Chapter 2: Learning and Simulation

Contents

Introduction

I cannot remember any time at school or at one of the UK's best universities when I was taught about learning. I regularly ask people when or if they were taught about learning and how to learn and the usual response is never. Because of this, here I explore several basic learning theories that I have found are relevant to the design and use of business simulations thus:

- **Experiential Learning Cycle (Kolb)**
- **Adult Learning (Knowles)**
- **Bloom's Taxonomy of Cognitive Learning**
- **Cognitive Load Theory**
- **The Learning Ladder**
- **Categories of Learning Investment**
- **Team Learning**
- **Tutor Managed Learning**
- **Teaching Methods and Retention**

Then this chapter compares classroom-based with Internet-based E-learning and finally explores the reasons why companies use business simulations.

Experiential Learning Cycle

Fundamental to the learning process associated with business simulations is the Experiential Learning Cycle (Kolb, 1984)

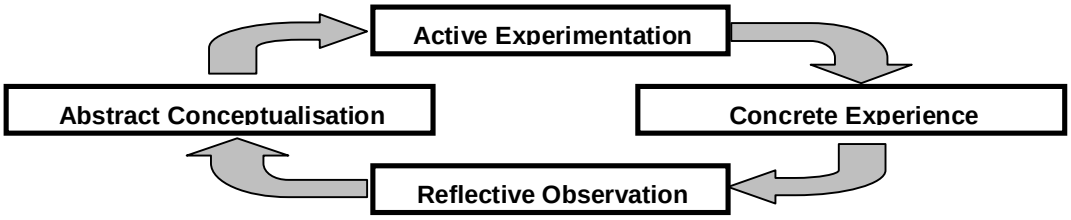
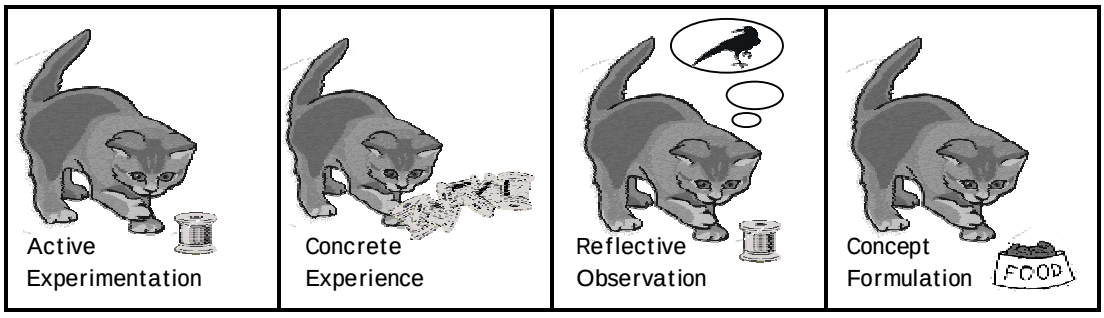


Figure 2.01: Kolb's Experiential Learning Cycle



Cartoon 2.01: Experiential Learning Cycle

Experiential Learning Cycle and Simulation

The Experiential Learning Cycle maps directly to the way the simulation cycles through decision-making, simulation, analysing results and replanning (Figure 2.02).

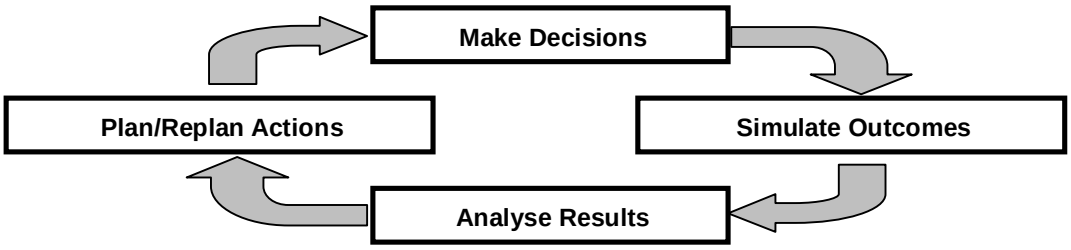


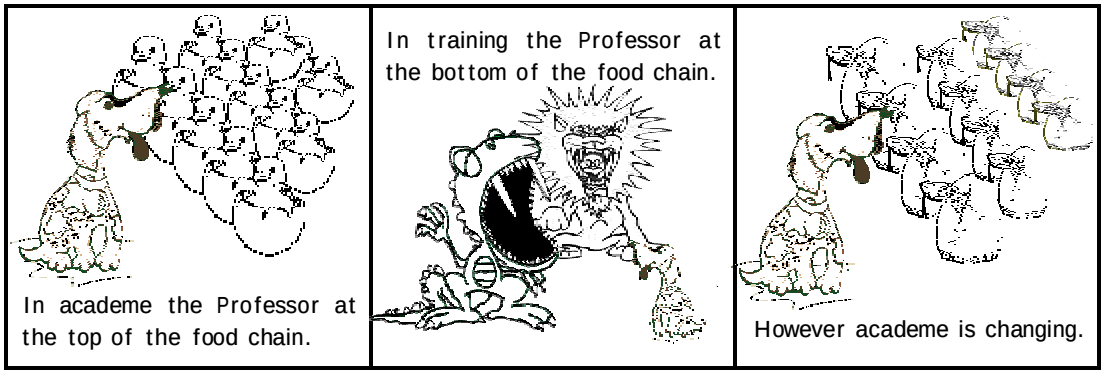
Figure 2.02: The simulation cycle

Adult Learning

Knowles et al (1998) and others recognise that adult learning needs (andragogic learning) differ from academic education (pedagogic teaching). Knowles articulated adult learning principles (Figure 2.03) that are especially relevant to business simulation use.

