

# **Business Navigator**

**The Next Generation of Management Development Tools**

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# EXECUTIVE SUMMARY

Today's turbulent business environment and the increasing skepticism of the effectiveness of management education, training and development programmes offer the perfect opportunity to:

- Reassess what skills are necessary for managers and executives to be able to face the challenges of this decade and beyond.
- Stimulate a debate on "next generation" approaches to learning through the presentation of a new type of management development tool: the *Business Navigator Methods*.

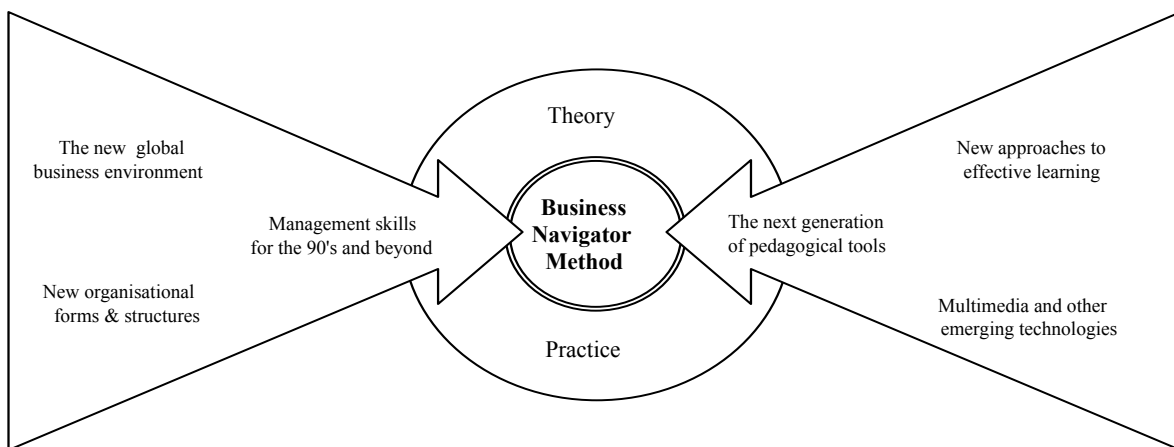


Figure 1: White Paper Overview.

In Part 1 of the paper we focus on what recent literature sources as well as academic and business experts identify as the "new set of skills" characterising effective managers and executives in the 90's (see left hand side Figure 1). It is not only the business environment that has changed during the last decade. Our perception of what makes learning effective has evolved too and the new information and communication technologies provide us with new opportunities for pedagogical development (see right hand side of Figure 1).

Given these two enabling factors, what is the next step? A new generation of pedagogical tools combining a richer form of learning with the potential of modern technology to better prepare managers for the challenges of today's and tomorrow's business environment.

The *Business Navigator Method*, introduced and discussed in Part 2 of the paper proposes a model for such a "new generation" of learning tools. A model which projects managers into a virtual business environment. A highly interactive and realistic environment in which he/she will experience the difficulties of thinking, moving, understanding and acting in the diverse, socially complex, information and knowledge-intensive, competitive and cooperative reality of today's businesses.

Is it a new generation of video games for managers? Superficially yes, but extremely sophisticated ones pursuing the precise pedagogical objectives described in this paper to provide a riskfree environment for experiential learning of key managerial skills.

The last section of Part 2 is dedicated to the practical implications and use of the *Business Navigator Method*. We discuss our initial answers to questions such as: How will we proceed in taking the method from concept to reality? What lessons have we learned from our experiences to date? How will we make the development of the computer-based tools easier? How will the method be used? and What research and challenges are ahead of us?

The methodology used in this research focused on extensive literature search and interviews with selected academic and business experts. A glossary is included for reference.

### **Acknowledgments**

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## **PART 1: EXECUTIVE DEVELOPMENT CHALLENGES FOR THE 90'S.**

### **The New Management Skills.**

The traditional management education methods in use today were developed in response to the stable and predictable business environment of the 1960's, 1970's and early 1980's. Organisations were characterised by hierarchical structures, internal focus, remuneration based on personal accomplishments, lifelong career expectations and individual competition fostered at all levels. Executive power was based on formal authority, personal information access and network, political savvy and ability to get things done through others. In simple terms, management development programmes concentrated on developing functional and analysis skills for the graduate manager through MBA type programmes and strategic and conceptual skills for the executive through short duration courses. The conventional wisdom in structuring these courses was the more experienced the manager the less realistic or voluminous the casework required. Has anything changed? Should anything change?

**The business environment has changed.** Books, magazines, journals, research, seminars, training courses and news items devoted to describing the business environment of the nineties have a number of consistent themes:

- continuing globalisation of corporations and markets (Barham and Devine, Donegan, Dotlich);
- increasing and even overwhelming volumes of information becoming accessible (Huseman and Miles, Hussey<sup>a</sup>, Meyer);
- rapid rate of change in technology innovation (Donegan, Dotlich, Keen<sup>a</sup>, Scott-Morton, Tesler);
- rising number of recent industry leaders experiencing record losses or profit decline (Byrne<sup>b</sup>, Collingwood, Gross, Schroeder);
- tendency toward economic regionalism<sup>8</sup> due to the establishment of the single European market and GATT negotiation uncertainties (Economic Focus, Hine);
- changing demographic makeup and expectations of the workforce (Donegan, Pindur et al.);
- increasing emphasis on corporate and personal social responsibilities (Barnum, Blanchard, Brown, Reynolds).

**Organisations are adjusting.** In order to respond to these environmental drivers organisations have already started to rebuild and refocus themselves after a period of rightsizing tactics (Javetski et al., Mandel and Tilsner), to undertake continuous improvement and total quality management programmes and to empower employees and stakeholders (Binney, Deming, Donegan), to experiment with more flexible internal structures (Bartlett and Ghoshal, Hedlund and Rolander, Hirschhorn and Gilmore, Tapscott and Caston) and to explore strategic alliancing and other cooperation strategies (Byrne et al., Malone and Rockart).

These responses are resulting in changes to organisational form, policy and process. Tapscott and Caston capture the essence of these changes in their comparison between closed hierarchy and open networked organisations illustrated in Table 1.

	Closed Hierarchy		Open Networked Organisation
Structure	Hierarchical	----->	Networked
Scope	Internal/closed	----->	External/open
Resource focus	Capital	----->	Human, information
State	Static, stable	----->	Dynamic, changing
Personnel/focus	Managers	----->	Professionals
Key drivers	Reward and punishment	----->	Commitment
Direction	Management Commands	----->	Self-management
Basis of action	Control	----->	Empowerment to act
Individual motivation	Satisfy superiors	----->	Achieve team goals
Learning	Specific skills	----->	Broader competencies
Basis for compensation	Position in hierarchy	----->	Accomplishment, competence level
Relationships	Competitive (my turf)	----->	Cooperative (our challenge)
Employee attitude	Detachment (It's my job)	----->	Identification (It's my company)
Dominant requirements	Sound management	----->	Leadership

Table 1: The various dimensions of an open networked organisation are compared with its predecessor, a closed hierarchical organisation.

**The new skills necessary to manage in the turbulent nineties are evolving.** There is general consensus that executives need to increase the breadth and depth of their skill base in order to be effective in the business environment and organisations of the nineties. Representative of current thought on what this skillset is are Meyer's<sup>1</sup> comments that a manager must be able to:

- operate internationally across continents and have a good understanding of cultural differences;
- select essential data, interpret signals, determine clear objectives and act rapidly, often on the basis of excessive though incomplete information;
- be flexible and adopt continuous learning as a philosophy of life;
- get things done WITH others.

Meyer's view of which abilities will be crucial for executive effectiveness is strongly supported by leading management academics and survey research alike:

The literature abounds with quotes of '**Think Global Act Local**' and creative rewording of the theme (Barham and Devine, Barnum, Neale and Mindel, Noel and Charan, Mann and Staudenmier, Rhinesmith). The adoption of a global mindset means increasing managers' skills in handling complexity and uncertainty and developing cross-cultural sensitivity. This is in addition to gaining a sound understanding of international principles, practices and tools and industry dynamics. Bartlett and Ghoshal expand the concept of a global manager to a network of specialists when discussing the transnational organisation. Four types of executives must work together, the Business Manager, the Country Manager, the Functional Manager and the Corporate Manager who leads, identifies, develops and negotiates between the previous three. Key skills within each of these roles is the ability to analyse, synthesise and persuade within a global, country and functional perspective, select the appropriate approach or tool for the variety of decisions they make, use proprietary and environmental information as a competitive corporate asset, and cooperate with each other.

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<sup>1</sup> President Europe, Philips Electronics N.V. Comments adapted from the opening address given to the incoming 1993 INSEAD MBA promotion.

**Leveraging the information and intellectual capital** of an organisation is considered critical by many advocates (Dotlich, Hussey<sup>a</sup>, Huseman and Miles, Keen<sup>a</sup>, Northwestern, Prahalad and Doz). Key drivers shaping the focus on information and knowledge as corporate assets are the exponential increase in capacity to store information, with storage capabilities doubling every 18 months (Markoff) and the exponential decrease in the cost of computing, halving every three years (Tesler). The combination of being overwhelmed by the amount of information available and unable to grasp and exploit the advances being made in computing and communication technologies is a problem for the majority of executives and companies today. Taking the perspective that information is a resource to be utilised on a cost effective basis, in order to achieve corporate goals, executives need to develop skills and processes which enable them to select, analyse, interpret and communicate information faster than their competitors in what is becoming a single worldwide information network.

