DEVELOPING MANAGERIAL EFFECTIVENESS: ASSESSING AND COMPARING THE IMPACT OF DEVELOPMENT PROGRAMMES USING A MANAGEMENT SIMULATION OR A MANAGEMENT GAME.

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ABSTRACT

This research evaluates the effectiveness of using a management simulation, a management game or case studies within a strategic management training programme. The literature suggests that there is anecdotal evidence that both simulations and games surpass the use of case studies, but there is much criticism of the lack of robust research models used to validate the claims.

Using a quasi-experimental design with a reliable managerial competency assessment instrument, the authors assess the impact of different programme groups, the assessed change in workplace behaviour on a 180° basis and participant learning as demonstrated to their own senior managers.

INTRODUCTION

The use of computer-based simulations has received attention more recently for both their increasingly sophisticated design and their promotion of participant interest (Mitchell, 2004). However, one of the major problems of simulations is how to “evaluate the training effectiveness [of a simulation]” (Feinstein and Cannon, 2002) citing (Hays and Singer, 1989). Although for more than 40 years, researchers have lauded the benefits of simulation (Wolfe and Crookall, 1998), very few of these claims are supported with substantial research (Miles et al., 1986, Butler et al., 1988).

Many of the above cited authors attribute the lack of progress in simulation evaluation to poorly designed studies and the difficulties inherent in creating an acceptable methodology of evaluation.

This paper is from an on-going research study comparing the use of different types of simulation and case studies in a quasi-experimental design assessing learning and behaviour change in the workplace following a development programme intervention.

BACKGROUND AND CONTEXT

A large amount of business gaming literature has dealt with how its method fared against the traditional methods for delivering course material (Keys and Wolfe, 1990). For example, the studies by Kaufman (1976), McKenney (1962, 1963), Raia (1966) and Wolfe and Guth (1975) found superior results for game-based groups versus case groups either in course grades, performance on concepts, examinations, or goal-setting exercises. Although anecdotal evidence suggests that students seem to prefer games over other, more traditional methods of instruction, reviews have reported mixed results.

Despite the extensive literature, many of the claims and counterclaims for the teaching power of business games and simulations rest on anecdotal materials or inadequate or poorly implemented research (Gredler, 1996). As reviewed by Keys and Wolfe (1990), these research defects have clouded the business gaming literature and hampered the creation of a cumulative stream of research.

Much of the reason for the inability to make supportable claims about the efficacy of simulations can be traced to poorly designed studies, the lack of generally accepted research taxonomy, and no well defined constructs with which to assess learning outcomes (Gosenpud, 1990, Feinstein and Cannon, 2001). As highlighted by Sales and Cannon-Bowers (2001), there is a somewhat misleading conclusion that simulation (in and of itself) leads to learning; unfortunately, most of the evaluations rely on trainee reaction data and not on performance or learning data. There are also such a variety of stimuli (e.g., teacher attitudes, student values, the teacher-student relationship) in the complex environment of a game that it is difficult to determine the exact stimuli to which learners are responding (Keys, 1977).

Gosen and Washbush (2004) pointed out that although it seems appropriate to undertake research assessing the value of simulations, the majority of early studies have focused on performance in the simulation (including aptitude scores in the form of SATs, grades, and other measures of academic abilities). However, research on the relationship between learning and performance has strongly suggested that the two variables do not co-vary, performance is not a proxy for learning, and it is inappropriate to assess simulations using performance as a measure of learning (Washbush and Gosen, 2001, Wellington and Faria, 1992). There is thus evidence to suggest that computer-based simulations are effective, but the studies showing these results do not meet the highest of research design and measurement standards, and any conclusion about them must be tentative (Gosen and Washbush, 2004).

This research seeks to evaluate the effectiveness of using a management simulation, a management game or case study within a strategic management training programme. The three interventions are compared in a quasi-experimental method with pre-test and post-test and consider in particular, the development of managerial competencies, i.e. the behavioural change of individual managers in the workplace. This research considers each individual's preferred learning style (Kolb, 1984) to consider if particular individuals are likely to benefit more or less from a particular method of performance intervention and will take account of each individual's age, position in the organisation, gender and level of formal qualification to assess if there is a trend as suggested by Aldrich (2002) that younger managers prefer and benefit more from computer-based, immersive technology-based training methods.

SIMULATIONS AND GAMES

Lundy (2003) proposed that the critical difference between computer games and simulations is in what the main objective is: entertainment versus skill building. As emphasized by Callanhan (1999), while simulations often have rules 'for play', possess room for alternative strategic tactics, and can be fun, they are not, by definition, games. While games generally focus on one intent (i.e., that of winning), simulations stress the complex, real-life situations and array of goals that organizations attempt to implement on a daily basis; in addition, the simulation environment offers opportunities for action and reflection that is not always inherent in a ‘pure play’ environment (Callanhan, 1999).

As emphasized by Feinstein et al (2002), simulations cannot be viewed as a collection of methodologies for experiential learning environments if we expect to be able to effectively assess their value. Specifically, the following two types of computer-based simulations will be considered in this research:

1. Management game: a structured activity in which teams *compete* within constraints of rules to achieve an objective (Wolfe, 1990). All business games are competitive games in that they are typically turn-based or round-based, where teams compete against each other for a limited amount of resources, against a game facilitator (can be the computer) who is manipulating external variables, or a combination of the two, to meet some market need or opportunity in the face of competition. Outcomes are typically rewarded for maximizing profitability and/or creating innovative managerial strategies (Feinstein et al., 2002).

2. Management simulation: an interactive, advanced, symbolic operation model, and outcomes of decisions are based on analysis and research of real companies (Romme, 2003). C*ooperation* is key; participants have to determine whether they can solve the problems and achieve the goals that the simulation presents from a range of multiple decision/outcome possibilities and levels of online feedback/coaching. Emphasis is on running experiments, testing different strategies and building a better understanding of key aspects of the real world, and rich futuristic plans and recommendations usually result (Keys et al., 1994).