1. **Need to Know**
2. **Self-Concept**
3. **Prior Experience**
4. **Readiness to Learn**
5. **Orientation**
6. **Motivation**

Figure 2.03: Adult Learning Principles



Cartoon 2.02: Pedagogy v Andragogy

Need to Know

The adult learner needs to know why he or she should learn, what they are learning and how they will be learning. In school or university learning focuses on *what* is learned (content). For the adult learner this extends to and is overshadowed by the reason for learning (*why)* and the learning process (*how).* The **why** means that the learning must be relevant to the learner. As simulation places the learner in the position of working on a *"real"* business problem relevance is ensured as there is a direct link to business. Further, the **how** means that the learning process is important and as the learner must link the learning (*what)* to its relevance (*why)* this process should be self-directing, allow time for reflection and ensure deep cognitive processing. Again these are the characteristics of business simulations.

Self-Concept

The adult learner is used in his or her day-to-day life to be autonomous and self-directing. They are well past childhood when they were *looked after* by their parents or *looked up* to their teachers! In school and to an extent university, the student is in the position of subservience and fear of failing. Student sees themselves in the context of their parents rather than as individuals. In contrast the adult learner seems herself or himself as an autonomous, self-directing being. Thus at school or university the pupil sees the teacher as a font of knowledge and accepts the relevance of the instruction. In contrast, the adult businessperson, especially the experienced manager, is willing to challenge the trainer and demand that the teaching is relevant.

Prior Experience

Besides business knowledge, the adult learner will have business experience that moderates their learning and they expect this experience to be recognised and used as a resource. Where business people are learning in small groups the diversity of their experience and prior learning is a rich learning resource. The need for learners to argue and negotiate their contribution to the group ensures *deep cognitive processing* and new learning is *linked to and refreshes existing mental schema.* But, experience may have been misinterpreted and create bias. It is important for the trainer to recognise the adult learner's experience and knowledge, validate this and the trainer's role becomes that of *leader* (learning manager) rather than *instructor.* For simulations this means that there must be a clear idea of prior learning and existing knowledge and experience. Further, the simulator must support and help the trainer *manage* the learning process.

Readiness to Learn

Life related developmental task: Again contrasting learning at school and university with the adult business learner suggests that the former is concerned and happy with learning to know (and pass exams). In contrast, the businessperson learning is life related. He or she learns to develop their work skills. Where the relevance of the learning is demonstrated the adult learners are motivated to learn. (With simulation this is often demonstrated by the way course members work into the early hours.)

Orientation
Problem centred and contextual: Because the adult learner learns to aid his or her work and problem centred activities demonstrate the relevance of the learning, adult learners find these motivational.

Motivation
Intrinsic value and personal payoff: Anyone who has seen business people working into the early hours will not be surprised that adults are motivated to learn - provided that is that they see the relevance, have found the learning process engaging and productive The learning process should be self-directing and provide regular feedback on success. And if the feedback indicates failure there must be ways to overcome this.

The differences between the academic learner and the business learner suggest that simulations designed for academic use may not provide effective and efficient learning when training businesspeople on short courses (Hall, 1995a).

Bloom's Learning Taxonomy
Often I have found that people assume that learning is only concerned with gaining (factual) knowledge and no account is given to the fact that there is a learning hierarchy. Bloom (1956) and more recently Anderson et al (2001) suggest a taxonomy of cognitive learning (Bloom's Taxonomy) that represent a hierarchy of learning (Figure 2.04).

Level	Explanation	Example	Simulation
Knowledge	Recall or recognise information	Identify marketing mix components	Reinforce prior learning
Comprehension	Understand meaning	Explain each marketing mix component	Review current learning
Application	Use or apply knowledge	Determine breakeven	Determine what learning is appropriate
Analysis	Interpret knowledge	Identify a marketing problem	Use learning to find needs
Synthesis	Develop new structures	Suggest solutions to the marketing problem	Use learning to find possible solutions
Evaluation	Assess concepts	Recommend the best solution	Make decisions and implement solution

Figure 2.04: Bloom's Taxonomy of the Cognitive Domain

The examples are from Whiteley (2006) and he differentiates between lower-ordered learning (knowledge, comprehension and application) and higher-ordered learning (analysis, synthesis and evaluation). He suggests that *"higher-ordered learning is much more difficult to achieve than lower-ordered learning, since higher-ordered learning reflects critical thinking"* and that higher-order learning is delivered by business simulations.

Electronic Learning Tools and Bloom
Miller et al (2010) linked a range of electronic learning tools to Bloom's taxonomy (Figure 2.05).