The cry for organisations and individuals to **adopt a continuous learning philosophy** has extensive support (Binney, Cohen, Deming, Donegan, Dotlich, Mann and Staudenmier, Rhinesmith, Senge). If this is a true paradigm shift the effects will be far-reaching, calling for completely new education infrastructures worldwide which support and stimulate lifelong learning processes. Although this would be an interesting debate to pursue, the focus of this paper is on more immediate personal and organisational impacts of adopting a continuous learning philosophy. At a personal level this implies a need to 'know thyself better', to continually challenge and adjust mental models (Senge) through action and critical reflection processes (Argyris<sup>a</sup>). From a corporate perspective it is necessary to institutionalise these practices, adopt a system thinking approach to understanding complexity, focus on team rather than individual performance and create a safe, open environment in which team members can learn with and from each other. From a training perspective, the key to putting this philosophy into practice is to understand the interrelationships between course content and delivery methods and the impact they have on how we learn so that the most effective approach is used for each learning experience.

The move to **work WITH rather than through others** continues to gain support whether as the employee empowerment movement, participative management, team based effectiveness, quality circle approach or strategic alliancing. (Binney,

Brown, Byrne et al., Deming, Donegan, Pindur et al.). A fundamental in moving from conceptual agreement of working with others to its implementation is for executives to understand the dynamics of teamwork/groups - the value added - and the interdependent structures and processes which aid or detract from its effectiveness. The combination of global business operations, strategic networking, information sharing and workplace teamwork has put unprecedented pressure on the need for executives to develop coordination (Malone and Rockart) and communication skills and processes. Given the distributed nature (geographic spread) of global corporations this cooperative approach also means that managers must learn to manage and interact with advanced computer and communication technology.

In summary, the business environment will continue to be turbulent - as Heraclitus, the Greek philosopher is reported to have said "the only constant is change". The new model of the business world is complex, paradoxical and characterised by unpredictability, uncertainty, flexible structures, information overload and cooperation. We have found that the mix of skills and competencies needed by executives in this environment has been defined at a high level of abstraction. To be successful an executive needs to develop the capabilities to nurture a global mindset that is balanced with regional awareness and cultural sensitivity, leverage the information and intellectual capital of resources available both internal and external to the organisation, embark on a lifelong learning journey, and thrive in a networked organisation which values teamwork and cooperation and empowers all personnel towards self-management.

Are business school courses, management development programmes and company's internal training meeting these needs?

### **The Next Generation of Pedagogical Tools.**

Much debate has been generated about the effectiveness of current approaches to management education, training and development (the three of which we use synonymously throughout the paper). This debate has led researchers and management practitioners to raise interesting and provocative questions including:

- Do the current pedagogical tools support an optimal learning experience? (McMahon, O'Reilly, Turner);

- Do companies know what they get for their management development dollar? (Conant);
- If business schools are doing so well, why are American companies doing so badly? (Byrne<sup>a</sup>).
- Is the traditional MBA model doomed? (Linder and Smith<sup>a,b</sup>);

Each of the questions above clearly deserves an extended study in its own right but for our purposes the signals from their diversity and significance are obvious. In order to develop managers who can transform themselves and their organisations during this decade and beyond, management education and its approaches also need to undergo substantial change.

This transformation of management development has commenced. There is a concerted effort underway by management practitioners and academics alike to push forward their thinking and experiences in the fields of teaching pedagogy, learning, cognitive science, management science, decision making, organisational behaviour, artificial intelligence<sup>s</sup>, human-computer interaction and the integration of information and communication technologies in order to meet the business challenges.

We have identified two key advances that are enabling the next generation of pedagogical tools to be developed: 1) the push to better understand the nature of learning processes and the effectiveness of current tools and 2) the potential for leveraging emerging technologies such as multimedia<sup>s</sup> and virtual reality<sup>s</sup>. The following two sections provide an overview of relevant research and developments in these fields, in order to better understand the conceptual basis of the Business Navigator Method presented in Part 2.

### **Understanding the learning process**

Critical to the issue of developing executives is understanding how people learn and applying those principles when defining the structure, content and delivery of training packages. Experiential learning, action learning or learning by doing are all based on the premise that learning is enhanced through having realistic experiences when compared to the more passive absorption of material through listening and reading. Education which only provides the learner with a conceptual understanding of the topics or issues is not enough for the business

world. The key is in being able to learn from experiences as they are gained and to put concepts, models and theories into context and into practice on a continual basis.

The Experiential Learning Model (Kolb et al.) provides a sound theoretical background for the development of learning programmes (Ronchetto et al.). It offers a simple four stage model of the learning process encompassing experience, reflection, conceptualisation and experimentation (see Figure 2). This model has been successfully used in developing the structure of courses.

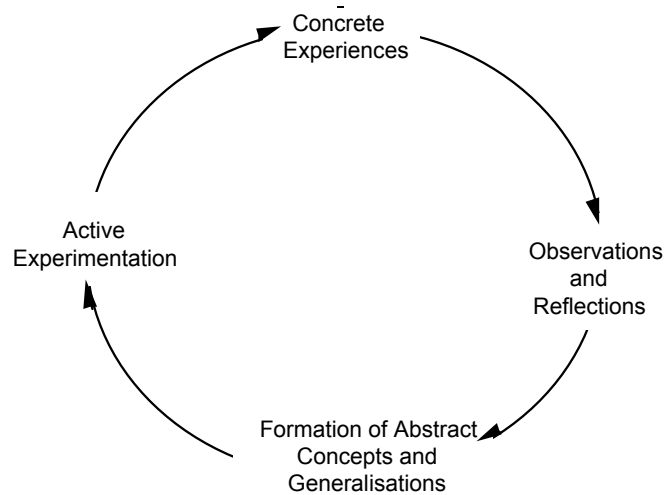


Figure 2: The Four Stage Experiential Learning Model developed by Kolb.

A common theme in articles on learning is the reminder that reflection, that is the second phase of Kolb's model, is often underestimated (Argyris<sup>a</sup>, Bowen, Lederman, Keys and Wolfe<sup>b</sup>, Senge and Serman). Research in this field has demonstrated that adequate reflection and processing time must be factored into the teaching process in order to allow participants to generate a clear cognitive map for understanding their experiences (Bowen, Thatcher).

A second important aspect discussed in recent articles is the customisation of training material to individual learning style. The Learning Styles Inventory (LSI) questionnaire has been successfully used to identify preferred learning styles, and to determine whether the learners tend to behave like convergers, accommodators, divergers or assimilators (Kolb et al.). The content of training material can then be adapted to support individual learning style preferences to guarantee an optimal learning experience (Verlander<sup>b</sup>).

A third relevant issue is the correlation between personal learning style and personal approach to problem solving. One of the consequences of this correlation is that the results of the LSI questionnaires can be used to raise the learner's awareness of their tendency to overfocus and underfocus on essential phases of the problem solving process rather than giving each phase the equal effort it deserves. A number of studies have taken the Experiential Learning Model as their base and determined the relationship between the Four Stage Model of Figure 2, personal learning styles identified through the Learning Style Inventory questionnaire, and personal approaches to problem solving. These relationships are summarised in Figure 3 below (for a detailed discussion of these relationships, see Kolb et al.).

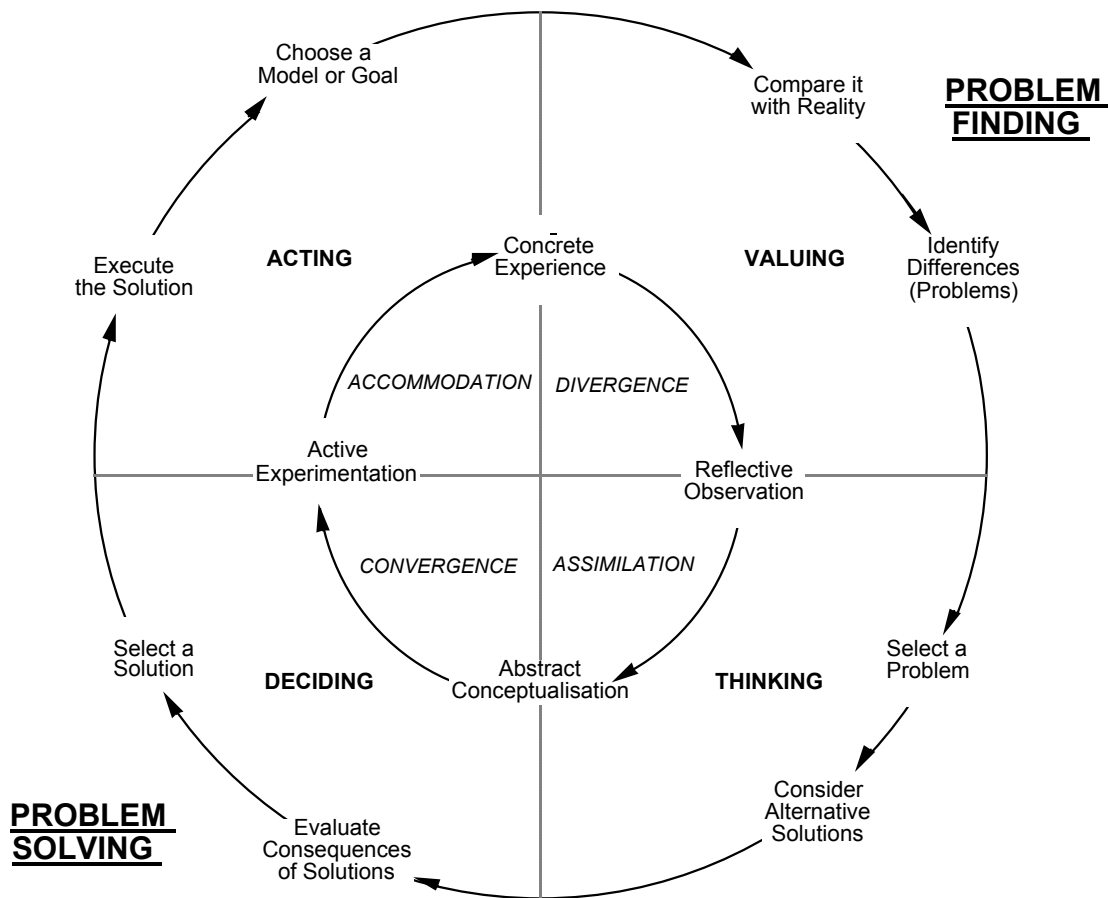


Figure 3: The relationship between the Experiential Learning Model process, Personal Learning Styles and Problem Solving Approaches is described graphically (Kolb et al.). Learners are classified according to their personal style. The type of questions most likely to be asked by each learner category has been identified by McCarthy (Ronchetto et al.): divergers ask Why?, assimilators ask What?, convergers ask How? and accommodators ask What if?