INSTRUCTOR INFLUENCE

A significant research area in the literature includes game administration factors, such as how the instructor creates the companies within the simulation, places the game within the context of a course, and rewards and interacts with the students playing the game (Keys and Wolfe, 1990). As highlighted by various writers (Keys, 1977, Certo, 1976, McKenney, 1967), instructor guidance must be applied during crucial stages in the development of the teams and at the debriefing stage of the simulation to insure that some degree of closure and summary insights are obtained from the experience. Garris et al. (2002) provided support and found that the role of the instructor in debriefing learners is a critical component in the use of instructional games, as are other learner support strategies such as online help, cues/prompts, and other activities.

MEASURING MANAGERIAL COMPETENCIES

Traditionally, the views surrounding the issue of managerial effectiveness have tended to be largely based on the assumptions about what managers do, and what they should do to be successful according to Robotham and Jubb (1996). These assumptions are challenged (Luthans et al., 1985) in that rather than relying on an evaluation of managers' performance that is based on the activities traditionally prescribed for managerial success, a focus on the activities managers actually perform has emerged.

Models abound in the literature for measuring the behaviours and knowledge of managers and provide a suitable basis to measure managerial effectiveness (competence in doing the job of management).

In a recent paper, Kenworthy (2003) proposes the use of the Hay/McBer (McBer, 1997)Managerial Competency Questionnaire (MCQ) as a reliable, valid set of scaled competencies that have sets of behaviours ordered into levels of sophistication or complexity (Spencer and Spencer, 1993), as a suitable assessment tool to examine the extent to which the different programmes impact on the managerial competency of the individuals participating in the programmes. The Hay/McBer MCQ competencies found to be the most critical for effective managers include (Table 1):

Table 1. Hay/McBer Competencies

- Achievement Orientation
- Developing Others
- Directiveness
- Impact and Influence
- Interpersonal Understanding
- Organisational Awareness
- Team Leadership

The Hay/McBer MCQ provides a robust, reliable tool to consider as a basis of measuring managerial behaviours suitable for this research study (Kenworthy, 2003).

EVALUATING TRAINING INTERVENTIONS

Reviewing the history and development of training evaluation research shows that there are many variables that ultimately affect how trainees learn and transfer their learning in the workplace. Russ-Eft and Preskill (Russ-Eft and Preskill, 2001).suggest that a comprehensive evaluation of learning, performance , and change would include the representation of a considerable number of variables. Such an approach, whilst laudable in terms of purist academic research, is likely to cause another problem, that of collecting data to demonstrate the affects and effects of so many independent variables and factors. Thus, we need to recognise that there is a trade off between the cost and duration of a research design and increasing the quality of the information which it generates (Warr et al., 1970).

Hamblin (Hamblin, 1974) points out that a considerable amount of evaluation research has been done. This research has been carried out with a great variety of focal theories, usually looking for consistent relationships between educational methods and learning outcomes, using a variety of observational methods but with a fairly consistent and stable background theory. However, the underlying theory has been taken from behaviouralist psychology summed up as the 'patient' - here the essential view is that the subject (patient) does (behaviour or response) is a consequence of what has been done to him (treatment or stimulus).

Another approach according to Burgoyne (Burgoyne and Cooper, 1975) which researchers appear to take to avoid confronting value issues is to hold that all value questions can ultimately be reduced to questions of fact. This usually takes the form of regarding the quality of 'managerial effectiveness' as a personal quality which is potentially objectively measurable, and therefore a quality, the possession of which could be assessed as a matter of fact.

METHOD

While scientific method would suggest that the purest form of test of the Experiential Learning Model would be one that isolates a single learning cycle, Gibbs (1988) suggests that may not be either possible or even desirable, as all experiences (and therefore the interpretation of those experiences) are influenced by the sum of preceding experiences. Easterby-Smith (1994) suggests that the classic design of experimental research to assess the effectiveness of a particular training intervention would require two groups, one group to be trained (given the treatment) and a comparable group not to be trained (receive no treatment). Individuals within the experiment would be assigned randomly to each group and both groups measured immediately before and after the training. The difference between the groups could then be attributed to the training received. In any evaluation of experiential learning, the existing portfolio provides the foundation upon which any test must be based (Morse, 2001). This design is based on the "before and after" experimental design methodology commonly used in both education and the social sciences (May, 1993). The test assumes that the background of each participant remains a constant during the cycle and implicitly accepts the existing portfolio of knowledge, experience, motives, traits and values. Therefore, a pre- and post- test seems most appropriate.

Easterby-Smith continues warning against experimental design (1994) stating that there are "innumerable problems in achieving matching of control groups" and cites several studies (Easterby-Smith and Ashton, 1975) and (Bligh, 1971, Partridge and Scully, 1979) (cited in Easterby-Smith and Thorpe, 1997) where difficulties arise in interpreting the results either because the control group was not truly random (Easterby-Smith and Ashton, 1975), the criterion accepted was open to debate (Bligh, 1971), the experiment may have been methodologically flawed (Partridge and Scully, 1979). However, Easterby-Smith also points to dangers in more qualitative methods citing a study by Argyris (1980) who found that despite best efforts to assess delivery method of faculty according to their own values, that the behaviour of faculty was contrary to their espoused theories.

Anderson and Lawton (1997) suggest that there are two models to choose from regarding the assessment of the effectiveness of a simulation, a pre- and post-test design to measure the learning (using an objective measure) or an after-only test design using a random control group. They advocate the latter approach but recognise that whilst this may highlight the difference between different pedagogies used, it does not measure the learning at an individual level. Since we are likely to be affecting the outcomes anyway by becoming involved (action research) and ethically it is difficult to justify why one would deliberately give (even if randomly) a treatment that one believes is inferior (researcher bias) – such methodological approaches are unethical (Remenyi et al., 1998).