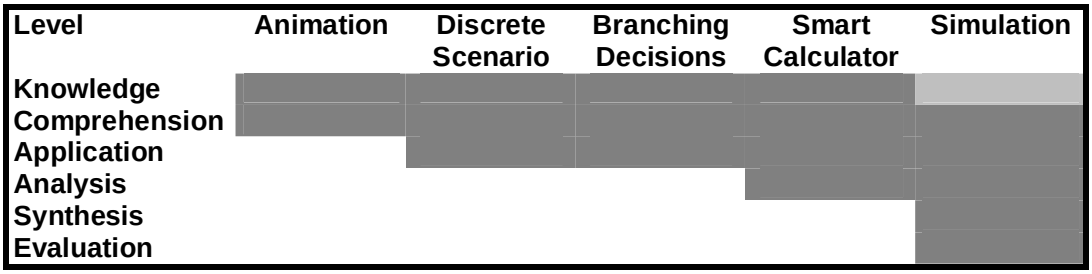


Figure 2.05: Tools Appropriate for Bloom's Taxonomy Stages

Miller et al describe animation as a graphic story using Flash or PowerPoint™, Discrete Scenarios as consisting primarily of multiple choice questions to test recall, Branching Decisions are based on Decision Trees and Smart Calculators are basically *What-if* Models. They argue that animation, discrete scenarios, branching decisions and smart calculators are not true simulations but I feel that the last two (Branching Decisions (Decision Tree Simulations) and Smart Calculators (Planning Simulations) are arguably simulations and can extend learning into the higher learning areas of Blooms Taxonomy. They classify Deterministic and Monte Carlo (Probabilistic) simulations separately but as discussed later in Chapter 5 (Drafting the Simulation) I see Probabilistic Simulations as only appropriate in limited circumstances. I do not feel that business simulations are appropriate for developing *new* knowledge. Rather they refresh prior learning and so the knowledge level is shown in a lighter shade of grey.

I believe that the role of simulation is to *reinforce* lower-ordered learning and it's *strength* is in delivering higher-ordered learning. But this may require *team learning* and *tutor-managed* learning.

Selecting the appropriate method

Finally, beyond using simulation, it is important to consider what parts of Bloom's Taxonomy are required for the learning and from this decide the most appropriate instructional method or medium – a process shown in figure 2.06.

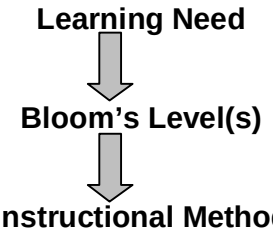


Figure 2.06: Selection of Instructional Method

Cognitive Load Theory

My experience actually using business simulations in the classroom has illustrated the need to design taking into account cognitive load. Chapter 4: Design for Process explores this in the context of simulations and Chapters 3 and 6 explore ways to reduce cognitive load and focus it on learning. Here I review some basic aspects of cognitive load theory looking at

- **Human Cognitive Architecture**
- **Types of Cognitive Load**

Human Cognitive Architecture

The human cognitive architecture can be seen as consisting of two parts – working memory where learning is processed and long-term memory where learning is embedded.

Long-Term Memory and Schema

Learning can be seen as changing and adding to the *schema* in long-term memory. Schema are domain-specific knowledge structures (van Merrienboer and Ayres, 2005) and this has implications in terms of prior learning for simulation design in terms of linking the simulation to prior learning appropriately and testing the authenticity of prior learning. I remember once when running my Market Strategy planning simulation with a group of recently graduated accountants, one asked *"Why do you measure both IRR and NPV – they are both the same".* A remark that is the same as saying that black is the same as white because they are both colours. Instead of telling the accountant that he was wrong, I let the simulation show that he misunderstood the measures of discounted cash flow!

Long-term memory can be viewed as essentially unlimited (Artingo, 2008).

Working Memory

Working Memory provides the link between the external world and long-term memory (where the learning is embedded). Unfortunately, working memory is a bottleneck and has limited capacity. Miller (1956) suggests an ability to process seven plus or minus two items simultaneously. Further, working memory needs to be refreshed (rehearsed) every 15 to 30 seconds (Driscoll, 2005). In the context of business simulation design this has major implications in terms managing the cognitive load during the simulation – issues that I address in Chapter 3 in terms of *simplification* and decision and result *granularity*, in Chapter 4 in terms of the *workload dynamic* and in Chapter 6 in terms of *learning waste* and *leanness.* Additionally by providing printed results the design facilitates refreshing working memory in a way that is not possible with purely screen based output.

Types of Cognitive Load

An understanding of cognitive load is key to deciding what to include in the simulation and the amount of time required for learning to be ensured.

Intrinsic Cognitive Load

This relates to the number of items that must be processed simultaneously in working memory that are directly provided by the learning activity and schema construction. Sweller (1993) described *"Intrinsic cognitive load is the mental work imposed by the basic characteristics of the information".* In the context of business simulation design, intrinsic cognitive load is the load imposed by the simulation model, decisions and results that focus on and address learning objectives.

Extrinsic Cognitive Load

This is also known as ineffective cognitive load and is the load associated with working on activities that are not related to schema construction (learning) (Sweller, 1994). Specifically it is the *"load not inherent within the instruction, but is imposed by the instructional designer"* (Chandler & Sweller, 1991). In the context of business simulation design, extrinsic cognitive load can overwhelm the intrinsic cognitive load (cause confusion) and add to simulation duration (waste learners' time). Thus it is the load caused by the inclusion of irrelevant models, inappropriate decisions and results.

Germane Cognitive Load

This is also known as effective cognitive load and is cognitive capacity remaining after taking into account intrinsic and extrinsic cognitive load that can be directed towards schema acquisition (Sweller et al., 1998). In the context of business simulation design and experiential learning, this is the capacity available for reflection and concept formulation. (In contrast, intrinsic and extrinsic cognitive load can be seen as the load associated with active experimentation and concrete experience.)