Figure 3 also highlights two important facets of learning processes: problem solving and problem finding (or identification of opportunities). Given that organisations are experimenting with more flexible structures, and given the importance that opportunity identification and problem finding assume in later career stages - when strategic decisions are taken (Smith) - a better balance between problem finding and problem solving skill development is being increasingly advocated by authors and academics.

A last issue which has gained considerable attention in recent studies is the observation that learning is only effective when motivation, involvement, curiosity and interest are stimulated. Experiences have shown that motivation and involvement are enhanced through ensuring that course content is in a context that is meaningful to the learner (Northwestern). Motivating adult learners also means that pedagogical approaches must satisfy the personal needs and interests of the adult, take advantage of his/her experience, incorporate a process of mutual enquiry and accommodate differing needs such as learning style, time, place and pace (Verlander<sup>b</sup>). On the other hand, curiosity and interest can be stimulated by providing the learner with relevant and recent information (for example benchmarking data, survey results, on-line database services) they are unlikely to have access to (Northwestern, Verlander<sup>a,b</sup>) and adding a touch of fun, novelty and mystery (Berger).

The research on learning highlighted in the previous paragraphs emphasises experiential approaches and helps shed light on the design of effective management development tools. Many methods are in use today (see Figure 4) and the literature and research on the effectiveness of these tools is prolific.

Reading Assignments	Simulations	Video-taping and Playback
Lecture	Self Assessment	Videos
Conference	Role Plays	In-Basket
Case Method	Behaviour Modelling	Individual and Group projects

Figure 4: Variety of pedagogical instructional methods available (adapted from McMahon)

For instance, McMahon states that there are six desired outcomes from management training: Content knowledge, Self-knowledge, Diagnostic skills,

Application skills, Teamwork skills and Self control and proposes that the effectiveness of each of the instructional methods in Figure 4 should be examined relative to these objectives.

Other studies which we reviewed concentrated on comparisons between two methods (Specht and Sandlin), an overview of the pros and cons of a single method (Argyris<sup>b</sup>, Curry and Moutinho, Dunbar and Stumpf, Fulmer, Kirrane, Larreche, Osigweh, Romm and Mahler, Smith), comparisons of tools used to support a given method (Keys and Wolfe<sup>b</sup>, Klein and Fleck) or discussion of single tools or company experiences (DeGeus, Neale and Mindel, Noel and Charan). In some cases, the anecdotal approach gave a good indication of the issues (Furnham, Turner). Particular attention has been paid to the Case Method<sup>s</sup> (Fulmer, Graham, Osigweh, Smith, Turner) and Computerised Business Simulations<sup>s</sup> (Keys and Wolfe<sup>b</sup>, Senge and Sterman) given their broad adoption in management development programmes.

In the rest of this document, we will reference specific research on management development methods and tools only if directly related to the development of the Business Navigator Method. For detailed discussions of advantages and limitations of some of the management development tools mentioned above, the interested reader should consult Keys and Wolfe<sup>a,b</sup>, McMahon, Osigweh, Senge and Sterman and Turner.

A final relevant point to be mentioned in this context is the importance for designers of pedagogical methods to be aware of three significant differences between executives and traditional young graduate students. These differences affect the way learners and educators interact. First, executives have the characteristics of adult learners and their experiences and needs generally differ from those of young graduates. Second, executives judge instructors by the content of the sessions and their experiences during the programmes, whilst graduates tend to emphasise the importance of grades and reputation. Third, teaching executives requires instructors to be more aware of the implications and the impact their training sessions have on the managers' working environment (political consequences, company culture, etc.). This aspect is generally less important when training graduates. (Berger).

## Leveraging emerging technologies

As illustrated in Figure 5, computing has already undergone four paradigm shifts since 1960 (Tesler).

	BATCH	TIME SHARING	DESKTOP	NETWORK
<i>DECADE</i>	1960s	1970s	1980s	1990s
<i>TECHNOLOGY</i>	MEDIUM-SCALE INTEGRATION	LARGE-SCALE INTEGRATION	VERY LARGE SCALE	ULTRA LARGE SCALE
<i>LOCATION</i>	COMPUTER ROOM	TERMINAL ROOM	DESKTOP	MOBILE
<i>USERS</i>	EXPERTS	SPECIALISTS	INDIVIDUALS	GROUPS
<i>USER STATUS</i>	SUBSERVIENCE	DEPENDENCE	INDEPENDENCE	FREEDOM
<i>DATA</i>	ALPHA-NUMERIC	TEXT, VECTOR	FONTS, GRAPHS	SCRIPT, VOICE
<i>OBJECTIVE</i>	CALCULATE	ACCESS	PRESENT	COMMUNICATION
<i>USER ACTIVITY</i>	PUNCH & TRY (SUBMIT)	REMEMBER & TYPE (INTERACT)	SEE & POINT (DRIVE)	ASK & TELL (DELEGATE)
<i>OPERATION</i>	PROCESS	EDIT	LAYOUT	ORCHESTRATE
<i>INTERCONNECT</i>	PERIPHERALS	TERMINALS	DESKTOPS	PALMTOPS
<i>APPLICATIONS</i>	CUSTOM	STANDARD	GENERIC	COMPONENT
<i>LANGUAGES</i>	COBOL, FORTRAN	PL/I, BASIC	PASCAL, C	OBJECT ORIENTED

Figure 5: The Four Paradigms of Computing.

The personal computer appeared in the early eighties, during the third paradigm shift and immediately became a tool to design, deliver and distribute pedagogical material. The benefits realised by learners and companies to date include improved computer literacy, control of learning pace, refresher/practice available on demand and increased understanding of economic, marketing and production theories through the use of pre-programmed simulations (Keys and Wolfe<sup>b</sup>, Wells). In spite of these benefits, the use of computers has been quite limited in the education and teaching fields (Fritzsche, Graham). Computers have been used mainly to display text and simple graphics, speed up mathematical calculations (that is 'crunch' numbers) and run business simulation games. From a technical

viewpoint, the low utilisation rate can be attributed to three main limitations of the current generation of technologies: (1) poor quality of human-computer interaction, (2) limited integration of different media (documents, pictures, video), and (3) limited networking capabilities. This is now changing. We are poised to take advantage of the emerging information and communication technologies in the delivery of training and education.

Multimedia overcomes the quality and integration limitations of computer based training tools (Cole, Kay, Reisman and Carr, Spitz). The seamless integration of text, voice, music, graphics, animation, still and moving pictures recreates learning experiences which retain the learner's interest and deliver accurate, recent information (Hoffos). Modern multimedia systems reduce the complexity in the use of very large volumes of information, make it much easier to maintain training information integrity, allow multipurpose usage for both training and reference and provide multi-language options (Orlin). Another advantage of multimedia systems is that the learner has much more flexibility and control over his/her experience (Elfin, Reisman and Carr). The learner uses the variety of media simultaneously or separately as and when he/she wants, eliminating the feeling of being controlled by and having to adapt to the computer, overcoming a major limitation of first generation computer-based training packages.

Virtual Reality offers the potential to further improve the effectiveness of multimedia and computer-based training tools (Hamilton, Jacobson). The more senses involved during the training experience the more effective the learning (Carr<sup>a</sup>). Virtual Reality technology recreates situations in which the hardware disappears from sight and the learner immerses him/herself into the learning experience through direct sensory perception of sight, sound and touch (Biocca). This technology can be used to recreate virtual environments, for example offices, laboratories or operating theatres. Virtual Reality may provide the optimum means for realising the objectives of the experiential approach to learning (learning by doing).

The benefits from Multimedia and Virtual Reality cannot be fully realised without the advances being made in networking and communication technologies. The combination of network, data and video communications (cable TV<sup>g</sup>, fibre optics<sup>g</sup>, LAN<sup>g</sup>, ISDN<sup>g</sup>, satellites<sup>g</sup>, video-conferencing, WAN<sup>g</sup>) and the emerging computer

supported cooperative work<sup>s</sup> (CSCW) applications (Johansen et al.) make it possible today to design new learning methods and delivery. For many global businesses, this means they can leverage their extensive investment in communication and information infrastructures and groupware (Holtham, Kirkpatrick) and link to universities, staff households, other parts of the company and external experts in order to achieve both their business and learning objectives. For the learners the combination of modern information and communication technologies can provide interactive access from home to a global multi-disciplinary team of professors and practitioners or corporate advisors. For academic institutions the walls have been removed from the classroom, the buildings are removed from campus, and the learners, teachers and experts can intervene interactively from anywhere in the world - distance learning has arrived (Elfin, Graham, Pea and Gomez).