RESEARCH MODEL

Based on insights drawn from the literature review, this research aims to add to our understanding of the effectiveness of computer-based simulations across different learning styles and assess changes in work-place behaviour. Given the realities of the training world and the difficulties in assigning individuals to random groups mean that a true experimental design is not feasible (Easterby-Smith et al., 1991) and precluded (Ross and Morrison, 2003). As such, this research will be a quasi-experimental design. Pre-testing of each individual presents the opportunity to qualify the similarities of the groups and the benchmark of the basis for the post-test to establish change in individuals' behaviour at the workplace according to self-assessment and a 180º third party assessment measuring if two types of computer-based simulations will be more or less effective for individuals with a preferred learning style (Kolb, 1984). (Figure 1)

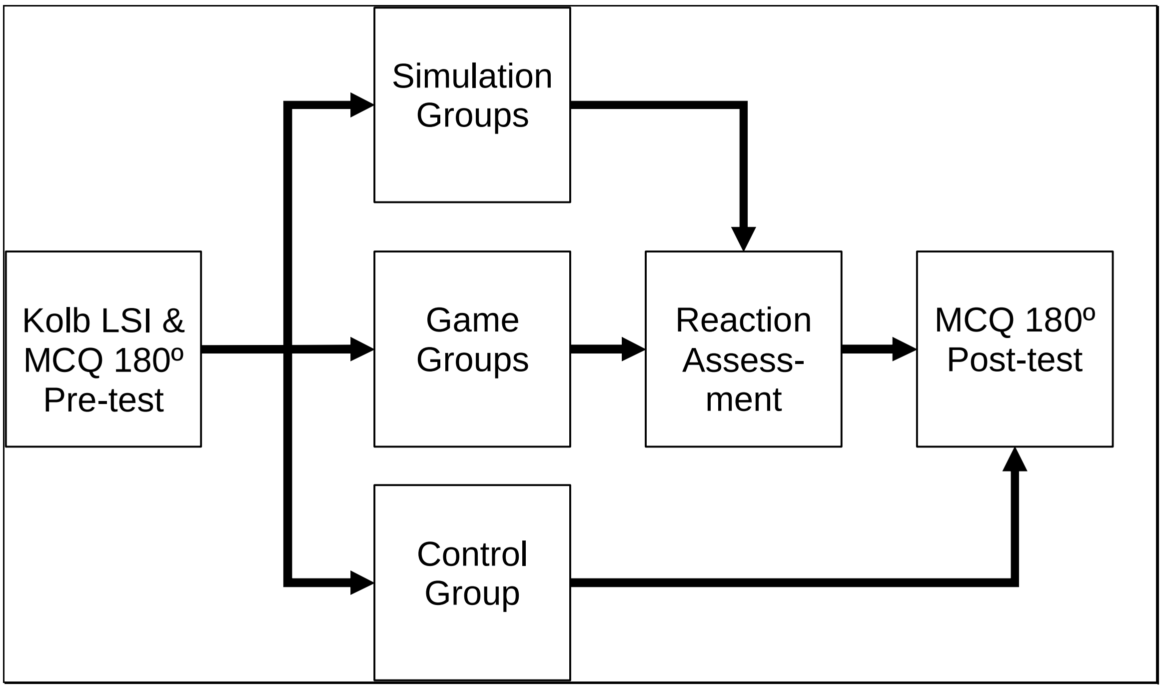

Figure 1. Research Model

Learning measure is post-test only (Anderson and Lawton, 1997) and is the assessment of Strategy Presentations made by participants at the end of each programme. Assessors represent the senior management of the client organisation and rate presentations on a 5 point scale with 1 being the lowest to 5, the highest. Making Strategy Presentations to Senior Management is one specific Learning Outcome of the programme (Table 2).

It has been suggested that management simulations have advantages over games (Mitchell, 2004). Such complex computer-based simulations encourage cooperation in experimenting with making decisions and immersing learners in an environment in which they actively participate in acquiring knowledge. In addition, management simulations allow learners to visualize situations and see the results of manipulating variables in a dynamic environment that cannot be duplicated in the typical turn-based competition strategies of management games (Feinstein et al., 2002).

PROGRAMME AND METHODS INVESTIGATED

The research study investigates two specific programmes:

A strategic management training programme using Imparta's Strategy CoPilot™ simulation, blended with theory and sessions specific to the application of the theory to the clients own organisations. This is compared with a group undertaking similar programme using a strategic management game developed by CELSIM – Strategy Management Edge. The third group undertook the same programme using paper-based case studies.

Learning objectives for the programmes were the same (Table 2):

Table 2. Programme Outcomes

Strategy Programme Outcomes
• Identify and prioritise critical strategic issues
• Generate and evaluate creative ideas for new strategic directions
• Build the assets, relationships and capabilities required to sustain superior returns
• Plan an achievable implementation strategy
• How to align organisation strategy and stakeholder needs
• Present new strategic plans to senior management

The choice of groups was made by client companies on the basis of their training and development needs and budget. The background of the individuals represents a cross-section of Singapore and Malaysian society and is broadly similar to participants on short course simulation based programmes. In addition, the researcher is involved in facilitating both groups eliminating the effects of researcher bias or facilitator interference identified by Argyris (1980).

Furthermore, as both groups are facilitated by the author and who gives feedback to each individual regarding their assessments – the concern about control over the feedback nullifies the argument that the process becomes a self-fulfilling hypothesis (Burgoyne and Cooper, 1975).

EVIDENCE COLLECTION

Following the recent literature on evaluation of experiential learning – this research will measure participants at three levels of Kirkpatrick's model, Reaction, Learning and Transfer (Kirkpatrick, 1959/60, Kirkpatrick, 1994). The fourth level, business benefits are measured in circumstances where the organisation under study provides confidential access to such data and as such is not considered in this paper.

PRE-TEST

- Participants' undertake a 180º Managerial Competency Assessment based on the Hay/McBer Managerial Competency Questionnaire instrument (McBer, 1997), nominating at least two third party assessors each (boss & staff or peer).