Teaching Methods and Retention

With continuous pressure to reduce the amount of time spent on training there is a desire to run the shortest courses possible. And this involves considering the trade-offs between learning effectiveness and efficiency. One aspect of this is the relationship between learning method and the amount of retention (Figure 2.07)

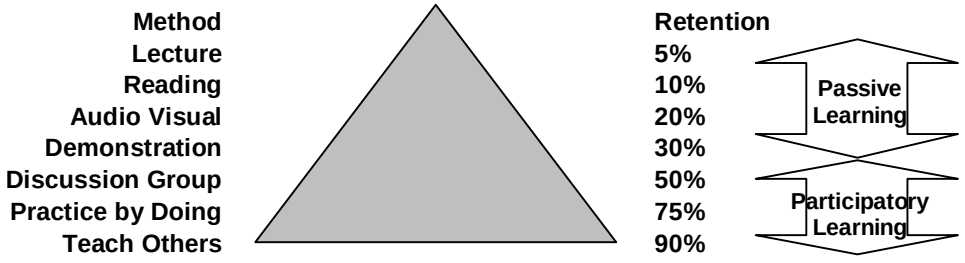


Figure 2.07: The Learning Pyramid

The Learning Pyramid (Mororola University, 1996) shows that Practice by Doing (the method employed through simulation) is *fifteen times* more effective than the lecture. In the context of Kolb's Experiential Learning Cycle this may be because during a lecture it is difficult to reflect. And, if the simulation's learners are working in small teams (see Team Learning later) with diverse business experience and knowledge, then the team members will spend time teaching each other and this will increase retention further.

When choosing an appropriate training method it is advisable to consider the type of learning (Bloom's Taxonomy) and differentiate between the efficient use of trainer's time and the efficient use of learners' time (a lecture to 200 students is efficient use of trainer's time but not of learners' time).

From knowledge through simulated experience to wisdom

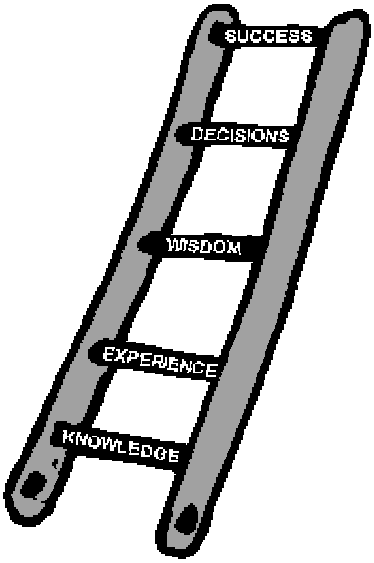
This, my firm's tag line, summarises what I feel is the purpose of business simulations – to build and hone business wisdom.

Why wisdom rather than knowledge? Most importantly because business is not *black and white* nor is it *grey.* Rather I see it as speckled, shimmering and ever changing. Why this rather fanciful description? We live in a world that has been changing, is changing and will continue to change. A world where new products and new companies are appearing daily and where old products and old companies are disappearing. In 1978 I wrote an article forecasting a microcomputer on every desk (Hall, 1979). This was at the time when *none* of the major computer companies produced microcomputers (the IBM PC did not arrive until August 1981 and none of the rest of the *BUNCH* survived). From 1980 to 1983 I spoke to middle and senior managers about the impact of technology (Hall, 1980) on a regular basis. And, one question I asked was *"when will you have a microcomputer on your desk".* The universal reply was *"never, we have a data processing department".* Consider too home shopping (again forecast in my early 1980s presentation) – who would have thought that we would buy books anywhere but a bookshop – Amazon proved that wrong?

Leonard and Swap (2005) use the term *deep smarts* describing these *"as close as we get to wisdom. They are based on know-how more than know-what – the ability to comprehend complex, interactive relationships and make swift, expert decisions".* Thus there is a need to develop *wisdom* to enable today's and tomorrow's leaders to make the best possible decisions - the decisions that lead to individual and organisational success. How does one develop wisdom? Leonard and Swap describe several methods and suggest that *"guided experience is the most powerful method [to transfer deep smarts].* Guided experience is just what is provided by business simulations.

The Business Learning Ladder

When talking to clients about simulation and it's use to deliver learning, I believe that it is important to differentiate between the learning levels (Bloom's Taxonomy) and emphasise adult learning and business benefits. Because of this I developed a learning model that I call *The Business Learning Ladder* (Figure 2.08)



The top rung emphasises that adult learning focuses on **business success**.

The penultimate rung emphasises the need to practice and test **decision-making.**

The middle rung emphasises the need for learning to develop managerial ***wisdom.***

The second rung emphasises the need to develop **experience** in a simulated, coached and controlled way.

The bottom rung emphasises the need to explore, challenge and use **knowledge** and this is the *first* step.

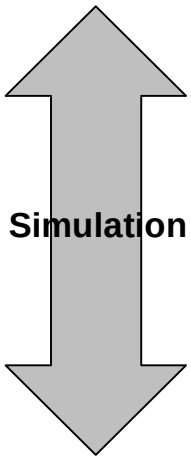
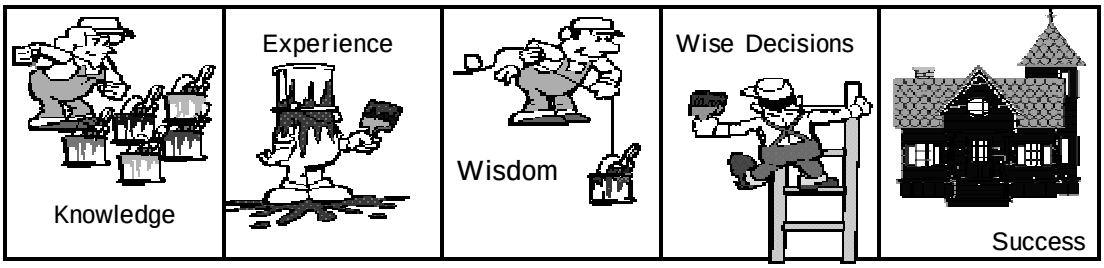


Figure 2.08: The Business Learning Ladder



Cartoon 2.03: from knowledge, through (bitter) experience to wisdom

In the cartoon, the first step to painting a house is concerned with having knowledge of the types of paint that are suitable, so one can choose the right one to paint the house. But, although a necessary starting point, this knowledge is not sufficient. When house painting, climbing the ladder carrying the paint aloft may be experiential and, perhaps, the wise painter hauls the paint up on a rope! Then one has to make decisions about how much one can paint before having to move the ladder (in turn this can add to knowledge, experience and wisdom. Finally, the job is done (successfully).

