 2005; Bragge, Thavikulwat, and Toyli, 2010; Garson, 2009; Saunders, 1995). However, the practical survey of academics who make use of business simulations demonstrated that the process of selection is often not considered rigorously. In particular the process of matching the learning goals supported by the business simulation and the required learning goals or outcomes for the particular part of the course of study in which the learner is engaged is often not fully explored. There is a great deal of evidence in the literature to back up the view that simulations and games can support learning. The potential for significant pedagogical benefits are discussed widely in the literature and appear to be clearly understood by both developers and academics commenting on the subject. There is almost universal support for the view that business simulations can support higher order learning, integration of learning across disciplines and can do this in a way which enhances student motivation to learn.

However, the practical survey of academics clearly demonstrated that the issues related to successfully integrating use of business simulations in the curriculum is often not clearly understood, or when it is understood there are external considerations which mean that the extent of support provided when using business simulations is not delivered. The most common reason cited by academic staff is lack of time to support delivery of the business simulation and in particular the level of work required to deal with multiple groups of learners as they work with the simulation. This is supported not only in the practical survey of academics conducted as part of this research but also by previous surveys of academics who use business simulations (Chang, 1997; Lean, 2006. Pongpanich, Krabuanrat and Tan 2009). In interviews with academics and from open comments provided as part of the survey of academics it was obvious that staff were familiar with the importance of 'scaffolding' – particularly in constructivist learning environments, but reported that there was simply not scope when running a simulation with a large class of learners to devote the amount of time to reviewing and encouraging learners which they would ideally like to have given. Other significant problems were identified relating to the integration of the simulation into the curriculum and the difficulty of ensuring that learners all had the necessary underpinning in terms of knowledge and skills required to engage fully in making some of the decisions they were required to make when assuming certain roles in the simulation. This was particularly noted in terms of students understanding of the financial environment and interpretation of financial results. The case study of learners at the Robert Gordon University demonstrated that this issue is of critical importance and provides another example of how important it is for academic staff to fully understand the content of the simulation being used and carefully audit the skills and knowledge of participants to ensure that they have all the pre-requisite skills.

There was also clearly difficulty in establishing teams and academic staff reported that dealing with group issues and resolving tensions within groups took a considerable amount of time. This is clearly one of the most significant problems which staff encounter when using business simulations (and it is also apparent in the feedback from learners on barriers which they faced in engaging effectively with simulations). Academic staff recognized that some of these issues were problematic for any situation in which group work was an important element

Finally the issue of assessment of learners (which as noted has a direct impact on motivation) was not fully addressed by academics although there is a clear perception which came through both in the literature and the empirical survey that students are very much ‘assessment driven’ as an important motivational aspect of engaging with any learning experiences (Pellegrino et al. 2001, Draper, Cargill and Cutts, 2002). There appears to be no clear consensus on either what should be assessed (in terms of performance in the simulation as opposed to performance in examinations or coursework conducted after using the simulation) or the weight which should be given to assessment.

9.3.3 Evaluating student learning using business simulations

Computer based simulations clearly have considerable potential to achieve educational objectives and as noted in the thesis the business simulation clearly involves students in undertaking the four steps in the learning process which are identified in the Kolb learning cycle i.e. concrete experience, reflective observation, abstract conceptualization and active experimentation (Kolb, 1984). Again the empirical studies and the literature reviewed demonstrate that academics have a good understanding of pedagogic theories and models of learning. It is also clear that the link between these theories and the way in which business simulations can support learning are well understood. However, what is not well understood is the means by which evaluation of the pedagogic benefits of business simulations should be carried out. A significant contribution to theory of this research has been to critically examine the practice of evaluation and the principles upon which it should be based. The discussion in Chapter Five of the thesis proposes a general framework for evaluation which takes into account the different stages at which evaluation should be conducted (development and testing of software packages, selection of appropriate business simulations for use in higher education and evaluation of the student learning experience). It also incorporates the different types of evaluation which may be conducted (formative evaluation, illuminative evaluation, integrative evaluation, summative evaluation and cost benefit analysis) and underlines the importance of applying these in terms of specific referencing the aims and objectives which were set for selection/use of the business simulation. It also stresses the critical importance of context in evaluating the student learning experience. The case study evaluation described in Chapter Eight of the thesis applied the framework developed in Chapter Five of the thesis and confirms the importance of understanding the context in which business simulations are used. It has demonstrated the value of undertaking an illuminative approach to evaluation and focusing on how students learn rather than simply what (or if) they learn. The most obvious example of the importance of undertaking a qualitative approach to evaluating student learning were the findings which demonstrated the fact that all groups of students (in this case those who joined the course later in the session) were not equally supported in realizing the potential benefits of using the simulation in their learning.