- Participants complete a self-assessment of their learning styles using the Kolb LSI version III (Kolb, 1999).

REACTION TEST

- Participants' reaction to the training event is measured immediately following the event asking for their rating on a five-point scale their enjoyment and usefulness of each separate session within the training event.

- Client organisation senior managers assess participant's final presentations on a 5-point scale.

POST-TEST – LEARNING AND TRANSFER

- Participants undertake a 180º managerial competency assessment using the same questions as previously in a different order. This is undertaken between 8 and 10 weeks after the event.

- All participants receive personal feedback on their assessments after the post-test results.

In assessing the development of managerial competencies, the mean 180 degree assessment of the participant competencies before the programme was compared with the mean assessment 8-10 weeks after the programme (Higgs and Rowland, 2001).

The pervasiveness of Kolb's learning styles theory is well represented in the literature and for this reason, it has been chosen here as the basis to determine the effectiveness of computer-based simulations across different learning styles. Byrne and Wolfe (1974) established that with regard to the design of optimal learning experiences, individuals have different needs for learning, both with regard to the content and to the preferred method of learning. Learning styles can potentially influence the learners' preference for training delivery mode, and it follows that learning environments that are not consistent with an individual's style are more likely to be rejected or resisted by the individual (Brenenstuhl and Catalanello, 1977).

RESULTS

Data were collected across 6 separate programmes held during 2003 and 2004. Data for a participant who did not complete the full series of assessments are deleted – representing a total of 20 participants.

Table 3 below indicates the statistical test that have been undertaken with the data based on commonly used techniques in research in educational technologies (Ross and Morrison, 2003) and the summary results.

Table 3. Tests and Summary Results

Analysis	**Research Question/Hypothesis**	**Results at 5% except where noted at 10%**
t test Independent samples	*H1 The simulation or game treatment group surpass the Case Study group*	Yes, significant across each reaction variable. Significant in behavioural competencies in 6 factors
	H2 The Simulation group will surpass the Game Group	No, significant only in usefulness of Feedback.
t test Dependent samples	Will participants change their behaviour in demonstrating particular competencies from pre-test to post-test following the treatment?	Yes, significant in all seven assessed competency factors on a 180 basis.
Analysis of variance (ANOVA)	*H3 There will be differences in learning among three groups that learn from simulation, game and the control group*	Yes, significant difference with Case Study group lower than wither Simulation or Game group. No significant difference between Game and Simulation group.
Analysis of covariance (ANCOVA) or (MANCOVA)	Will there be differences in competency behaviour change, with differences in prior behaviour controlled?	Yes, the differences are significant with control of prior (pre-test) behavioural competencies.
Pearson *r*	Is enjoyment positively related to usefulness, learning and change in behavioural competency?	Positive correlations between enjoyment and usefulness in some factors, but not to learning or behaviour change.
Multiple linear regression	How well do experience, age, gender, and educational qualification predict demonstration of managerial competencies?	Gender is significant in predicting change in Achievement Orientation. Position is significant in predicting changes in Developing Others, Directiveness and Team Leadership.
Discriminant analysis	Do students with different learning style preferences differ with regard to enjoyment and usefulness of sessions?	Yes, Enjoyment of Simulation and Lecture are significant at 10%. Usefulness of sessions does not appear to be significant.
	H4 Convergent Learners will enjoy the simulation and find it more useful than non-convergent learners.	Yes, significant. Convergent Learners show higher enjoyment and find the game and case study more useful. Non-convergent learners show higher usefulness for the simulation.

ANALYSIS

T-Test of change in each competency factor, reaction test and learning comparing the simulation, game and control groups (Table 4) show no apparent significant difference between the Simulation and Game in change of competency level. T-Tests between the pre and post mean competency scores show a significant difference at the 5 % level for every factor across all groups.

Table 4. Summary Table T-Tests

	Summary Table	Differences Standard Deviation Simulation (n=27)	Game (n=49)	Case (n=24)	Significance of Differences Sim-Game	Sim-Case	Game-Case
Reaction Means	Enjoy Simulation/Case	0.688	0.571	0.780	0.164	**0.000**	**0.000**
	Enjoy Teamwork	0.555	0.721	0.917	0.767	**0.000**	**0.000**
	Enjoy Feedback	0.764	0.634	0.680	0.656	0.103	**0.017**
	Enjoy Lecture	0.550	0.660	0.464	0.417	**0.000**	**0.000**
	Useful Simulation/Case	0.542	0.612	0.676	0.221	**0.000**	**0.000**
	Useful Teamwork	0.557	0.662	0.932	0.362	**0.002**	**0.000**
	Useful Feedback	0.832	0.574	0.816	**0.012**	**0.013**	0.246
	Useful Lecture	0.730	0.726	0.779	0.151	**0.000**	**0.000**
Learning Test	Learning Increased	0.701	0.832	1.042	0.588	**0.000**	**0.000**
MCQ Mean Differences pre-test to Post-Test	Dif Achievement Orientation	3.594	3.868	2.383	0.787	**0.028**	**0.016**
	Dif Developing Others	3.488	4.646	2.712	0.661	0.237	0.156
	Dif Directiveness	3.498	4.372	2.858	0.239	0.114	**0.012**
	Dif Imapct and Influence	3.413	4.029	2.617	0.445	*0.072*	**0.016**
	Dif Interpersonal Understanding	2.735	3.114	2.677	0.126	*0.061*	0.644
	Dif Organisational Awareness	3.225	3.189	2.944	0.625	0.215	*0.069*
	Dif Team Leadership	5.249	3.372	3.189	0.474	0.109	**0.002**

Significant differences at the 5% level are highlighted in **bold**, those significant at the 10% level are *italic*.