The emerging technologies listed above are being used now. Northwestern University has developed numerous training applications since 1989 using multimedia platforms (Northwestern, Schank). Andersen Consulting state that they have reduced training time by 30-50% using Interactive Video Instruction, and IBM has observed that learning is improved by 40% at their Advanced Technology Classroom ATC<sup>2</sup> (Ronchetto et al.). Using multimedia based training, British Telecom have cut costs by 15% and Ford Motor company have reduced training costs for Statistical Process Control to less than 5% of that originally incurred via classroom-based teaching (Lingard). Northern Telecom Canada Ltd also report staggering savings, such as 85% decrease in the time taken to train operators to perform pattern, color and defect inspections of semiconductor wafers (Orlin).

The first generation of Virtual Reality applications in learning are being developed as well. These systems are being used in situations where mistakes are very costly, the environment is dangerous or hostile or real world experience is impossible. Examples include flight simulators, space simulations, medical diagnosis and operation training, disaster management training, scientific visualisations and industrial product design (Carr<sup>a</sup>, Jacobson, Newquist III). Numerous projects are underway: The University of Washington's Human Interface Technology Laboratory and DEC are considering applications in training and education for industries such as office automation and health care (Newquist). Stanford Medical

School and NASA are developing operating simulations for training in surgical procedures (Newquist III). Researchers at the University of Nottingham are experimenting with support for children with special learning needs and the University of Grenoble is experimenting with virtual instruments to teach music (Feldman).

To conclude Part 1, the stable, predictable and hierarchical business world is rapidly changing. The new model involves unpredictability, uncertainty, information overload, flexible corporate and decision making structures and cooperation. There is general consensus on the high level capabilities to be developed by executives for managing the global corporation in the nineties. The essential components for developing the next generation of executive development pedagogical tools are also available. In education as in architecture, form follows function (McMahon) therefore the challenge is to leverage the insights in learning theory, the advances in information and communication technologies and identify any other significant variable to create even better management development tools in the future.

This next generation of methods has the potential to enable managers to enjoy a rich learning experience in a risk free environment (Bowen), organisations to realise increased benefits through increased transferability of skills into the workplace and cost and time reduction relating to training and travel, and universities and trainers to design and deliver multi-site, multi-user, multi-disciplinary programmes which support managers to gain the appropriate skills to manage in the turbulent nineties.

## **PART 2: THE BUSINESS NAVIGATOR METHOD.**

### **A Step Beyond Traditional Executive Development Methods.**

The Business Navigator Method we introduce and discuss in this second part of the paper is a new approach to management development. It combines the advantages of the two most widely used methods (Case Method and Business Simulation Games) and it defines a framework for the next generation of management development tools to be employed both in educational programmes and organisations.

In particular, the Business Navigator Method can be seen as an extension of the traditional Case Method. As a pedagogical tool, use of the Case Method can be traced back to around 1870 in the Harvard University Law School although it was not until the 1920's that the Harvard Business School adopted the approach (Osigweh). The success of the Case Method in becoming the most widely used teaching approach in management education has been attributed to three key factors. The method provides:

- exposure to a real business context or situation described in a 20 to 30 page case narrative;
- an opportunity to exercise analytical skills (diagnosis, problem solving, synthesis, decision making);
- a forum for facilitated analysis and group discussions of theoretical frameworks.

The combination of these factors results in an extension of a manager's knowledge of industries and organisations and in the development of analysis and communication skills (Argyris, Fulmer, Osigweh, Romm and Mahler, Smith).

The Business Navigator Method aims at extending further these three success factors of the Case Method. The central idea of the method is to project the manager into a highly interactive and realistic environment in which he/she can experience the difficulties of thinking, moving, understanding and acting in the diverse, socially complex, information and knowledge-intensive, competitive and cooperative reality of today's businesses.

The learning experience is achieved by providing so-called *Virtual Interactive Business Environments* (VIBEs) in which managers can *navigate*. From a manager's perspective, navigating through such a VIBE means (1) being faced with vast amounts of verbal, written and visual information reflecting the complexity of a real business context, (2) having to operate selective choices in gathering information, developing efficient strategies to attain the desired information sources and combining them into an articulated, coherent picture, and, last but not least, (3) operating under time pressure.

More precisely, the interactive navigation takes place at the three interconnected levels illustrated in Figure 6.

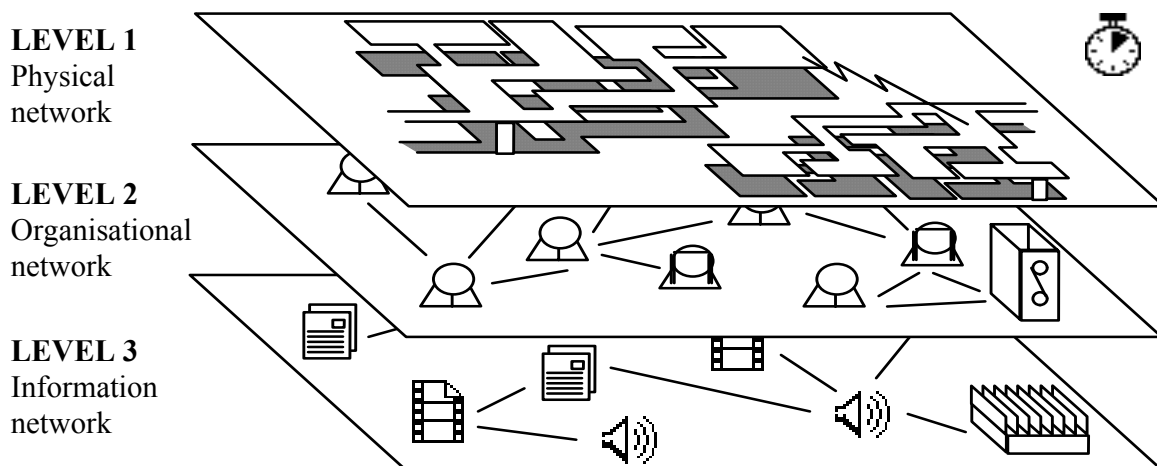


Figure 6: Navigation in a multi-layered, Virtual Interactive Business Environment (VIBE)

The concept of navigation on the first, physical level is straightforward. Here, the navigator *moves* in the business environment walking through corridors and public spaces, entering offices and meeting rooms. Level 1 is a physical representation of a globally dispersed corporation, for example a transnational organisation (Bartlett and Ghoshal) or a virtual corporation (Byrne et al.) which is typically comprised of a network of organisations and/or consultants located around the world. Current Multimedia and Interactive Video technology allows the production of such "navigable scenes" in which one can decide dynamically in which direction to "turn one's head" in a given room (e.g. an office), control movements from one location to another (e.g. walking down a corridor to reach a specific office) and use equipment such as telephones and computers. Virtual Reality can further enhance

the realism of the navigation experiences by immersing the learner into the business environment through sight, sound and touch.

At the second level, the concept of navigation is extended to a network of "information owners", i.e. the organisational and external agents inhabiting the virtual business environment. These agents can be contacted on request and can give access - when approached and asked suitably - to the information sources that are made available at the third navigation level. This second level reflects the formal organisational structures, inter and intra organisational relationships and personal networks of "information owners".

At the third level, the information sources associated with "information owners" assume their usual form, such as video and audio interviews, documents, reports from organisational, external databases, etc. The so-called "Knocking at Doors" metaphor used in this context guarantees that information sources are accessible only on specific request, after a contact has been established with organisational agents (e.g. the company's CFO) or external information providers (e.g. market researchers or industry experts).

### **Business Navigator's Pedagogical Objectives.**

Five pedagogical objectives underly the Business Navigator Method. First, the method aims at providing a systematic approach to modelling - and hence communicating - a dynamic, lively image of a global organisation. The approach goes way beyond the passivity of videos, written reports and traditional exhibits, as it is based on the metaphor of an "interactive visit" and "discovery experience", in which decisions on what to see, whom to contact and which information to collect about the company are taken dynamically. It clearly creates a powerful "learning by doing" stimulus in a safe environment in which mistakes can be made.

Second, it emphasises the importance of being able to manage efficiently two crucial resources: time and information. This is achieved by simulating the complexity of today's business environment in a realistic way. The learner is exposed to accurate volumes of business information related to industries, organisations and environmental forces - social, cultural, economic, technical, political - thus significantly increasing their knowledge of industry, organisational

and interpersonal dynamics. The method provides an effective way for conveying important messages concerning the value of information (Information is not for free), the need for developing and refining strategies to decide who to approach in an organisation, and when, where and how to approach them (Information is not always easy to get as it is grounded in a social environment) and other peculiar characteristics of this resource (Information is not necessarily consistent; Information is subject to interpretation and to discounting).

Third, the method provides managers with the opportunity to reflect on the speed and quality of their decisions in complex and information-extensive situations<sup>2</sup>. For this specific purpose, so-called "Stimulus Agents" interactive in the roles of advisors, devils advocates and story tellers (Angehern) provide continuous stimulus for the learners to reflect on the speed and quality of their decision making, as well as on their navigation experiences, information gathering and time management strategies.