9.4 Critical Success Factors and their interaction

The discussion above and a detailed analysis of the opinions and perceptions of suppliers, academics and learners have informed development of the following model which seeks to capture the critical success factors and the stage in development and use of simulations on which they have a major impact. The term *critical success factors* is used to refer to “the few key areas of activity in which favourable results [were] absolutely necessary for a particular manager to reach his goals” (Bullen & Rockart, 1981, p. 3).

Since then, the concept of success factors (i.e. that the success of a given endeavour could be determined by a few key areas of activity), has appealed to a large number of researchers. However, there is often a degree to which subjective judgment operates in determining exactly what are identified as critical success factors and it is therefore important to be precise about how these have been identified.

The approach taken in the current research has been to attempt to draw out the critical success factors at different stages of the process – from development to use by learners and the following diagram sets out where the main issues are located. All of the factors listed in the diagram could be said to be ‘critical’. But in order to provide a useful summary of critical success factors which should be addressed in terms of improving the development and implementation of business simulations the approach taken has been to highlight those factors which require action by either developers or academics in order to improve the process of creating useful learning materials and (more importantly) using learning materials in order to allow learners to gain maximum benefit from use of the materials.

TABLE 9.1 CRITICAL SUCCESS FACTORS	COMMENTARY
SIMULATION SOFTWARE	
Technical Specification	While some concerns are noted historically recent literature indicated no concerns about technical specification of products. A review of the literature also demonstrates that there are robust testing methods in place and suppliers are confident that the systems provided are error free.
Technical Support	Academics did not note any concerns in relation to the support and technical assistance provided by the suppliers of simulation products and in the software reviewed (including the Mikesbikes simulation used in the case study) the level of support in terms of staff and student manuals and online help was of a very high standard
Costs	This was seen as an issue and there were clearly misperceptions between suppliers and academics about the costs involved in developing high end simulations. Remedial action: more communication is required between suppliers and academics to ensure that expectations in relation to costs are clearly communicated. There is also some evidence that academic institutions are under considerable pressure financially and in seeking to justify costs may use cost benefit arguments (in relation to support for teaching large numbers of students efficiently) which have not been objectively proven.

Key to Diagram

Critical in terms of improving the learning benefits of use of simulations (but dealt with)

Critical in terms of improving the learning benefits of use of simulations (requiring action)

TABLE 9.1 CRITICAL SUCCESS FACTORS	COMMENTARY
SIMULATION CONTENT	
Accuracy of academic content	While there are some criticisms of academic content in general academics did not voice concern about the factual content of simulation packages. The system suppliers generally have mechanisms in place to either work with academics or use reliable academic textbooks to support the simulation.
Accuracy of modelling of decisions using simulation	The issue of how the simulation changes in response to change in variables in the environment is still a very big concern – mainly from developers who view this from a technical perspective in terms of assuring the validity of the outcomes when using the simulation. In general both academics and students are more comfortable with the fact that modelling the decisions is reasonably accurate. The issue is, however, very important if claims about being able to transfer the learning from the simulation directly to the workplace are to be sustained.
PEDAGOGICALISSUES	
Interactivity	Levels of interactivity within the simulation itself are satisfactory although note has been made that very advanced techniques for gaining and acting on user inputs and presenting resultant decisions are less well developed in simulations marketed for HE rather than those aimed at the corporate market.
Design (including use of multiple media and interface)	Design interfaces are almost always commented on as being excellent and support engagement of learners with the simulation package.
Fit with pedagogical theory	Simulations clearly are capable of meeting pedagogical objectives outlined in a number of teaching theories and models.