The results of ANOVA of Simulation Type and for LSI preference for each competency factor change, reaction to enjoyment and usefulness and learning increase (Table 5) suggest that simulation type is a significant differentiator for enjoyment and usefulness, though LSI preference has some significance in enjoyment. Simulation type is significant at the 5% level for change in Achievement Orientation, Directiveness and Team Leadership – and Impact and Influence at 10% level.

Table 5. Summary Table ANOVA

	Summary Table	ANOVA (5%) Sim Type F-Ratio	Probability	Power	ANOVA (5%) LSI Pref F-Ratio	Probability	Power
Reaction Means	Enjoy Simulation/Case	29.96	**0.0000**	1.000	2.26	*0.0865*	0.555
	Enjoy Teamwork	11.85	**0.0000**	0.994	0.55	0.6464	0.160
	Enjoy Feedback	3.11	**0.0489**	0.587	0.12	0.9467	0.072
	Enjoy Lecture	0.52	0.5937	0.134	2.41	*0.0719*	0.585
	Useful Simulation/Case	34.53	**0.0000**	1.000	1.68	0.1757	0.428
	Useful Teamwork	10.94	**0.0001**	0.989	0.07	0.9778	0.061
	Useful Feedback	5.22	**0.0070**	0.820	1.40	0.2484	0.361
	Useful Lecture	2.62	*0.0777*	0.511	0.97	0.4092	0.258
Learning Test	Learning Increased	12.07	**0.0000**	0.994	0.82	0.4835	0.223
MCQ Mean Differences pre-test to Post-Test	Dif Achievement Orientation	3.24	**0.0436**	0.604	3.60	**0.0162**	0.778
	Dif Developing Others	1.11	0.3345	0.240	2.58	*0.0583*	0.618
	Dif Directiveness	3.67	**0.0291**	0.663	0.02	0.9973	0.053
	Dif Impact and Influence	3.09	*0.0501*	0.583	0.15	0.9263	0.078
	Dif Interpersonal Understanding	2.21	0.1152	0.441	3.36	**0.0219**	0.746
	Dif Organisational Awareness	1.67	0.1929	0.345	1.43	0.2377	0.369
	Dif Team Leadership	3.71	**0.0281**	0.668	1.40	0.2474	0.361

The chart (Figure 2) below shows the mean differences in each competency factor between pre-and post-test for each intervention. The Game group showing greater positive change in each factor except Interpersonal Understanding. Both the simulation and game group show greater positive change than the case group. LSI preference is significant (5%) in change of Achievement Orientation, Interpersonal Understanding and Developing Others (10%).

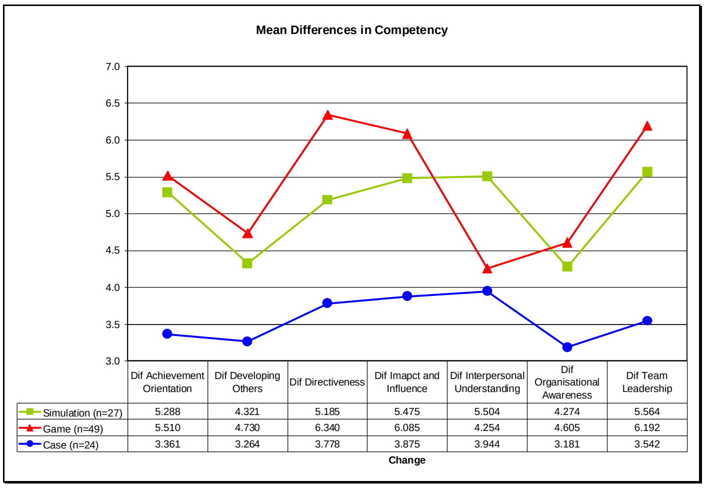

Figure 2. Mean Differences in Competency

Multiple Linear Regression of independent variables of age, gender, position and academic achievement against the differences in competencies scored. Table 6 below shows the significant factors and the predictive power of the associated competencies. Female participants showed a significantly higher increase in Achievement Orientation than Males. Senior Managers showed significantly higher competency increase in: Developing Others, Directiveness and Team Leadership than Managers.

Table 6. Multiple Linear Regression competency difference

Multiple Linear Regression

Competencies	Variable	Std Error	Probability	Power at 5%
Achievement Orientation	Gender = Female	0.7448	**0.0026**	0.8649
Developing Others	Position = Senior Manager	0.8681	**0.0044**	0.8244
Directiveness	Position = Senior Manager	0.8502	**0.0087**	0.7561
Team Leadership	Position = Senior Manager	0.8790	**0.0049**	0.8132

ANCOVA and MANCOVA Analysis (Table 7) show that Achievement Orientation is significantly different between Simulation type and Gender. Change in Developing Others is significant by position but not seemingly affected by Simulation Type. Directiveness and Team Leadership show that Simulation Type may not be the significant factor – when Position is covariate.

Table 7. ANCOVA Analysis

ANCOVA & MANCOVA 5%	Variable	F-Ratio	Probability	Power
Achievement Orientation	Simulation Type	3.81	**0.025761**	0.6795
	X Gender	5.38	**0.022570**	0.6313
Developing Others	Simulation Type	0.03	0.972417	0.0541
	X Position	3.40	*0.068374*	0.4463
Directiveness	Simulation Type	0.71	0.495046	0.1666
	X Position	1.69	0.196139	0.2516
Team Leadership	Simulation Type	1.05	0.352763	0.2296
	X Position	0.98	0.323657	0.1657

The charts (Figure 3) below suggest why the simulation type, whilst significant using One Way ANOVA for Developing Others, Directiveness and Team Leadership are influenced by the covariate of position – the latter being a significant predictor using multiple regression for the change in these factors. We cannot therefore, accept that Simulation Type is alone a significant factor in the change in demonstration of these competencies.