Fourth, the method focuses on training the learner in problem/opportunity identification, interpretation and sense making skills in addition to improving analytical and problem solving skills. The learner is required to act and demonstrate initiative, make sense of the information collected and actively practice all forms of interpersonal and communication skills along his or her interactive journey through the organisation. While the Case Method can be used effectively to train managers to analyse a business context summarised and pre-structured in a 20 to 30 page narrative, the Business Navigator Method shifts the perspective of a manager from the "case reader" to the "case writer" seat. Adopting this point of view corresponds more to the reality managers are confronted with in practice.<sup>3</sup> Information is not provided in advance in a well-structured report. It must be collected, extracted from its social context, selected, interpreted and structured into a coherent picture. As is the case in practice, analysis and action, interpretation and information gathering, problem solving and problem recognition are not separated, but interlinked managerial activities.

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<sup>2</sup> Research findings highlight that speed and quality of decision making is a key characteristic of successful companies, e.g. in high-tech industries (Eisenhardt)

<sup>3</sup> Research related to the use of simulation models in management education claims that learning experiences and insights gained through the simulation of a microworld<sup>8</sup> can be improved if the learner adopts the role of a "model builder" rather than simply that of a "model user" (Graham et al., Senge and Sterman).

Fifth, the Business Navigator Method does not only provide a unique opportunity to experience the complexity and interactions of a business environment, but significantly enhances the quality and diversity of the ensuing discussions and reflection (see Figure 7).

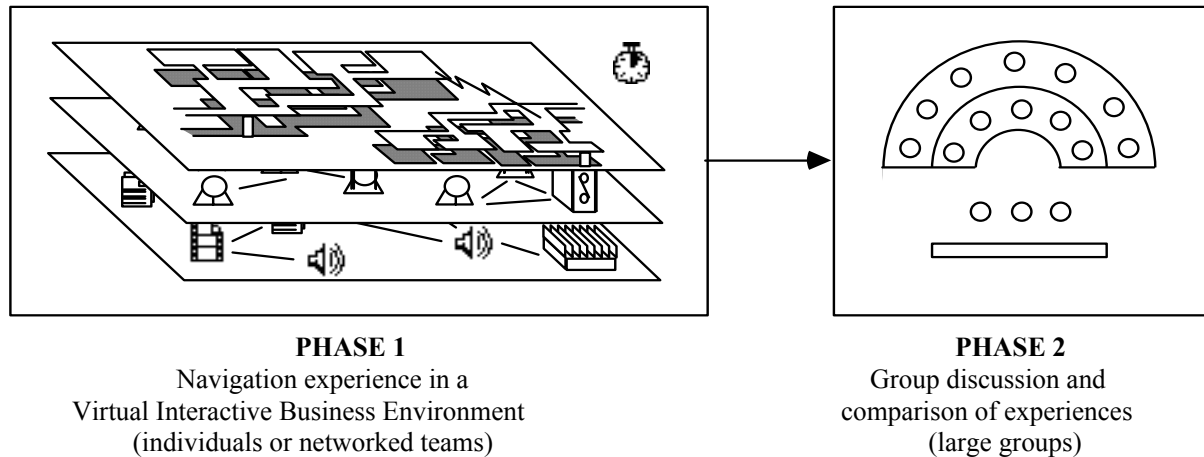


Figure 7: The two phases of the Business Navigator Method.

The experience gained during the navigation provides the foundation for lively group discussions on the solutions the learners have generated, both individually and in teams, for given contexts and situations. Facilitated reflection on personal experiences in relation to strategies and processes used during the navigation enables the learners to compare experiences and examine how their culture, functional discipline, work experience, individual and team behaviours and other factors influence their information gathering and decision making processes and help them appreciate the diversity of managing and working in multicultural and global teams. This is in addition to the traditional benefit of increasing the learners understanding of various theoretical frameworks.

In summary, at the pedagogical level, the Business Navigator Method provides a much richer and more intensive learning experience than traditional management education methods with its main strengths being:

- creating a powerful, safe experiential (learning by doing) experience;
- capturing and mirroring the complexity of today's business environment;

- expanding personal organisational and industry knowledge;
- emphasising the importance of managing time and information;
- interactively stimulating continuous reflection on quality and speed of decision making processes;
- complementing opportunity and problem finding with interpretation, sense-making, problem solving and communication skill development;
- developing team building sensitivities and skills;
- stimulating reflection on personal experiences and being able to appreciate the variety and diversity of management thinking and action.

### **Putting The "Business Navigator Method" Into Practice**

As with the introduction of any new concept or method, the implementation becomes significantly easier and understandable when the steps in achieving it are incremental and intuitively follow a logical, evolutionary path. The impact of the change process is also minimised when differences can be described in terms of their impact on known processes. The realisation of the Business Navigator Method vision is described within the context of these key change management techniques.

#### **An evolutionary path**

The Business Navigator Method described in the previous section aims at extending the traditional management development methods along three dimensions: Delivery Medium, Learning Style and Information Content.

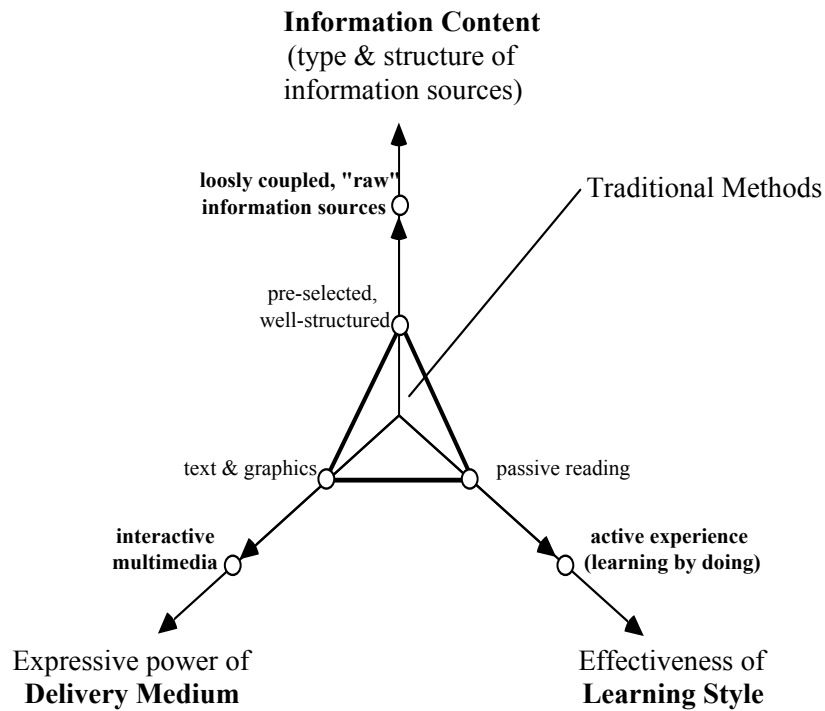


Figure 8: Extension along three pedagogical dimensions (from traditional methods to the Business Navigator Method)

As illustrated in Figure 8, the expressive powers of the Delivery Medium can be enhanced by performing the step from simple text and graphics to the use of interactive multimedia. At the same time, the Learning Style can be made more effective by providing environments in which relatively passive absorption of material (e.g. through reading) is complemented by active experiences as discussed in Part 1 (learning by doing). In regards to the Information Content dimension, the extension consists of moving away from exposing learners to a preselected, well structured set of information and exposing them to a more realistic, complex view of the business environment in which selection, interpretation and sense making skills are crucial.

In order to implement the Business Navigator Method we have identified an evolutionary path that leads, in a planned, incremental way from today's executive development tools to the Business Navigator Method. Figure 9 illustrates this path with the intermediate stages of "Multimedia" cases, "Situation-Based" cases and "Data-Search" cases which extend traditional methods along a single dimension. These intermediate stages are tools in their own right and each realises some of the characteristics of the Business Navigator Method.