TABLE 9.1 CRITICAL SUCCESS FACTORS	COMMENTARY
IMPLEMENTATION	
Clarity of objectives	In general clarity of objectives are provided by academics are good but it should be noted that there is some evidence that these are not always clearly communicated to students and some evidence that they are not fully taken into account when selecting appropriate software to support student learning.
Integration with curriculum	In the case study conducted as part of this research there was a significant failure to take into account the integration of the simulation with student prior learning and a clear failure to take into account individual learning differences.
Introduction and support for learners	In the case study one of the most frequent issues which raised negative comment was the way in which students were introduced to and prepared for working on the simulation. The literature on implementation also supports this view as being a more general one (e.g. Snow's comment on this being little more in some cases than asking students to read the manual). .
Feedback to support learning	The level of interactivity which is required between academics and learners was clearly not met in the case study and again evidence from the literature and surveys suggests that failure to provide adequate learning support is often a problem. The reasons provided for this are almost always related to the significant amount of work which this involves – particularly in terms of management of team working which is associated with the simulation. The lack of interactivity is also evident in the frequently reported lack of debriefing and may be one of the reasons why there is still considerable debate on the value which should be attached to use and 'success' of students in terms of results of using the simulation in terms of assessing the overall grade which should be given to this activity.

It is clear from the above diagram that the main focus of effort in improving use of business simulations/games should be directed into assisting academics to engage more effectively with the introduction and use of simulations. In particular it is important to ensure that academics provide sufficient 'additional' input to supporting learners both to understand how the simulation functions but more importantly in terms of supporting them to understand the impact of the decisions which they make when using the simulation and 'learning from doing'. It was very clear both from the literature and from survey responses/interviews from academic staff that this is very labour intensive but without putting in the time to select and manage teamwork more effectively, to provide effective feedback to learners as they engage in using the simulation, to consolidate their learning and to make clear to learners and encourage them to reflect critically on their learning, simulations as a teaching method cannot achieve their full potential.

9.5 Future directions for research into the development and application of business simulations

Arising from the above discussion a number of recommendations can be made about future research directions in developing and implementing business simulation.

With reference in particular to the literature reviewed and the issues which appear still to need a clearer resolution:

There is still a need to arrive at a consensus on what is meant by 'realism' of a business simulation. The issue of the extent to which the business simulation must faithfully represent all the complexities of the 'real world' business environment is a very complex one. On the face of it the argument would seem to be that because one of the primary reasons given for using a business simulation is that it gives student experience of real life challenges the simulation should accurately mimic the real world. However, this poses particular problems in an educational setting. The complexity of the environment and the multiplicity of variables which would need to be accounted for would make the simulation extremely difficult to understand and place a huge burden on the learner. Education usually involves a process of simplification and gradual introduction of complexity and it is important that developers of simulations work closely with educational technologists to develop learning simulations which are designed to stage and support learning.

The central position of team working and the ways in which this impacts on student learning needs further research. There is, as noted in this research, a considerable body of literature which looks at the issue of team working and developing effective teams. However, there is no consensus on the best approach to assigning groups of students to teams and considerable debate on the ‘ideal’ team composition and the impact of this on collective decision making processes. The single most important issue for learners in the empirical study reported in this research was the extent to which problems associated with group work had a negative impact on their learning experience. In addition the academics who were surveyed, while they all agreed with the principle of group learning, also expressed doubts about the extent to which this provided a true reflection of an individual’s contribution to the work and the amount of work involved in managing the learning of a large number of diverse teams.

With reference in particular to the practical programme of work conducted during the course of this research:

There is still considerable scope for further testing the perceptions of learners using more robust evaluation techniques in order to determine the extent to which they benefit from the use of business gaming/simulation as part of the higher education curriculum. The empirical studies which have been carried out as part of this research could not cover all of the different approaches which have been used in a range of simulations nor the different ways in which such simulations are introduced and used. In particular such studies should concentrate on the claims which have been made which are central to what are generally assumed to be the central benefit of the application of this type of educational approach. Specifically research should be focused on:

- More research studies and case studies are required which clearly report the context of how simulations have been implemented and how their effectiveness has been evaluated. Such research would provide a better basis for developing more generalisable conclusions and potentially would allow the application of meta-analytic studies (such as those used by Kulik (1994) in assessing a range of studies in use of multimedia) which may provide more robust conclusions than can be drawn from the isolated examination of a range of individual studies.