Except, perhaps, for the bottom rung, simulations provide learning at all levels of the *Business Learning Ladder* and I believe are particularly relevant to and effective for managerial development and business training.

Categories of Learning Investment

With a business background I view investment in learning in exactly the same way as I view capital investment in plant and equipment (Hall, 1996). So just as there are three categories of capital investment (operational, tactical and strategic) there are there are three categories of learning. For all of these it is possible to quantify the investment but they differ considerably in terms of the ability to predict outcomes in terms of cost saving or profit earned, their importance to the business and life.

Knowledge and Business Need	Frequency Of Use	Importance of Work	Breadth of Knowledge
OPERATIONAL	continuous	minor	narrow
TACTICAL	infrequent	needed	wide
STATEGIC	very rare	vital	very wide

Figure 2.09: Categories of Learning

Operational Training

This parallels investing in operational equipment (such a replacement machines in the factory). Here the need is known accurately and it is possible to predict the cost saving accurately. Consider buying a new printer for your office. You know approximately how many sheets of paper you print each month, whether colour is a necessity, etc. So you are in a position to compare the cost of the printer against running costs and based on this choose the best printer. The first stage of this process may be to choose between an Ink Jet printer (low capital cost, high running cost) and a Laser printer (higher capital cost, low running costs). As part of this analysis will be ease of paper handling, printing speed, resolution, automatic duplex, range of paper sizes and types. Based on this it is possible to quantify relative ROI. Operational Learning is concerned with gaining knowledge (bottom of Bloom's Taxonomy). So for example learning how to use Word Processing software will improve a person's productivity. Finally, just as the life of the capital equipment may be relatively short life, the utility of operational learning may be limited (so for example learning how to use Word 2000 was no longer relevant when Word 2007 was introduced). **Operational Training is concerned with knowing about a relatively narrowly defined subject and this leads to the possibility of measuring productivity changes and the assessment of ROI.**

Tactical Learning

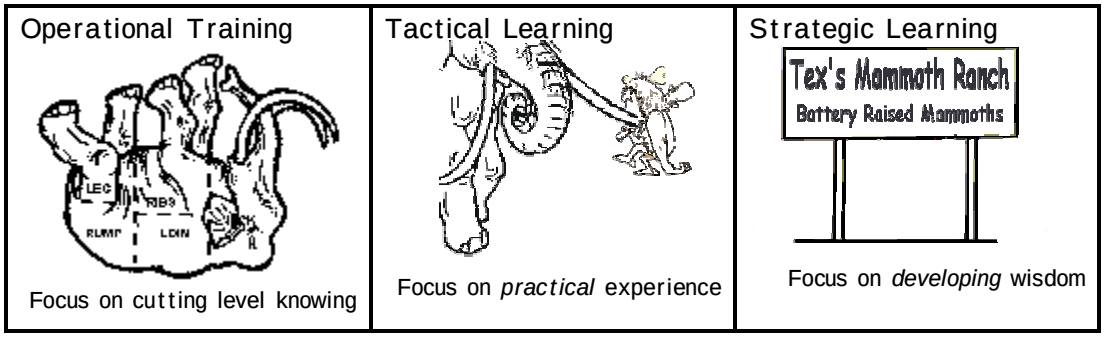
This parallels tactical investments. Here the prediction of the probable outcomes is more difficult. For example, whenever Microsoft produces a new operating system I need to check that my simulations operate on it. I have just bought a computer using Windows 7. The rational for my investment was that, even if I only used the new computer to check that my software worked with Windows 7, the cost of the new computer was less than changing the operating systems and other software on my existing computers and much less than the cost of losing business and upsetting customers because my software did not work on Windows 7 (it does). Tactical Learning is concerned with preparing people to diagnose and solve known problems. Thus it includes critical incident simulations for the emergency services, clinical simulations for the medical profession, war games for the military. Computer based versions of these simulations are likely to require a rich graphical environment with avatars etc. **Tactical Learning is primarily concerned with building practical experience – the ability to do the right thing.**

Strategic Learning

This parallels strategic investments – investments that are seen as vital for the business in the long term but where it is impossible to predict or even know the outcomes. In my business there were two such investments – the purchase of my first microcomputer in 1980 and establishing a web presence in the late 1990s. During the 1970s I ran my simulations on Computer Time-Sharing where I paid for computer use as I used it. Purchasing a microcomputer involved moving from being a high variable cost business to being a high fixed cost business and involved a significant investment. (The investment in a basic computer (with 48k RAM and two 80k Floppy Disks) was about £2000 ($3200) – equivalent to about £10,000 ($16,000) today). Provided I could run several simulations each year the investment would be just economically viable. What I had not thought about was how the purchase would allow me to extend my product range. Excluding my time, when I used Computer Timesharing it cost me about £3000 to develop a new simulation but using my own microcomputer the cost was zero. As a consequence, I moved my business from running simulations to designing simulations. In turn, this meant that at the beginning of 1983 I moved from running my business part-time to full-time. I registered the domain www.simulations.co.uk in 1997 without knowing what the benefit would be. Since then it has changed my business fundamentally both in terms of finding new clients and geographic coverage. In 1997 one hundred percent of my business was in the UK, today 85% of my business is outside the UK and virtually all my new business comes via the internet. Strategic Learning has similar characteristics. In the mid 1960s while working for GE in the USA I learnt business financial basics - knowledge that I still

use in my day-to-day business life. It is difficult perhaps impossible to forecast or even measure the ROI of strategic learning (like business acumen or leadership development, team working etc.)