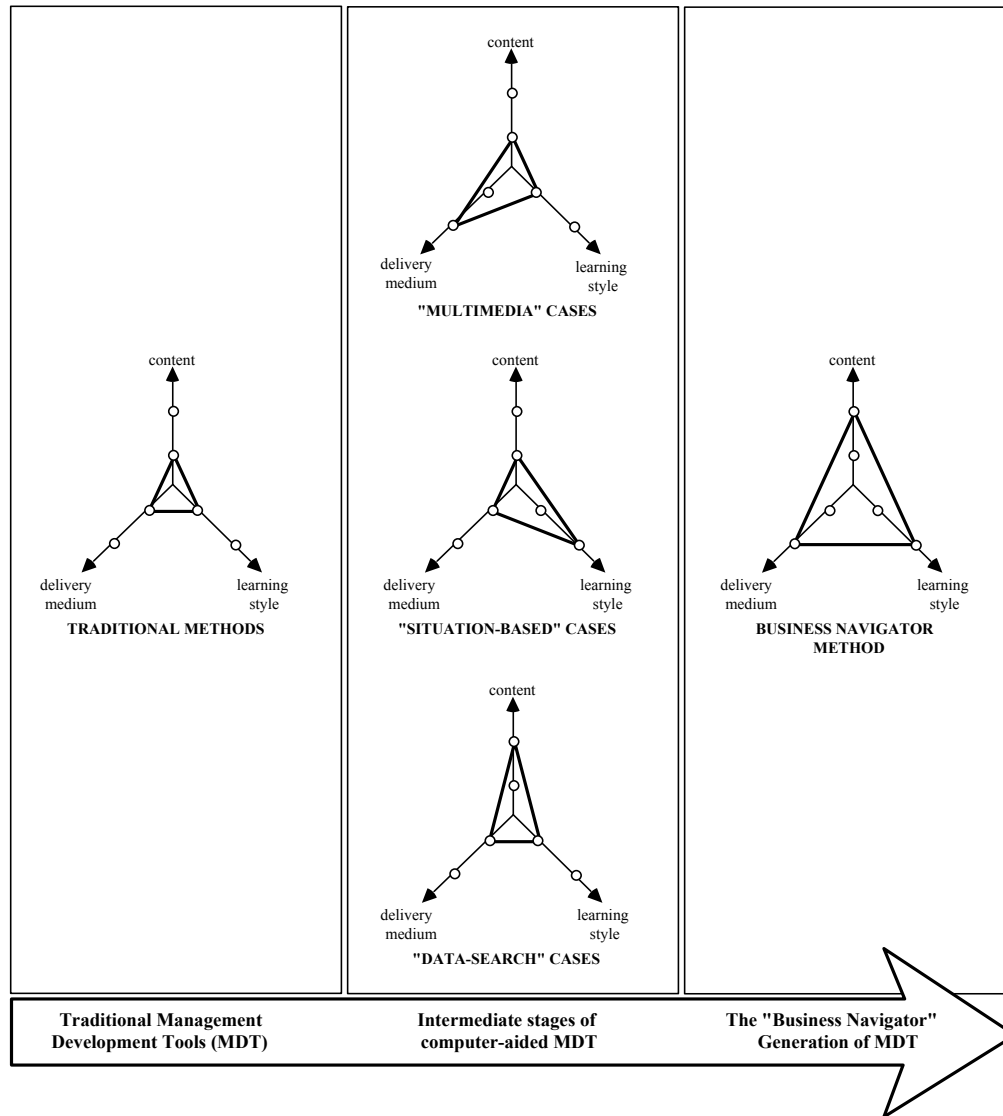


Figure 9: The evolution path from traditional methods to Business Navigator Method.

"Multimedia" cases extend traditional methods along the Delivery Medium dimension (see Figure 8). An existing traditional case is taken, scanned and embedded together with videos, pictures, and interactive use of accompanying tables and financial data into a hypermedia<sup>8</sup> system. Learners can access the narrative sequentially or by keyword search, watch videos and manipulate financial reports whilst reading, highlight interesting facts and make notes in the margin of the electronic pages they are viewing.

"Situation-Based" cases are an attempt to extend along the Learning Style dimension (see Figure 8). The development of a Situation-Based case requires a different approach. The starting point is still an existing case but the narrative is decomposed into "situations" which relate to the most likely way the information was originally received or gathered. Thus the narrative disappears but the information remains. Learners are put into situations in which only their *actions* via the computer (opening documents on their desk, attending meetings, playing videos) result in various reactions and events, thus creating new situations and requiring additional information to be accessed.

"Data-Search" cases attempt to extend along the Information Content dimension (see Figure 8). They differ from traditional cases in that they do not provide information to the learner in a prestructured narrative. The learner is challenged to develop skills in analysis, interpretation, sense making and determining information gathering strategies through accessing vast amounts of normally available business information. This includes documents, corporate Executive Information Systems<sup>s</sup> (EIS), television programmes, newspaper articles and other forms of reference material.

### **The key changes in the pedagogical development process.**

Figure 9 represents the roadmap identified to explore the feasibility of the Business Navigator Method and acquire insight into the development process. To date, we have gained experiences in developing Multimedia and Situation-Based cases and in using and evaluating their effectiveness with MBA students (Angehrn and Giffin). These experiences have highlighted a number of major differences to traditional pedagogical tool developments. The three key lessons learned from these experiences can be described comparative to the development of traditional cases:

The first lesson is that the development of a Virtual Interactive Business Environment (VIBE) requires the adoption of a multiple-perspective approach. This means that collecting the information necessary to recreate a realistic navigation experience for the learner cannot be left to a single person (the traditional "case writer"). Adopting a multiple perspective approach contributes to maximising the diversity and volume of the information sources to be included in the VIBE as well as capturing different techniques through which information can

be accessed in a Real Business Environment (RBE). This objective can be reached by a team of organisational "explorers" with different working and disciplinary backgrounds.

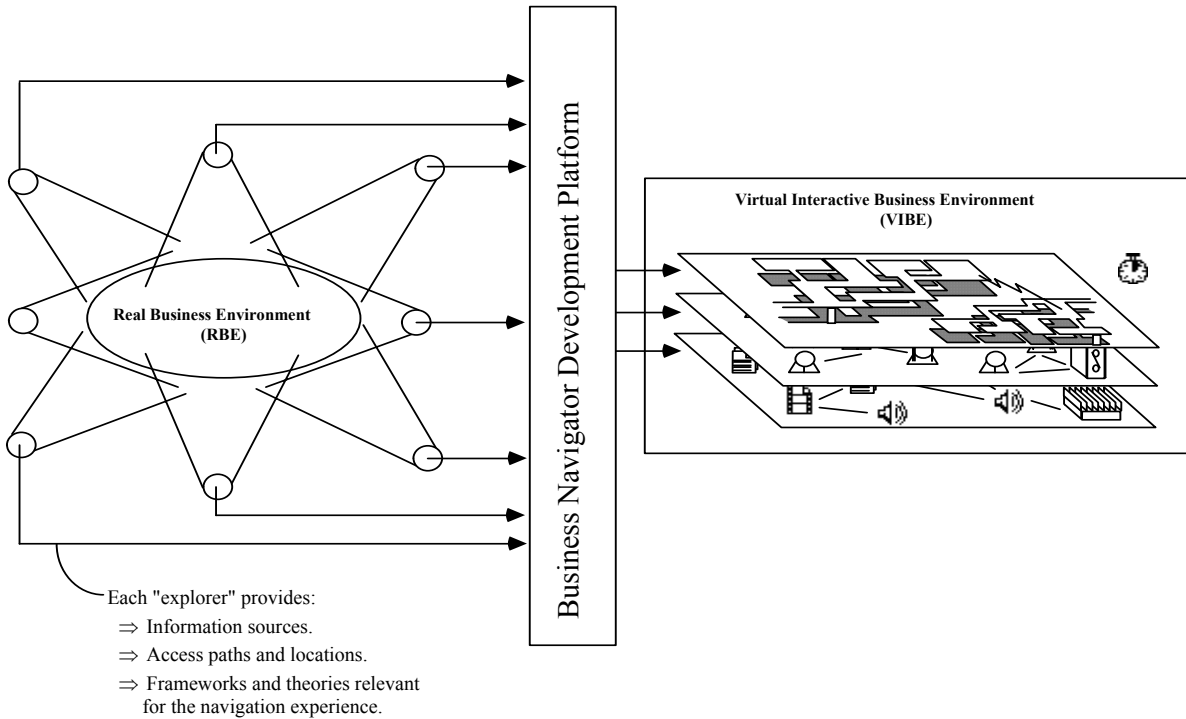


Figure 10: The development of a Virtual Interactive Business Environment (VIBE).

As illustrated in Figure 10, the specific task of each explorer consists of providing his/her own perspective on a RBE and to understand and capture the dynamics of the organisation, the people, the information, the industry, and the different stakeholders. Although more people-intensive and time-consuming, adopting a multiple-perspective approach during the VIBE development stage appears the only viable solution to achieve the objectives of the Business Navigator Method. As described in the previous sections, the variety of information sources and potential navigation paths determine the richness of the simulated environment and hence the possibility for the learners to develop their own information gathering strategies and interpretation skills.

The second lesson drawn from our experiences is that the new generation of case writers ("explorers") have to change the way they document the experiences they have in the RBE. In developing traditional cases, case writers first gather information in its raw form (through visits, interviews, company reports, etc.) and

then document their findings in narrative form. With the Business Navigator Method, the tasks of selecting and synthesising information are left to the learner. Thus, developing a VIBE requires the explorers to detail original information sources (people, documents, images etc.) as well as how and where these sources were both located and accessed.

The third lesson relates to how the experiences and information gathered by the "explorers" are mapped into actual VIBEs. A flexible development platform must be provided in order to overcome duplication of effort from reconstructing similar situations over and over again and to reduce the technical complexity for the VIBE developer. The platform should be comprised of situation templates, reuseable "objects" and enable the integration of videos and sound from a non-technical interface. It should enable computer literate non-programmers to efficiently create the environment through which learners navigate.

From a technical perspective, the platform (or application generator<sup>®</sup>) enables the efficient mapping of the information into the three navigation levels illustrated in Figure 10. At the first level - the Physical network - the developer is supported in re-creating the physical environment which the learner will navigate through. This includes three dimensional (3-D) plans and interactive videos of the navigation space. Working environments are efficiently recreated by providing default "situations" such as offices, meeting rooms, production sites and home workspaces. The features of a default office for instance would include bookshelves, filing cabinets, telephones, fax, computer terminals, printers, email, voicemail, software, clocks, writing pads, pencils, post-its and rubbish bins. The developer would either use default objects or adapt them to the specific situation (by changing book titles, amending what is located on desks, etc.).

At the second level - the Organisational/Social network - the developer is supported in defining the information owners with whom the learner interacts. An information owner is a broad category that covers everyone within the company's sphere of operations including staff, board members, customers, competitors, alliance members, suppliers, shareholders, investor analysts and external knowledge providers. The platform supports the efficient mapping of the formal corporate structures and the informal networks of the individual information owners (links to other level 2 inhabitants), their relationship to the physical and

geographic environment (link to level 1) and their relationship to information and knowledge resources (link to level 3). The minimum amount of information to be captured regarding an information owner includes formal title and position, knows whom, works with whom, influences whom, and information or knowledge held.

At the third level - the Information network - the developer is supported in creating the repository of information which learners will be given selected access to based on their appropriate communication and information gathering strategies. At this level, the platform supports the efficient storage and retrieval of the information captured by the "explorers" as well as any concepts, analytical methods, theories and techniques learners will have access to during the navigation. Figure 11 gives an overview of types of information involved and the media form in which they would be captured, that is film, memos, videos, spreadsheets, photographs, etc.