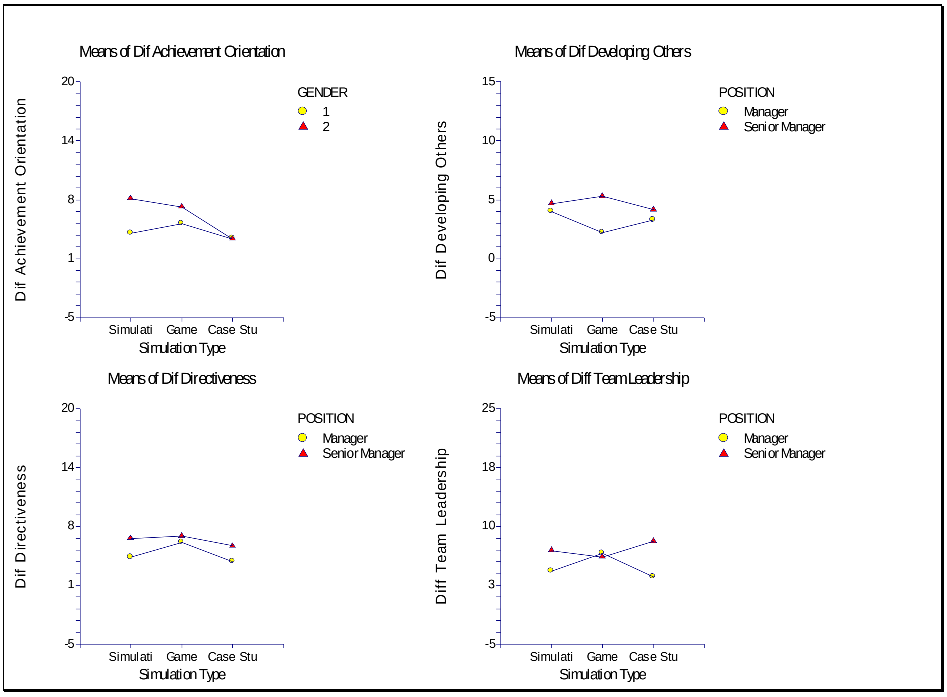

Figure 3. Co-Variate and Simulation Type Charts

The data do suggest that Simulation Type is the most significant factor in change in competency change for Impact and Influence (Figure 4) and a significant factor, along with gender (particularly Female) for change in Achievement Orientation (Figure 5).

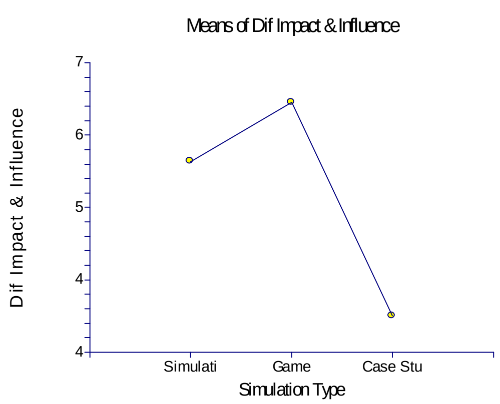

Figure 4. Means Impact & Influence by Simulation Type

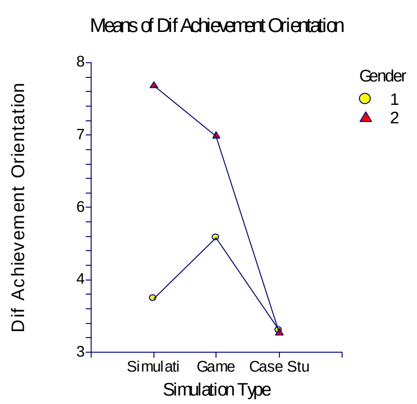

Figure 5. Achievement Orientation by Simulation Type and Gender

The data on Learning Style Preference do suggest difference in enjoyment and usefulness. Selecting only to compare Convergent Learners against other preferences across all factors of enjoyment and usefulness show significant differences in Enjoyment and Usefulness of the Simulation/Case, which after Kolb, we would expect to be the situation (Table 8).

Table 8. Convergent and Other LSI Preferences

Reaction	Convergent or Other LSI	Std Error	Probability	Power at 5%
Enjoy Simulation	Convergent	0.1834	**0.0112**	0.7261
Useful Simulation	Convergent	0.1827	**0.0447**	0.5214

The charts, Figure 6 & 7 above show that there is little difference in enjoyment and usefulness between the Simulation and Game, and lower ratings for Case Study by both Convergent and other Learning Style preferences.

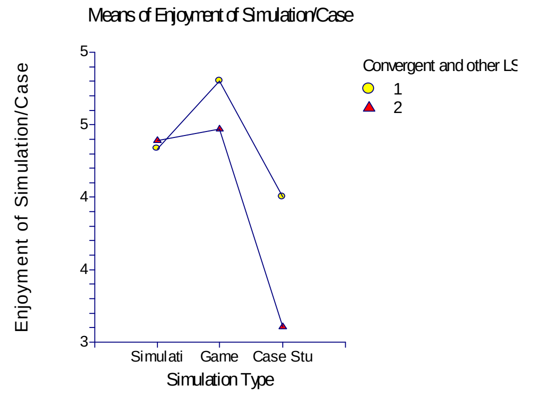

Figure 6. Chart Simulation enjoyment Convergent vs other LSI

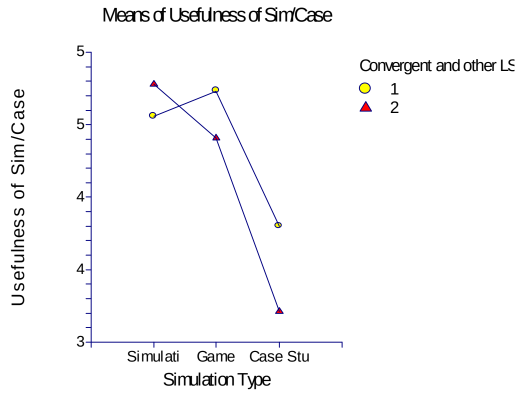

Figure 7. Chart Simulation usefulness Convergent vs other LSI

Significant differences have been found for age and position by simulation type, suggesting that younger managers do have a higher rating fro enjoyment and usefulness of the simulation or game. Interestingly, older senior managers (over 40) significantly preferred the simulation to the game. However, the sample size of under 30's and over 40's is too small at this stage of the research to be definitive.