Strategic Learning is concerned with building wisdom, with building learners' ability to deal with complex situations where there are no clear-cut or even known solutions – learning that has a long term impact.



Cartoon 2.04: Investment Categories and Learning

Team Learning

"Learning is enhanced when it is more like a team effort than a solo race. Good learning, like good work, is collaborative and social, not competitive and isolated. Working with others often increases involvement in learning. Sharing one's own ideas and responding to other's reactions improves thinking and deepens understanding. (Chickering and Gamson, 1987).

I believe that *effective managerial learning* involves small groups (teams) of managers sharing knowledge & experience and presenting, promoting and negotiating views. This section explores this belief - first asking why this is necessary and second by describing why team learning provides for these needs

Why is team learning needed?

Business management is not black and white

Management knowledge is not black and white. It is not even grey. Rather it is speckled and shaded with the differing patterns depending on the current situation and the perspective of the individual. So for managers, learning must be concerned with developing wisdom rather than just gaining knowledge and remembering facts. Understanding that incorporates different viewpoints and encourages *thought outside the box!*

Business management is multi-faceted and multi-functional

Today's business is holistic and the successful manager must wear many hats. He or she must understand the breadth of business across all functions - marketing, operations, finance and design. She or he must consider the effect of a decision on the customer (marketing), the process implications (operations), the financial consequences (finance) and the improvement issues (design).

Change

The world is changing not just in the context of technological change but in what is regarded as *good management.* Change that means that tomorrow's manager must continuously update and up-rate his business knowledge and be able to solve new, unforeseeable business problems.

Working in Teams

Some 40% of a manager's working time is spent working as a member of a team (Boston University). Thus learning as a member of a team allows you to develop the experience and skills associated with team working and this is a key aspect of our simulations.

What does team learning deliver?

Presenting, promoting and negotiating views

Working in a team forces participants to present, promote and negotiate their views. This is a process that forces the learner to think critically. From a cognitive psychology perspective, it forces *restructuring* of existing knowledge and the formation of new mental *schema* to organise the knowledge. This *deep processing* ensures (*rehearsal* in short-term memory (Driscoll, 2005)) ensures assimilation and retention. The Learning Pyramid (Figure 2.7) suggests that *practicing by doing* and *discussion* have retention rates of 75% and 50% respectively. And this contrasts with the *lecture* (5% retention rate) and *audio-visual* (20% retention rate).

Teaching Others

Sharing knowledge and experience while working in a team is, in effect, teaching others. Again the Learning Pyramid (Figure 2.7) suggests that this ensures a ninety percent retention rate. Thus working in a team helps *embed* the learning.

Variety of Knowledge and Experience

A typical group of business people on a business course will have different prior learning, knowledge and experience and working in a team of four or five provides a means of sharing this. And the amount and diversity of knowledge and experience contrasts with university learning (Hall, 1995a)

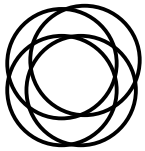
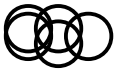
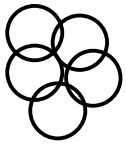
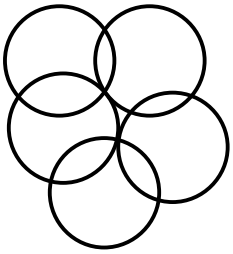
Knowledge & Experience Sets	**Knowledge Sets**	**Experience Sets**
University Business Students: For these it is reasonable to suggest that their management and business knowledge will reasonable and consistent. This is illustrated by the closely overlapping, large *knowledge sets*. However, they will have limited experience - illustrated by the overlapping, small *experience sets*.		
Adult Business Learners (Training Courses): For business people the situation is the reverse. Those who have a business qualification may have forgotten much of what they learned and for those that moved from another discipline in to management will not have management or business knowledge. This is illustrated by the small and diverse *knowledge sets*, However, in work and in life they will have gained considerable experience and this is illustrated by the large, diverse *experience sets.* As both their *knowledge* and *experience sets* are diverse this is a resource for learner centred learning and a challenge to the trainer.		

Figure 2.10: Knowledge and Experience Sets – Students and Adult Learners

Team Working and Team Building

Working as a team member helps build team-working skills. Additionally, if the team consists of fellow workers, the process helps build the team and is particularly useful in building links in a diverse organisation. If the fellow workers are from different functions or cultures, this diversity enhances learning as team members share their individual viewpoints and experiences.

Motivation

The team working process both recognises the expertise of the team members and allows them to direct the learning process. Both of these are needs of adult learners and

hence are emotionally rewarding. (In contrast, for student learners the ambiguity and uncertainty with this may be demotivating.) Managers working in a team generally see themselves as being in competition with the other teams and this motivates them (to work through coffee breaks and into the early morning in an attempt to get a lead on the others and this increases the amount of learning delivered by a course).

When designing simulations, it is important to know the depth and diversity of prior knowledge and experience, match this to the simulation and design in appropriate learner and tutoring support.