<p><b>Object Type: GRAPHICS</b></p> <p><i>Examples:</i>            Organisation Structure Charts            Sales Trends Graphs            Fixed/Variable Cost Trend Graphs            Competitor Market Share Graphs</p>		<p><b>Object Type: VIDEOS</b></p> <p><i>Examples:</i>            Interviews with People            Interviews by Staff on TV            Comments about Company News/Business            In-House Staff Announcements on Video</p>	
<p><b>Object Type: DOCUMENTS</b></p> <p><i>Examples:</i>            Annual Reports            Job Definitions            Newspaper Articles and Books            Business Plans            Market Research Reports</p>		<p><b>Object Type: EXTERNAL DATABASES</b></p> <p><i>Examples:</i>            Dunn &amp; Bradstreet            Reuters            ABI Inform            New York Times</p>	
<p><b>Object Type: SPREADSHEETS</b></p> <p><i>Examples:</i>            Budgets            Performance Against Plan Reports            Production Scheduling</p>		<p><b>Object Type: AUDIO TAPES</b></p> <p><i>Examples:</i>            Telephone Call Dialogues            Meeting Comments</p>	
<p><b>Object Type: PICTURES</b></p> <p><i>Examples:</i>            People            Products</p>		<p><b>Object Type: PEDAGOGICAL MATERIAL</b></p> <p><i>Examples:</i>            Frameworks, Concepts and Theories            Reference Manuals            Exercises and other Instructional Objects</p>	

Figure 11. Overview of different information sources used when developing Virtual Interactive Business Environments (VIBEs).

## **BUSINESS NAVIGATOR METHOD - THE NEXT STEP.**

The experiences described in the previous paragraphs indicate that the Business Navigator Method is feasible from both a technical and methodological viewpoint.

From a technical viewpoint, the type of hardware needed to develop and deliver the Business Navigator Method is already available and affordable. The majority of today's workstations or high-end personal computers with features such as a high speed processor, 500 megabyte internal hard disk, audio-visual capture card and ability to integrate different media types are appropriate as development platforms. Our current experiences at INSEAD demonstrate the suitability of light weight, colour portables as delivery platforms. Using CD-Rom drives makes it possible for VIBEs to include, say, 20 hours of video and animation displayed in a 2" by 2" window on the monitor, 1,000 photographs, 8,000 pages of text and 10,000 graphics and charts.

Whilst hardware is not an issue, the integration of "high tech" educational technology into currently installed technical and communication infrastructures in organisations and educational institutions may be problematic. In order to exploit the real potential of multi-disciplinary and multi-site learning, joint planning exercises involving both information technologists and capital planners are necessary so that education requirements for information and communication technologies are included in the medium term strategy planning.

From a methodological viewpoint, although at an early stage of development, the objectives to date have been achieved, reactions are very promising and interest is high. The lessons learned from our experiences with Multimedia and Situation-based cases are enabling us to further develop our working methodology and to measure the extent to which the pedagogical objectives outlined on pages 20-22 can be achieved. New prototypes<sup>s</sup> of Data-Search cases (see Figure 8) are planned for development. They will enable us to test the most effective approach for the "explorers" to gather and record their experiences and determine the most appropriate multi-disciplinary theories, processes and techniques which will be included to support the learner during the navigation. In addition, these prototypes will give us the opportunity to further explore phase 2 of the Business Navigator Method (group discussion and comparison of experiences as illustrated

in Figure 7) and define the skills necessary for successful facilitation of the method. Following the evolutionary path described in Figure 9, Multimedia, Situation-Based and Data-Search cases are providing us a basis for conducting empirical research on the Business Navigator Method's impact in practice.

Of particular interest to us is the opportunity to customise the approach for MBA classes, externally provided management development programmes and external or in-house company specific programmes. In fact, Virtual Interactive Business Environments can provide a variety of learning scenarios. Different scenarios would allow learners to assume the role of senior executives, strategists and functional managers ("internal" perspective), or adopt the viewpoint of consultants, would-be suppliers or even acquirers ("external" perspective). To include real-time interaction during the navigation experience, scenarios can also be set up for multiple learners to interact concurrently in a variety of interdependent roles.

The Method generates potential for research beyond those areas that have been highlighted in Part 1. Research complementary to the development of the Business Navigator Method will include comparative studies:

- to explore current pedagogical methods in order to understand their most appropriate use, misuse and best practice.
- to cross-reference how successful pedagogical approaches are relative to each other for developing the manager skillsets necessary for success in the nineties.
- to specify the features and benefits to be gained from multi-sensory, visual, audio and text-based learning approaches.
- to analyse the speed of knowledge absorption when using multimedia based methods relative to traditional approaches.

## **CONCLUDING REMARKS.**

Our main objectives for this White Paper were to outline some of the major trends within the management development field and stimulate reflection about the challenges facing both organisations and educational institutions in the nineties. We have done this through:

- presenting what we consider to be the most significant trends both in management development and technology based tools.
- an in-depth discussion of the Business Navigator Method, a state of the art project aimed at providing a new generation of tools which better meet the development needs of today's and tomorrow's managers.

Although technically and methodologically feasible, innovative approaches to management development such as the Business Navigator Method present corporations and educational institutions with a set of new challenges. The material presented in this paper indicates clearly the need for corporations and human resource executives to start rethinking and innovating their approach to management development as well as formulating incremental strategies so they are prepared for and can take full advantage of the emerging educational technologies.

Educators will be faced with major challenges too. We are making very high demands on them both in the way course content is researched and collected, and in the way learning experiences are facilitated. Increasingly, the ability to operate in multicultural teams, to formulate information gathering strategies, to take advantage of technological opportunities and to develop effective communication skills will be just as critical to educators as they are to executives.

The Business Navigator Method opens up new forms of multi-disciplinary, multi-sensory learning and teaching - an opportunity to do things differently rather than just automate or substitute the current generation of pedagogical tools. As a result of corporations, researchers and educators accepting this challenge, we expect the Business Navigator Method to play an important role in the transformation of the executive development learning experience in the nineties.

## **GLOSSARY OF TERMS**

### **Application Generator**

An application generator is a computer-based system that provides a set of capabilities to build specific applications quickly and easily (Martin et al.).

### **Artificial Intelligence**

Artificial intelligence, or AI, was originally the study of how to represent human intelligence in ways to enable the development of hardware and software systems which act as decision makers. Debate continues as to whether this is both possible (it has not been possible yet to "teach" a computer to use common sense - the ability to recognise and adapt to context) and philosophically appropriate. AI techniques are used today in expert systems, decision support systems (DSS) and performance support systems<sup>g</sup> (PSS) (Keen<sup>b</sup>).

### **Business Navigator Development Platform**

The interactive application generator<sup>g</sup> supporting the efficient development of Virtual Interactive Business Environments<sup>g</sup> (VIBEs).

### **Business Navigator Method**

The new management development method described in Part 2 of this paper.

### **CD-Rom**

Compact Disc (CD) - Read Only Memory (ROM) is a form of optical storage. CD-ROM exploits digital coding of information and laser technology to provide fast and flexible searching of large volumes of data. CD-ROM disc readers that attach to a personal computer cost between USD \$300 - \$600. They are also available as internal drives.

CD-ROM is a powerful and proven tool for putting masses of information at the fingertips of users in a form that is easy to scan and digest. Its variants include CD/I (interactive CD, developed by Philips and readable from normal T.V. sets) and Photo-CD (a high-quality photographic storage medium developed by Kodak). (Keen<sup>b</sup>, European)

### **Cable T.V.**

There are less than 500,000 homes in the UK receiving broadband cable television but 60% of all North American homes have it and some parts of Benelux have over 90% penetration. TV companies are experimenting with compressed digital high-definition-TV (HDTV), stereo multi-channel audio, and interactive T.V., and computer/communication companies are entering into partnerships - IBM and Time Warner, Philips and GTE, Apple and Bellcore - to pursue research in cable technology.

Cable is therefore an alternative to ISDN<sup>g</sup>, which is only affordable and driven by business and industry at present. There is also some speculation that TV and telephony will need to be delivered through cable by 2050 just to free up the air space for other communication devices. (Thomas, Wilson)

### **Case Method**

The case method of teaching is not a recent phenomenon. It can be traced back to ancient times where the use of parables and special questioning techniques were the basis for philosophical learning and historical military records and writings were used for teaching military strategy (Smith). Around 1870 Professor Christopher Langdell started using court case summaries in his teaching at Harvard University Law School. It was not until the 1920's that Harvard Business

School seriously adopted the approach. (Osigweh) Once case studies became widely accepted as a business school pedagogical tool (though not, arguably, empirically tested) they were springboarded into the multi-million dollar business they are today.

The case method features a written case, usually 20-30 pages of descriptive narrative with supporting tables and facilitated Socratic dialogue which enables the participant to involve themselves in analysing cause and effect, problem solving, applying concepts and models and developing communication skills.

### **CSCW - Computer Supported Co-operative Work**

Computer Supported Co-operative Work (CSCW, Groupware, Workgroup Computing) is a generic term for specialised computer aids that are designed for the use of collaborative work groups. Typically, these groups are small project-oriented teams that have important tasks and tight deadlines. Groupware can involve software, hardware, services, and/or group process support (Johansen).

CSCW technology includes communication systems, shared workspace facilities, shared information facilities and group activity support systems such as Group Decision Support Systems (GDSS) (Kirkpatrick).