- more attention needs to be paid to reconciling the claims made in the evaluation of simulations with respect to their claims to develop high order conceptual learning and higher-order cognitive skills. This is not particularly a feature of use of business simulations in education but is also true of any educational intervention which makes claims for the development of higher order skills such as critical thinking, analytical skills.
- In particular there needs to better match between claims made in the literature which centre around the fact that business simulations provide learners with the ability to transfer their learning to the workplace. Intuitively it would seem to be the case that allowing students to learn in an environment in which they can practice ‘real life’ business skills would result in the development of skills and knowledge which can be directly transferred to the workplace. However, there has been very little research which attempts to substantiate this empirically. To conduct such research requires a large scale longitudinal study which can demonstrate a direct link between real or perceived improvement in either being prepared for the workplace or performance in the workplace.
- Rather than seek simply to demonstrate ‘success’ it is important for evaluations to demonstrate reasons for success and in particular demonstrate how specifically it was the use of the business simulation which was central to that success.
- The issue of cost benefit and cost effectiveness of using simulations in the higher education curriculum is often promoted in the literature. This is a significant issue – particularly when viewed in the light of the arguments for cost effectiveness which are put forward by developers of business simulation games. The claims appear to be at odds with the reports from academic users which stress the high volume of work required to implement business simulations effectively.

9.6 Contribution to Knowledge

The thesis presented here provides two main contributions to knowledge:

The first of these is based on the extensive work done in analyzing the literature covering a wide range of studies on application of business simulations both from the perspective of developers and academics and presenting a comprehensive overview of the critical success factors across all stages of development and implementation of business simulations. While, collectively there has been a great deal of work done in reviewing specific aspects of either the development or use of business simulations the thesis represents an important contribution in synthesizing the literature to provide an holistic overview of the factors which are important in successfully using business simulations to support student learning in higher education in the United Kingdom.

The second major contribution is provided in the development of the framework for evaluation and the practical application of illuminative and integrative evaluation to provide a firm basis for deriving conclusions about how students learn when using business simulations. The study provided insights into the way in which students perceive their learning and drawing on its findings about the context in which the simulation was introduced and used it provided valuable insights into how student learning can be enhanced. The evaluation framework emphasizes that evaluation must be based on an explicit statement of the educational objectives which are set for the teaching method which is being developed or implemented. While there have been a number of reports in the literature on evaluation of use of simulations many of these are simply post hoc rationalizations of the benefits of using this type of educational technology. By firmly rooting evaluation in the aims and objectives of the learning experience the framework provides an assurance that what is being claimed as the benefits of using the approach is accurately measured and reported. Significantly the evaluation framework stresses the point that if the objective of introducing a business simulation into teaching the curriculum is to support a cognitivist approach to learning then this must be reflected in the evaluation and suitable instruments used to measure cognitive changes in learning.

The thesis emphasizes that the primary reason for engaging in evaluation should be to ensure that the introduction of a new teaching method must be shown to be effective in terms of improving the quality of learning or the efficiency of teaching. With regard to this it should be noted in conclusion that there is no doubt about the enthusiasm which the majority of academics have in the potential benefits of using business simulations. There is no doubt about the fact that the use of business simulations is consistent with current pedagogical theories and learning models. The main issue is centred on the questions which need to be asked to justify that enthusiasm and corroborate the validity of the approach. As noted by one prominent educational technologists it is important when doing this to ask the right questions as it takes just as much effort to research and answer the wrong questions (Reeves, 1997) but answering the wrong questions does not help us to move forward in understanding how students learn or the steps which can be taken to improve their learning experience.

It is contended that this thesis not only asks the right questions but also provides answers which justify the methodological approach used and helps to clarify the manner in which business simulations/games contribute to student learning. As such it thus represents a significant contribution to the body of knowledge on teaching and learning using new technologies.