CONCLUSIONS

Whilst this study is research in progress, it appears to indicate that there are differences between management development programmes using a management simulation, a management game and case studies. All programmes impacted behaviour change and learning and there are strong indications that the choice of simulation, game or case study does make a difference to the extent of the impact. There is little substantive difference between the management simulation and the management game though both show greater positive behaviour change and greater learning than the case study group.

The study overcomes many of the noted drawbacks of previous research with a rigorous research design within the realities of operating in the real business world. The use of a well-tested competency instrument to assess behaviour change on a 180° basis provides sufficient objectivity(Wimer, 2002) without being overly burdensome to both the participants, the client organisation and the researchers. However, the Kolb LSI, the subject of much criticism (Lamb and Certo, 1978, Freedman and Stumpf, 1980) yet widely used (Hunsaker, 1981) as a self-perception instrument may not be robust enough to hypothesize that a particular learning style would enjoy and benefit more from using a simulation than other learning style preferences.

The research is on-going and it is expected that future groups will allow the researchers to analyse a sufficient spread of data, particularly with younger managers to establish if there is a trend as suggested by Aldrich (2002) that younger managers prefer and benefit more from computer-based, immersive technology-based training methods.

BIBLIOGRAPHY

ALDRICH, C. (2002) *A Field Guide to Educational Simulations,* Alexandria, VA., American Society for Training & Development.

ANDERSON, P. H. & LAWTON, L. (1997) Demonstrating the Learning Effectiveness of Simulations: Where We are and Where We Need to Go. *Developments in Business Simulation & Experiential Exercises.*

ARGYRIS, C. (1980) Some Limitations of the Case Method: Experiences in a Management Development Program. *Academy of Management Review,* 5**,** 291-298.

BLIGH, D. (1971) *What's the Use of Lectures?* Harmondsworth, Penguin.

BRENENSTUHL, D. C. & CATALANELLO, R. F. (1977) An Analysis of the Impact upon the Learning Effectiveness of Traditional Instruction, Simulation, Gaming and Experiential Teaching Methodologies: An Experimental Design. *Computer Simulation and Learning Theory,* 3**,** 463-473.

BURGOYNE, J. & COOPER, C. L. (1975) Evaluation Methodology. *Journal of Occupational Psychology,* 48**,** 53-62.

BUTLER, R. J., MARKULIS, P. M. & STRANG, D. R. (1988) Where Are We? An Analysis of the Methods and Focus of the Research on Simulation Gaming. *Simulation & Games,* 19**,** 3-26.

BYRNE, E. T. & WOLFE, D. E. (1974) The Design, Conduct and Evaluation of a Computerized Management Game as a Form of Experiential Learning. *Simulations, Gaming and Experiential Learning Techniques,* 1**,** 22-30.

CALLANHAN, M. R. (1999) *Simulation and Role Play,* Alexandria, VA., American Society for Training & Development.

CERTO, S. C. (1976) The Experiential Exercise Situation: A Comment on Instructional Role and Pedagogy Evaluation. *Academy of Management Review,* 1**,** 113-116.

EASTERBY-SMITH, M. (1994) *Evaluating Management Development, Training and Education,* Aldershot, Gower.

EASTERBY-SMITH, M. & ASHTON, D. J. L. (1975) Using Repertory Grid Technique to Evaluate Management Training. *Personnel Review,* 4**,** 15-21.

EASTERBY-SMITH, M. & THORPE, R. (1997) Research Traditions in Management Learning. IN BURGOYNE, J. & REYNOLDS, M. (Eds.) *Management Learning: Integrating Perspectives in Theory and Practice.* London, Sage Publications Ltd.

EASTERBY-SMITH, M., THORPE, R. & LOWE, A. (1991) Management Research: An Introduction. London, Sage.

FEINSTEIN, A. H. & CANNON, H. M. (2001) Fidelity, verifiability, and validity of simulation: constructs for evaluation. *Working Paper.* Detroit, Wayne State University.

FEINSTEIN, A. H. & CANNON, H. M. (2002) Constructs of Simulation Evaluation. *Simulation and Gaming,* 33**,** 425,440.

FEINSTEIN, A. H., MANN, S. & CORSUN, D. L. (2002) Charting the experiential territory: clarifying definitions and uses of computer simulation, games, and role play. *The Journal of Management Development,* 21**,** 732-744.

FREEDMAN, R. D. & STUMPF, S. A. (1980) Learning style theory: less than meets the eye. *Academy of Management Review,* 5**,** 445-447.

GARRIS, R., AHLERS, R. & DRISKELL, J. E. (2002) Games, motivation, and learning: a research and practice model. *Simulation & Gaming,* 33**,** 441-467.

GIBBS, G. (1988) *Learning by Doing: a guide to teaching and learning methods,* London, Kogan Page.

GOSEN, J. & WASHBUSH, J. (2004) A review of scholarship on assessing experiential learning effectiveness. *Simulation & Gaming,* 35**,** 270-293.

GOSENPUD, J. (Ed.) (1990) *Evaluation of Experiential Learning,* London, Kogan Page.

GREDLER, M. E. (1996) Educational Games and Simulations: A Technology in search of a (Research) Paradigm. IN JONASSEN, D. H. (Ed.) *Handbook of Research for Educational Communications and Technology.* New York, Simon & Schuster Macmillan.

HAMBLIN, A. C. (1974) *Evaluation and Control of Training,* Maidenhead, McGraw Hill.

HAYS, R. T. & SINGER, M. J. (1989) *Simulation fidelity in training systems design: Bridging the gap between reality and training.,* New York, Springer-Verlag.