Tutor Managed Learning

At a time when e-learning is automating the lecture out of the training loop it may seem an anomaly to recommend tutor managed learning. Yet to deliver the higher levels of managerial learning the tutor plays a vital role - a role that extends beyond facilitation to that of learning management. Whiteley (2006) in the context the critical thinking required for simulation-based learning argues that *"the role of the teacher, or learning facilitator is more important"*. I believe that the tutor managed learning ensures effective and consistent learning in a learner centred and controlled environment.

Tutoring Tasks

The tasks of the tutor (Hall, 1994a) consist of:

- **Administration**
- **Facilitation**
- **Learning Management**

And, although this describes the *Tutor Managed Learning Model* in the context of computer simulation, much of this model is applicable to other learner centred learning initiatives (case-studies, tutor led discussion, role-plays etc.) It seems to me a viable role model for the traditional trainer or baby-boomer manager in this e-learning world.

Administration

For computer simulations this task has been progressively been reduced but there is still a need to keep records (for the review and to answer questions), to ensure that suitable facilities are provided (computers, team rooms, comfortable chairs etc.) and for interactive business simulations where decisions are entered into a single computer for the tutor to do this

Facilitation

The term *facilitation* is commonly used to describe the role of the trainer in active, learner centred learning situations. However, I find the blanket use of this term confusing. At one extreme there is the passively reactive tutor and at the other the proactive tutor. Here I use facilitation to describe the passively reactive work.

Here facilitation involves the trainer responding to requests for rule clarification, information about simulation results and knowledge support. Just as any *new job*, the simulation has procedures that need to be learnt and, although a well-designed simulation minimises these, some rules will need to be clarified (especially how to fill out forms clearly and legibly). Next, the business reports produced but the simulation may need explanation (such as financial terms or how results were calculated). Again a correctly designed and documented simulation will simplify this task. Finally, as the simulation progresses, the learners may realise gaps in their business knowledge (for example it may be necessary for the trainer to answer questions about pricing policy etc.)

Learning Management

With a business management background I feel that it is this task that is the most important. Like good business leadership where work is delegated to staff, simulations are student centred where the learner has the authority to make decisions and manoeuvre the learning process. But like the business leader, the tutor is still ultimately

responsible for ensuring learning. Thus, although some aspects of learning management overlap with passive and reactive facilitation, it is proactive and involves the tutor assessing team progress and then if necessary providing suitable feedback (Figure 2.11).

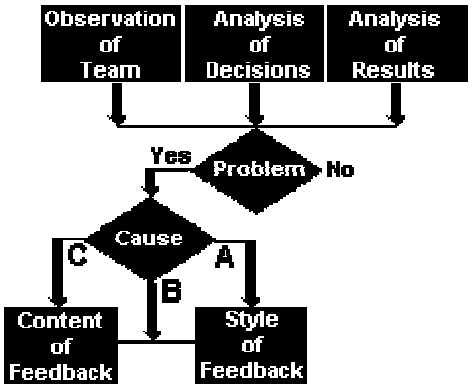


Figure 2.11: Tutor Managed Learning

Assessing Learning entails *observing teams, analysing decisions* and *results* to see if there is a problem. If a problem exists, the tutor must determine the cause. A cause due to understanding (cognition (C)) or feelings (affection (A)) or both (B). Then depending on these the tutor must decide *feedback content* and *feedback style.* For example, decisions may indicate a lack of business knowledge (cognitive problem). But, rather than telling the teams about this, the tutor should ask open questions about the problem area and encourage the team to discuss the topic drawing on their experience and knowledge.

Another example is where, at the start of the simulation, participants are feeling somewhat confused and overwhelmed (affective problem). Here they may be making sensible decisions and so the tutor should praise the team and ensure that it is "early days". Equally, later participants may feel arrogantly that they are much better than they really are. Here the tutor can take on the role of "head office" and challenge the team by asking them probing questions and requesting detailed plans. The manager of learning must *not* be prescriptive or be seen as critical and should only become involved when absolutely necessary or where a significant learning opportunity occurs.

Where learning is managed, you should incorporate a *Tutor Support System* to help the trainer identify problems and provide the information for he or she to take action. Tutor Support Systems are described in detail in later chapters.

Classroom-based vs. Internet-based E-Learning Simulations

This section discusses how Classroom Based simulations differ from E-Learning simulations delivered by the Internet and explains why I feel that for management learning, classroom based simulations are more appropriate than Internet delivered simulations.

Internet Based E-Learning

Modern hardware, colour graphics, animation, etc. allow information to be presented in an exciting and memorable fashion. Also Internet Based E-Learning software can both lead and unfalteringly assesses the student's learning (at an apprehensional level). The student interacting with the software initiates learning and ikonic learning (Sahu, 2002) takes place with the colour, interactive and graphical nature of the medium enhancing memorising. However, as discussed in the following section, active experimentation and working as an individual rather than a member of a group often mitigates against comprehension.

Classroom Based Learning

Management is complex. There are no "universal" truths, the world is turbulent and any action must balance risk and reward. The manager is continuously solving new problems. This requires deep business understanding. Classroom-based learning addresses these needs.

Because of the complexity and uncertainty of management, classroom-based simulations involve managers working in a small group. Working in a group initiates discussion and challenges individuals to justify their proposals in a way that is very difficult with Internet-

based E-Learning. In this manner apprehensive knowledge and previous comprehensions are exercised and synaptic links formed.