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APPENDIX 1

DEVELOPERS WEB SITES

APPENDIX 1

Suppliers of Business Simulations reviewed in Web Survey

Company	Subject	Web Address
Business Smart International	Banking	http://www.business-smart.com/products
	Strategy	
	Commercial Awareness	
	Management Development	
	Fantasy CEO	
	Team Building	
	Retail	
SimVenture	Strategy	http://www.simventure.co.uk/
Business Strategy Game	Strategy	http://www.bsg-online.com
Tenzing Business Simulations	Various	http://www.tenzing.co.uk/
Harvard Business Publishing	Entrepreneurship	http://hbsp.harvard.edu/list/simulations
	Capital Budgeting	
	Private Equity Finance	
	Finance	
	Marketing	
	Pricing	
	Global Supply Chain	
	Operations Management	
	Project Management	
	Operations Management	
	Supply Chain	
	Change Management	
	Leadership	
	Strategy	
	Innovation	
Business Simulations Infocus Ltd	Online Business Simulation	http://www.businesssimulationgames.co.uk
	Bissim	
	Simpact	
Tycoon Games	Agribusiness	http://www.learn4good.com/games/tycoonbusiness.htm
	Tourism	
	Retail	

Company	Subject	Web Address
Tycoon Games	Airline	
	Real Estate	
	Entrepreneurship	
	Construction	
	Music Industry	
	Retail	
Cesim	Business Strategy	http://www.cesim.com/simulations
	Marketing Management	
	Simfirm	
	Smal Services	
	Hospirality Management	
	Electric Utilities	
	Telecoms	
	Banking	
	Project Management	
Pixelearning	The Business Game	http://www.pixelearning.com
	Soft Skills	http://www.potentialmatters.co.uk
Elgood	General Business	http://www.chris-elgood.co.uk/
	General Business	http://www.thesmallbusinessgame.co.uk/
	Stock Market	http://www.jisc-collections.ac.uk
Celemi	Finance	http://www.celemi.com/
	Marketing	
	Business Strategy	
	Project Management	
	Sales	
	Marketing	
Marketplace®Live	Marketing	http://www.marketplace-live.com
	Supply Chain	
Wall Street Survivor	Stock Market	http://www.wallstreetsurvivor.com
Oak Tree Simulations	Marketing	http://www.oaktreesim.com
	Entrepreneurship	
Tata Interactive Systems	SimBls	http://www.tatainteractive.com
Industry Masters	Print Media	http://www.industrymasters.com/
	Machine Industry	
	Fashion Retail	
	Banking	
Capsim	General Business	http://www.capsim.com/
	General Business	
	General Business - Assessment	
Smartsims	Music Industry	http://www.smartsims.com

Company	Subject	Web Address
Smartsims	General Business	
	General Business	
	Advertising	
Virtonomics	Economics	http://www.virtonomics.com
Profitability Business Simulations	Enterpise Profitability	http://www.profitability.com/uk/
	Corporate Profitability	
	Strategic Profitability	
Goldsimulations	Microeconomics	http://www.goldsimulations.com
ABSEL Simulation Packages		
Beat the Market	Business Strategy	http://www.bpg.bpgsim.biz/
Business Policy Game	Business Concepts	http://www.bussim.info
Geo	Entrepreneurship	http://pages.towson.edu/precha/
Global Business Game	Business Strategy	http://onlinebg.com
Fuure Force	Leadership	http://wwww.hpssims.com
Hall Marketing	HR	http://www.simulations.co.uk/RANGEFLY.htm
HRM Simulations	Accounting	http://www.knowledgecompanion.htm
Management Accounting Simulation	Business Strategy	http://www.microbuspub/com
Multinational Management Game	Business Strategy	http://www.microbuspub/com
Prostar	Agribusiness	http://www.prostar.ilstu.edu

APPENDIX 2

SURVEY MONKEY QUESTIONNAIRE TO DEVELOPERS

Development and markets for Business Simulations

1. Who are the main customers for your products/services

- ◯ Educations (Public or Private)
- ◯ Corporate Organisations

2. Specifically in relation to simulations for use in educational institutions, geographically where are your main markets?

- ◯ United States and Canada
- ◯ Europe (including UK)
- ◯ Far East (excluding China)
- ◯ China
- ◯ India and Indian subcontinent
- ◯ Middle East
- ◯ Africa
- ◯ South America
- ◯ Australia and New Zealand

3. Geographically where do you expect your market is most likely to grow in the near future?

- ◯ United States and Canada
- ◯ Europe (including UK)
- ◯ Far East (excluding China)
- ◯ China
- ◯ India and Indian subcontinent
- ◯ Middle East
- ◯ Africa
- ◯ South America
- ◯ Australia and New Zealand

4. What general areas are covered in the business and management simulations your company develops?

- ☐ Total Enterprise Simulations
- ☐ Specific Subject/Skill

Development and markets for Business Simulations

5. If you develop simulations for specific subject areas or skills please specify range of subjects/skills covered

6. How are your simulations designed for delivery?

- [ ] Stand alone PC product
- [ ] Networked Delivery over Internet
- [ ] Networked Delivery using customer Intranet

7. Are your simulations designed for individual or group use?

- ◯ Groups of learners
- ◯ Individual learners
- ◯ Both

8. What are the main design considerations and technical considerations which are taken into account when developing business simulations?