HIGGS, M. & ROWLAND, D. (2001) Developing change leaders: Assessing the impact of a development programme. *Journal of Change Management,* 2**,** 47-64.

HUNSAKER, J. S. (1981) The experiential learning model and the learning style inventory: an assessment of current findings. *Journal of Experiential Learning and Simulation,* 2**,** 145-152.

KAUFMAN, F. L. (1976) An empirical study of the usefulness of a computer-based business game. *Journal of Educational Data Processing,* 13**,** 13-22.

KENWORTHY, J. M. (2003) Evaluating management Development. *Henley Working Paper Series.* Henley-on-Thames, Henley Management College.

KEYS, J. B. (1977) The management of learning grid for management development. *Academy of Management Review,* 2**,** 289-297.

KEYS, J. B., WELLS, R. A. & EDGE, A. G. (1994) The multinational management game: a simuworld. *The Journal of Management Development,* 13**,** 26-37.

KEYS, J. B. & WOLFE, J. (1990) The role of management games and simulations in education and research. *Journal of Management,* 16**,** 307-336.

KIRKPATRICK, D. (1959/60) Techniques for evaluating training programs: Parts 1 to 4. *Journal of the American Society for Training and Development,* November, December, January and February.

KIRKPATRICK, D. L. (1994) *Evaluating Training Programs: The Four Levels,* San Francisco, Berret-Koehler.

KOLB, D. A. (1984) *Experiential Learning: Experience as a source of learning and development,* Englewood Cliffs, NJ, Prentice Hall.

KOLB, D. A. (1999) *Learning Style Inventory,* HayGroup.

LAMB, S. W. & CERTO, S. C. (1978) The Learning Style Inventory (LSI) and instrument bias. *Academy of Management Proceedings***,** 28-33.

LUNDY, J. (2003) E-learning simulation: putting knowledge to work. *Gartner U.S. Symposium/Itxpo.*

LUTHANS, F., ROSENKRANTZ, S. A. & HENNESSEY, H. W. (1985) What do successful managers really do? An observation study of managerial activities. *The Journal of Applied Behavioural Science,* 21**,** 255-70.

MAY, T. (1993) *Social Research: Issues, Methods and Process,* Buckingham, Open University Press.

MCBER (1997) *Managerial Competency Questionnaire,* London, TRG Hay/McBer.

MCKENNEY, J. L. (1962) An Evaluation of Business Game in an MBA Curriculum. *Journal of Business,* 35**,** 278-286.

MCKENNEY, J. L. (1963) An Evaluation of a Decision Simulation as a Learning Environment. *Management Technology,* 3**,** 56-67.

MCKENNEY, J. L. (1967) *Simulation Gaming for Management Development,* Boston, MA., The Division of Business, Harvard College.

MILES, W. G., BIGGS, W. D. & SCHUBERT, J. N. (1986) Students Perceptions of Skill Acquisition Through Cases and a General Management Simulation: A Comparison. *Simulation & Games,* 17**,** 7-24.

MITCHELL, R. C. (2004) Combining Cases and Computer Simulations in Strategic Management Courses. *Journal of Education for Business,* 79**,** 198-204.

MORSE, K. (2001) Assessing the Efficacy of Experiential Learning in a Multicultural Environment. *Developments in Business Simulation & Experiential Learning,* 28**,** 153-159.

PARTRIDGE, S. E. & SCULLY, D. (1979) Cases Versus Gaming. *Management Education and Development,* 10**,** 172-180.

RAIA, A. P. (1966) A Study of the Educational Value of Management Games. *Journal of Business,* 39**,** 339-352.

REMENYI, D., WILLIAMS, B., MONEY, A. & SWARTZ, E. (1998) *Doing Research in Business and Management,* London, Sage Publishing.

ROBOTHAM, D. & JUBB, R. (1996) Competences: Measuring the Unmeasurable. *Management Development Review,* 9**,** 25-29.

ROMME, A. G. L. (2003) Learning Outcomes of Microworlds for Management Education. *Management Learning,* 34**,** 51-61.

ROSS, S. & MORRISON, G. R. (2003) Experimental Research Methods. IN JONASSEN, D. H. (Ed.) *Handbook of Research Methods in Educational Communications and Technologies.* Second ed., AECT.

RUSS-EFT, D. & PRESKILL, H. (2001) *Evaluation in Organizations*

A Systematic Approach to Enhancing Learning, Performance, and Change, Cambridge, MA., Perseus Publishing.

SALES, E. & CANNON-BOWERS, J. A. (2001) The Science of Training: A Decade of Progress. *Annual Review of Psychology,* 52**,** 471-499.

SPENCER, L. M. & SPENCER, S. (1993) *Competence at Work: Models for Superior Performance,* New York, John Wiley & Sons.

WARR, P. B., BIRD, M. W. & RACKHAM, N. (1970) *Evaluation of Management Training,* Aldershot, Gower.

WASHBUSH, J. & GOSEN, J. (2001) Learning in Total Enterprise Simulations. *Simulation & Gaming,* 32**,** 281-296.

WELLINGTON, W. J. & FARIA, A. J. (1992) An Investigation of the Relationship Between Team Cohesion, Player Attitude, Performance Attitude on Player Performance. *Developments in Business Simulation & Experiential Exercises,* 19**,** 184-189.

WIMER, S. (2002) The Dark Side of 360-degree. *Training & Development***,** 37-42.

WOLFE, J. (Ed.) (1990) *The Evaluation of Computer-based Business Games: Methodology, Findings, and Future Needs,* USA, Association for Business Simulation and Experiential Learning (ABSEL).

WOLFE, J. & CROOKALL, D. (1998) Developing a Scientific Knowledge of Simulation/Gaming. *Simulation & Gaming,* 29**,** 7-19.

WOLFE, J. & GUTH, G. (1975) The Case Approach vs. Gaming in Evaluation. *Journal of Business,* 48**,** 349-364.