This process involves a conflict. The action-based concept testing and concrete experience stages can overwhelm the reflection and conceptualisation stages. Therefore the role of the computer is subordinated and the process is tutor led. Often the simulation model is accesses through the tutor. The tutor receives decision forms from the teams, enters these, simulates and returns printed results to the teams. In other simulations, participants make direct use of the software. Unfortunately, as has been commonly observed, this can change group dynamics and circumscribe reflection and conceptualisation. This problem is alleviated by the software providing printed output rather that screen-based output and through the "calibration" of the simulation. Even so the tutor must encourage participants to think and discuss and discourage too much use of the software.

Learning Purpose: Knowledge Acquisition or Wisdom Creation

Kolb describes Learning as "the Process of Creating Knowledge". To decide which delivery process (classroom or Internet) is the most appropriate we must consider what knowledge is to be created. Dewey (1938) suggests two classes of learning - apprehension and comprehension.

Apprehension involves assimilating knowledge. In management terms it involves knowing, for example, the content and difference between a Profit & Loss Account and the Balance Sheet; what makes up the "Marketing Mix" and so on. It involves building up a mental "database". This acquisition of new "factual" information is also known as cerebral learning (Bateson, 1973).

Comprehension involves organising knowledge - building the links between the mental "data base" and linking the new "data" to the existing "data base". This "transformational" learning involves a process of structuring and restructuring mental schema (Kelly, 1991). It results in a general understanding and an ability to apply the knowledge successfully. In management terms it means that the links and dynamics between management actions, the P & L account and Balance Sheet are understood so that appropriate decisions can be made.

Both these two processes are necessary and may be regarded as two steps in knowledge creation. I suggest that Internet-based E-Learning tends to focus on knowledge apprehension (assimilation) and classroom based simulations tend to focus on knowledge comprehension (understanding and application). This is assertion is supported by a survey by ASTD of experienced E-Learning professionals (*Learning Circuits - ASTD's Online Magazine All About E-Learning*) (Figure 2.12).

E-learning Content	Classroom Content
§ Short, targeted, task-driven, and episodic content	§ Longer, broad, and programmatic content
§ Content that needs frequent updating	§ Topics that require face-to-face interactions
§ Information delivery	§ Complex or new topics
§ Managing the learning process (class schedule, orientation)	§ Business problem solving
§ Performance assessments	§ Expert observation
§ IT-related topics	§ Culture building
	§ Networking

Figure 2.12: Internet-based E-Learning vs. classroom-based simulation

In the same article Tony O'Driscoll (IBM Institute for Advanced Learning) says *"Classroom situations are best for issue-based discussion. Where conceptual and applied knowledge are being leveraged to solve real or simulated business problems."*

I see **Internet-based E-learning** as a foundation that provides ***basic*** *managerial* ***knowledge*** such as basic financial, marketing, operations and people theories and definitions. Thus **it is concerned with *knowledge acquisition*** but **not** its **application.** In contrast, **Classroom-based simulation** is ***not good*** at building basic knowledge. Rather, it provides a way to ***explore, challenge & use*** *acquired* ***knowledge****.* It provides ***controlled & coached experiences*****,** it focuses on **developing *managerial wisdom*** (the ability to think through a ***real-world problem***) and provides a way of **practicing decision-making.** ***In other words, Internet-based E-learning starts the managerial learning process and computer simulation completes it.***

Why Companies use Simulation

When I won a Churchill Fellowship to study business simulation one question that I tried to answer was **"*Why do Companies use Simulation?*"** To do this I reviewed why my clients had used simulation, asked other designers and users of simulations why they used simulations and, finally, asked company trainers why they used simulations on courses. This analysis did not just cover use in the UK but extended to the rest of Europe, the USA and the Middle East. The analysis covered the use of well over two thousand simulation runs across hundreds of courses involving tens of thousands of business people.

I found that the reasons for using simulation fell into five categories (Hall, 1996) thus:

- **To Explore Knowledge and Test Understanding**
- **To Practice and Develop Skills**
- **To Motivate and Engage Learners**
- **To Assess and Evaluate Learning and Teaching**
- **To Enhancing Learning**

To Explore Knowledge and Test Understanding

The knowledge explored included:

- Strategic Management
- Tactical Management
- Management Appreciation
- Marketing Management
- Marketing Appreciation
- Financial Management
- Financial Appreciation
- Operations Management
- Application of Techniques
- Illustration of Concepts

To Practice and Develop Skills

The skills practiced included:

- Analysis & Diagnosis
- Decision Making
- Problem Solving
- Handling Ambiguity
- Handling Uncertainty
- Managing Business Dynamics
- Team Working
- Business Presentation
- Numeracy

To Motivate and Engage Learners

The motivational needs addressed included:

- Encourage Competition
- Break Down Inhibitions
- Involvement
- Engender Excitement
- Change Pace
- Emphasise Profit
- Result Focus
- Team Building
- Build Relationships
- Fulfil Adult Learning Needs

To Assess and Evaluate Learning and Teaching

These needs involved *assessing* the learners and *evaluating* the teaching thus:

Learner Assessment

- Self Assessment
- Informal Assessment
- Formal Assessment

Teaching Evaluation

- Course Needs
- Prior Learning
- Delegate Needs
- Remedial Needs

To Enhance Learning

Here simulations were chosen rather than other training methods because they help:

- Integrate Knowledge
- Assimilate (Memorise)
- Test Understanding
- Revise, Review & Reinforce
- Link Theory with Practice

they are

- Participant Centred

and provide

- Active Learning
- Clinical Practice

Appendix E (Simulation Session Check List) provides a way of recording needs in terms of this development needs model for both a simulation and *other* learning. I include *other learning* because I believe that simulations are *not* a universal solution. Rather, they need to be used in conjunction with other, perhaps prior, learning.