9. How do you validate the teaching/training content of your simulation?

10. Specifically with respect to simulations used to support learning in an educational context please rank in order the main factors which you believe influence academics when purchasing your products/services.

	Accuracy and currency of the content covered
	Cost
	Quality of the design interface
	Degree of interactivity provided for learners
	Ease of use of the simulation
	Ability to customize the simulation

Development and markets for Business Simulations

11. What do you believe are the most important benefits which can be gained from using business simulations as part of the Higher Education curriculum?

- [ ] Delivering essential facts and theories
- [ ] Assisting learners to link practice to theory
- [ ] Providing more effective engagement with learning
- [ ] Facilitating experimentation in a 'risk free' environment
- [ ] Enhancing employability skills
- [ ] Encouraging reflective learning
- [ ] Developing team working skills
- [ ] Developing decision making skills
- [ ] Gaining immediate feedback on actions to support learning

12. Do you expect that over the next 5 years the market for business simulations will -

- ◯ Decrease
- ◯ Increase
- ◯ Remain relatively stable

13. Please provide any additional comments or observations you may wish to make on the development and use of business simulations in Higher Education

APPENDIX 3

PROMPT NOTES FOR INTERVIEWS WITH BUSINESS SIMULATION DEVELOPERS

APPENDIX 3

INTERVIEWS WITH DEVELOPERS OF SIMULATION

CONDUCT OF INTERVIEW AND QUESTIONS TO EXPLORE

1. Introduce the interviewee to the context of the study,explain the value of gaining their informed views and opinions on the development and use of simulations for use in business management teaching at higher educationlevel and provide assurances of confidentiality

2. Open the discussion by asking a general questions to establish what their views are on the current market for simulations in higher education and some of the challenges in developing and marketing their products to the higher education sector (contrasting if necessary with corporate market)

3. Ask about their view on the main benefits which they see – use the list of perceived benefits already established to provide prompts if necessary but initially allow the interviewee to talk freely about the issues.

4. Ask about the ‘interface’ between academics and developers and any specific problems or issues which arise – if required prompt for views on issues related to cost and implementation of the business simulation

5. Allow open discussion around what they feel is the future direction of use of business simulations in higher education and any barriers to adoption.

APPENDIX 4

BUSINESS SCHOOLS SURVEYED

APPENDIX 4

Business Schools Surveyed

1. Aberdeen Business School - Robert Gordon University
2. Lord Ashcroft International Business School, Anglia Ruskin University
3. Ashridge
4. Aston Business School
5. University of Bath, School of Management
6. University of Bedfordshire Business School
7. University of Birmingham - Birmingham Business School
8. Birmingham City University - Business School
9. Bolton Business School - The University of Bolton
10. Bournemouth University, The Business School
11. BPP Business School
12. Bradford University School of Management
13. Faculty of Business, University of Brighton
14. Bristol Business School - University of West of England
15. University of Bristol, Department of Management
16. Brunel University
17. University of Buckingham Business School
18. Clare Business School, Buckinghamshire New University
19. Canterbury Christchurch University, The Business School
20. Cardiff Business School
21. Cardiff School of Management, University of Wales Institute, Cardiff
22. Faculty of Business, Enterprise and Lifelong Learning at the University of Chester
23. Cass Business School, City University
24. Coventry Business School
25. Cranfield School of Management
26. Croydon College, Department of Management
27. University of Cumbria, Faculty of Business, Social Science and Sport
28. Derbyshire Business School
29. Dundee Business School, University of Abertay Dundee -
30. Durham Business School
31. Royal Docks Business School - University of East London
32. Edgehill, Department of Business, Management and Leisure
33. University of Edinburgh Business School
34. Edinburgh Napier University Business School
35. University of Essex Business School
36. Regent's College London
37. University of Exeter Business School
38. Faculty of Business and Society
39. Glasgow School for Business and Society
40. University of Glasgow - The School of Business and Management
41. University of Gloucestershire Business School