### **Computised Business Simulations**

A computerised business simulation is usually based on a firm's historical or fictitious data and supported by written documentation. The participants make decisions about a number of variables relating to, for example, marketing, capital, R&D, exporting, financing and production for a given time period. These results are fed into the computer model, which has pre-determined rules regarding the way in which the variables interact and the results are returned as input for the participants next set of decisions. The more advanced systems are now incorporating decision support systems and expert systems into the games. (Keys & Wolfe<sup>b</sup>)

### **Economic Regionalism**

The promotion of international linkages by geographically close countries through the establishment of free trade areas, customs unions, preferential trade agreements or deregulated labour and capital exchange. Regional programs include Single European Market (SEM), European Free Trade Area, (EFTA), Canada - US Free Trade Area (CUSTA), North American Free Trade Area (NAFTA), Association of South East Asian Nations (ASEAN). (Hine)

### **Executive Information System (EIS)**

An executive information system analyses and displays information on a business manager's workstation. This gives him/her a clearer picture of key trends and events before it is too late to do anything about them. The data, typically yesterday's sales and production figures, competitor data, financial information, industry statistics and key issue scanning are culled, organised, manipulated and displayed for the executive in the form he/she requested. Sources include both the firm's on-line business processing systems and third party organisations. (Keen<sup>b</sup>)

### **Fibre Optics**

A transmission medium in which data are transmitted by sending pulses of light through a thin fibre of glass or fused silica. Although expensive to install and difficult to work with, the high transmission speeds possible with fibre optic cabling - 500 thousand bits per second (bps) to 30 million (bps) are leading to its use in most new long-distance telephone lines. (Martin et al.)

## **Hypermedia**

Software programmes which allow users to explore one or more thematically-linked databases and audio-visual information sets through the use of keywords, searches, and graphical user interfaces (European).

## **ISDN - Integrated Services Digital Network**

ISDN networks have been the planned transition from current analog telephone technology to digital technology. They permit the combined transmission of any and every type of information available including voice, pictures, newspapers, diagrams, and video-conferencing. ISDN is 10 to 30 times faster than analog technology and simultaneously handles both telephone calls and transaction processing on the same line.

ISDN was originally envisaged as the Global Network facilitator but this has not been achieved to date due to 1) most telecommunication networks are quasi government monopolies, 2) alternatives to ISDN are not compatible with each other and 3) international standards are not fully accepted.

As for installations, the USA is considering a number of options whilst Europe and Asia are firmly committed to ISDN. Singapore, Indonesia, Australia and Japan are well along in their implementation and France commenced in 1987, Germany in 1989 and an EuroISDN initiative commences in 1993. (Keen<sup>b</sup>, Richter-Maierhofer)

## **LAN - Local Area Network**

A local area network (LAN) links computers, workstations and peripheral devices such as printers within a building or an office and allows the users to share the software and peripheral devices. LAN's can be interconnected to each other or with a wide area network<sup>g</sup> (WAN) using interface devices called gateways, bridges and routers. Fibre optic LAN's are now being developed based on the Fibre Distributed Data Interface (FDDI) standard. They provide high resolution images and support applications such as image processing and multimedia. (Keen<sup>b</sup>)

## **Microworld**

A microworld (or learning laboratory) is a microcosm of a real business setting in which the long term, system wide consequences of decisions can be experienced by managers. Roles are played out in the simulated organization with time and space being compressed through the use of computer simulations. It is more than just a computer simulation. Managers are trained in the cycle of learning - Discover, Invent, Produce and Reflect (Dewey), in identifying causes rather than symptoms, and in communicating clearer, coherent pictures of business complexities. (Senge & Sterman)

## **Multimedia**

Multimedia is the term used to describe programming which combines text, data, audio, graphics, animation and/or still and moving pictures. Text includes a document, novel or report and anything you may find in a good library. Audio typically comprises voice, music and sound effects. Graphics covers a variety of pictorial forms from conventional artwork to computer generated images, print and film, charts, graphs and other visual interpretations of data. Animation covers a vast range of creative techniques and media from three-dimensional (3-D) figures captured on film to wholly computer generated images. Still images are distinguished from graphics to describe truly photographic images transferred from media such as transparencies, negatives or videotape. Moving pictures similarly describe photographic images rather than animation. (Hoffos) Other features of Multimedia products include facilities to browse and access

information in a non-linear way, support a collaborative environment and automatically index/link new information to old.

The speed of processing required to simulate VHS videotape, and broadcast TV or film is a real challenge for compression and decompression technology since the two fundamental though incompatible components of multimedia, analog audio-visual and digital computer data must be integrated to provide the rich environment described. Prior to these advances in compression/decompression technologies, video images were too storage intensive - a 1.4MB floppy disk could hold about 350 pages of a normal book, store 3 conventional computer graphic images or about 1/8th of a second's worth of PAL or SECAM video film (Hoffos).

Multimedia systems typically combine the videodisk drive or reader with the computer in one box and consign all the data to a single delivery medium, usually some form of CD or the computer hard disk. The previous generation of systems, often called interactive video (IV) systems combined analog audio-visual material from video-disk with data and computer generated text and graphics from magnetic disk. They required a computer, a separate videodisk drive and optional peripherals such as CD-ROM readers and floppy disk drives. (Hoffos)

Ovum Ltd., in 1992 forecast growth in revenues in the USA and Europe multimedia markets from \$500m in 1991 to \$9 billion by 1997 (of which Europe will be earning 52%, USA 48%). This assumes the main technologies for video communications on workstations - that is multimedia workstations, improved quality of video compression and the spread of the ISDN network - will be in place. (Templeton)

For further reference, a comprehensive glossary of Multimedia technologies and products is available in The European Multimedia Yearbook 1993.

### **Object Oriented Programming.**

Object Oriented Programming is a breakthrough from old forms of computer coding. It addresses one of the longest standing concerns of information technologists - improving the quality and productivity of software development. It is the lego block or modular furniture approach to application development in which "objects" (modules) are linked together.

Each object (module) is independent and can run alone or interlock with other objects. They can be reused and they can amended separately, hence speeding up development time. Each object contains information about itself (encapsulation) and about which other objects it can relate to (inheritance). Objects interact by passing information to each other. For example an object that calculates "Gross Salary" and an object that calculates "Personal Tax Payable" could pass the resulting information to another object called "Net Salary", whose task it is to add the input and display it to the user. (Keen<sup>b</sup>)

### **Objects**

See Object Oriented Programming.

### **Performance Support System (PSS)**

A PSS is a computer-based system which supports a person to perform their job, when they need it, where they need it and in the form most appropriate. A PSS will generally comprise of knowledge based systems or expert systems, hypertext or multimedia, on-line reference and extensive databases. The emphasis is on improving performance with the support provided likened to that of a librarian, advisor, instructor or a dofer. Examples include the system Intel uses to help technicians identify defective micro-chips, the support provided for Amdahl technicians to identify the hardware problems of their own and other manufacturer connected equipment, and the three-dimensional (3-D) designer of decks/patios for the do-it-yourself (D-I-Y) market at Retail Home Centres which enables the buyer to *walk* around deck/patio, calculate how much it costs, print out the plans and leave with an itemised bill of materials for placing an order. (Carr<sup>b</sup>)

## **Prototypes**

A prototype is an initial version of the system which is built very quickly using fourth-generation software development tools. It is then tried out by users to determine how its effectiveness, whereupon an improved version is built, and this process of trial and improvement is continued until the result is satisfactory. (Martin et al.)

## **Satellites**

Communication satellites orbit the earth. Information is transmitted as very high frequency radio signals to a satellite's transponder which boosts the signal and transmits it back again to any receiving antenna in its broadcast range which is capable of receiving it. Satellite transmission has two advantages over "terrestrial" transmission: the costs are the same no matter how extensive the downlink network is and no massive infrastructure of cable is required. The fibre-optic based communication alternative will offer more competition to the satellite market as costs decrease. (Keen<sup>b</sup>)

## **Virtual Interactive Business Environment.**

Computer-based pedagogical tools used within the context of the Business Navigator Method<sup>g</sup> to provide managers with interactive experiences in simulated business environments.

## **Virtual Reality (VR)**

Virtual reality (and its various synonyms including telepresence, artificial worlds, multi-sensory I/O, cyberspace, cyberreality) is a technology that enables the user to enter computer generated worlds and interface with them three-dimensionally (3-D) through sight, sound and touch. This interfacing is called immersion. The more the system captivates the senses, submerges the perceptual system and blocks out stimuli from the physical world, the more immersive the system. (Biocca, Carr<sup>a</sup>, Newquist)

VR is emerging from the research labs. It will only take a few years for the cumbersomeness of the sensors, computer feeds, motion detectors and video signal transmitters to be overcome and for costs to decrease. The equipment required to immerse into a virtual experience include eyephones and headpieces that govern the eyes and provide a photorealistic 3-D effect, 3-D or holophonic headphones and earphones that regulate sound to its virtual location - above, below, behind etc. and data gloves and touch sensors to provide synchronisation of movement in the simulated environment - this can take the form of gloves or a complete body suit.

A complete system was estimated between \$55,000 - \$255,000 in March 1992. Separately, the components were estimated at: powerful personal computer \$5,000-\$10,000; data glove \$6,000-\$15,000; headset \$6,000 - \$50,000; developer software \$1,500 - \$10,000. (Newquist)

## **WAN - Wide Area Network**

A wide area network, or WAN, involves complex transmission facilities of voice and data over widely separated corporate locations. A WAN usually uses point-to-point transmission through facilities owned by a number of organisations including public telephone networks. (Keen<sup>b</sup>, Martin et al.)

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