42. University of Greenwich - Business Faculty
43. Henley Business School, University of Reading
44. Heriot Watt University, School of Management and Languages
45. University of Hertfordshire Business School
46. University of Huddersfield Business School
47. University of Hull Business School
48. Imperial College Business School
49. Judge Business School, University of Cambridge
50. Keele University, School of Economic and Management Studies
51. Kent Business School
52. Kingston Business School
53. Lancashire Business School
54. Lancaster University Management School
55. Leeds Business School, Leeds Metropolitan University
56. University of Leeds, Leeds University Business School
57. University of Leicester School of Management
58. Leicester Business School - De Montfort University
59. Lincoln Business School - University of Lincoln
60. Liverpool Business School, Liverpool John Moores University
61. Liverpool Hope Business School
62. The Management School - University of Liverpool
63. London Business School
64. London College of Fashion
65. London Metropolitan University - Department of Business and Service Sector Management
66. London School of Economics, Department of Management
67. London South Bank University
68. School of Business and Economics, Loughborough University
69. Manchester Business School
70. Manchester Metropolitan University Business School
71. Middlesex University Business School
72. Newcastle Business School - University of Northumbria
73. Newcastle University Business School
74. The University of Northampton
75. Norwich Business School, University of East Anglia, School of Management
76. Nottingham Business School - Nottingham Trent University
77. Nottingham University Business School
78. Open University Business School
79. Oxford Brookes University Business School
80. University of Oxford, Said Business School
81. The Plymouth Business School
82. Portsmouth Business School
83. Queen's University Management School, Queen's University Belfast
84. Queen Mary University London
85. Regents College - European Business School
86. The School of Business and Social Sciences - Roehampton University

87. Royal Agricultural College - School of Business
88. Royal Holloway, University of London - School of Management
89. Salford Business School
90. School of Management and Business - The University of Wales, Aberystwyth
91. University of Sheffield - Management School
92. Sheffield Hallam University - School of Business and Finance
93. Southampton Business School - Southampton Solent University
94. School of Management - Southampton University
95. University of St. Andrews - School of Management
96. St Mary's University College - School of Management and Science
97. Staffordshire University Business School
98. Stirling Management School - University of Stirling
99. University of Strathclyde Business School
100. University of Sunderland Business School
101. School of Management at the University of Surrey
102. University of Sussex, Brighton - SPRU
103. Swansea University, School of Business and Economics
104. Teesside Business School
105. Management Science and Innovation - UCL
106. University of Ulster - Faculty of Business and Management
107. University of Wales Newport - Newport Business School
108. Warwick Business School
109. West London Business School
110. University of the West of Scotland
111. University of Westminster - Westminster Business School
112. Winchester Business School
113. Wolverhampton Business School
114. University of Worcester Business School
115. Wrexham Business School
116. The York Management School
117. York St John Business School

APPENDIX 5

SURVEY MONKEY QUESTIONNAIRE SURVEY OF BUSINESS SCHOOL ACADEMICS

Academic Survey - Development and markets for Business Simulations

1. Please provide the name of your institution

2. Do you currently use simulations as part of teaching the curriculum?

- ◯ Yes
- ◯ No

3. If you used simulations in the past but do not now use them please note why this is the case

4. How do you rate the availability of business simulations to support teaching in your subject area?

- ◯ Poor
- ◯ Adequate
- ◯ Excellent

5. What general areas are covered in the business and management simulations your use on your course?

- ☐ Total Enterprise Simulations
- ☐ Specific Subject/Skill

6. If you use simulations for specific subject areas or skills please specify range of subjects/skills covered

7. How do you deliver business simulations as part of your course?

- ☐ Installed on stand alone PCs
- ☐ Networked Delivery over Internet
- ☐ Networked Delivery using customer Intranet

8. Do you make use of simulations designed for individual or group learning?

- ◯ Groups of learners
- ◯ Individual learners
- ◯ Both

9. If teaching using groups please indicate the number of students you assign to each group (tick multiple boxes if the range is greater than indicated in any one choice)

- ◯ 2-3
- ◯ 4-5
- ◯ 6-7
- ◯ 8-9
- ◯ 10 or more

10. How do you assign learners to groups?

- ◯ Randomly assigned by instructor
- ◯ Self selection by learners
- ◯ On the basis of learner profiles

11. Comment on how effective you feel the process of group allocation you use works

12. How are students introduced to using the simulation and supported when using it?

13. Which of the following methods do you use to assess the outcomes of student use of the business simulation?

On basis of performance in the simulated exercise

Through performance in other assessments which allows the student to demonstrate learning

Through self reflective analysis on use of the business simulation

Other (please specify)

14. How do you evaluate the teaching effectiveness of using the business simulation?

15. What if any are the problems/challenges which you face when using a business simulation as part of the curriculum?

16. Please rank in order the main factors which you believe are important when selecting a business simulation for use in supporting teaching your subject?

- [ ] Accuracy and currency of the content covered
- [ ] Cost
- [ ] Quality of the design interface
- [ ] Degree of interactivity provided for learners
- [ ] Ease of use of the simulation
- [ ] Ability to customize the simulation

17. What do you believe are the most important benefits which can be gained from using business simulations as part of the Higher Education curriculum?

- [ ] Delivering essential facts and theories
- [ ] Assisting learners to link practice to theory
- [ ] Providing more effective engagement with learning
- [ ] Facilitating experimentation in a 'risk free' environment
- [ ] Enhancing employability skills
- [ ] Encouraging reflective learning
- [ ] Developing team working skills
- [ ] Developing decision making skills
- [ ] Gaining immediate feedback on actions to support learning

18. Please provide any additional comments or observations you may wish to make on the development and use of business simulations in Higher Education

APPENDIX 6

PROMPT NOTES FOR INTERVIEWS WITH BUSINESS SCHOOL ACADEMICS

APPENDIX 6

INTERVIEWS WITH ACADEMICS WHO USE BUSINESS SIMULATIONS

1. Introduce the interviewee to the context of the study,explain the value of gaining their informed views and opinions on the development and use of simulations for use in business management teaching at higher education level and provide assurances of confidentiality

2. Open the discussion by asking a general questions to establish the personal experience of the academic in using business simulations and any issues which they have encountered when introducing simulations in teaching.

3. Ask about their view on the main benefits which they see – use the list of perceived benefits already established to provide prompts if necessary but initially allow the interviewee to talk freely about the issues.

4. Ask about implementation of business simulations – what do they see as the main issues which contribute to success.

5. Ask about experience of the students and their reaction to using the business simulation

6. Ask about the way in which they evaluate the teaching and learning experience

7. Allow open discussion around what they feel is the future direction of use of business simulations in higher education and any barriers to adoption.

APPENDIX 7

QUESTIONS FOR STUDENT FOCUS GROUP DISCUSSION

APPENDIX 7

STUDENT FOCUS GROUP QUESTIONS

1. Introduce the interviewee to the context of the study, explain the value of gaining their views and opinions and the potential benefit of the research to improve implementation and use of business simulations. Provide assurances of confidentiality

2. Open the discussion by asking a general questions on whether they felt that using a business simulation was a good way to teach students. Explore with them whether or not the students found using the simulation was

    a. Enjoyable
    b. Beneficial for their learning

3. Allow open discussion around how they would compare the use of the business simulation in their module with other teaching methods on other modules.

4. Ask about their view on any problems which they had when using the simulation. What would they change about the way in which it was used in their course

5. Ask about whether or not the students felt they understood and could use the business simulation to achieve the learning outcomes for their module. (Explain learning outcomes which were expected are:

    a. Developing their decision making skils
    b. Helping them to understand how all the different parts of their studies fitted together

6. Ask about group work and what they felt about working as a group.

    ADDITIONAL QUESTIONS

7. (For Home/EU students ask about experience of using business simulations in undergraduate studies)

8. (For Home/EU students ask about anything which they felt they were able to contribute specifically to helping the group)

9. (For students who had failed the module) Ask about their general understanding of the purpose of using the business simulation and getting them to work in groups

10. (For students who had failed the module) Ask a general question around why they feel they had failed the modules – was it because of the way it was taught using the simulation)