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# Towards Diagrammatic Hypermedia Authoring: Cognition and Usability Issues in Higher Education

## Appendices

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Geoff Elliott 1999

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# Appendix A

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# MAKING SENSE: A REVIEW OF HYPERMEDIA IN HIGHER EDUCATION

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**Abstract:** This paper explores some of the problems associated with the widespread development and use of hypermedia in higher education relating to motivational issues and technical difficulties associated with the authoring of hypermedia resources in an efficient and cost-effective manner. Concept maps have potential to enhance the development and use of hypermedia. The use and benefits of concept maps as 'CASE tools' for hypermedia development is discussed.

## 1 INTRODUCTION

Hypermedia is a cognitive tool, allowing students to explore and make sense of a knowledge corpus 'constructing' meaning in self motivated and self directed fashion and developing metacognitive skills [Jonassen, 1992], [Spiro et al., 1991]. For many, the use of advanced information technologies in higher education is seen as inevitable [McFarlane, 1990], for governments such use can underpin the strategic development of open and distance learning and support efficient academic delivery. In the UK £33.5 million has been invested in initiatives like TLTP and CTI [Darby, 1993a], [Darby, 1993b]. Hypermedia's potential in higher education has been much discussed [Oliveira, 1992], [Lennon & Maurer, 1994], [Linn, 1992] and its impact has been likened to the Gutenberg press [Thimbleby, 1992]. Despite enthusiasm, few teaching staff develop hypermedia applications with development time cited as the main reason for the lack of activity.

The aim of this paper is to: review the role of hypermedia in higher education; to consider hypermedia functionality, to review hypermedia authoring and environments and propose the application of concept mapping as a 'CASE tool' in the development and a 'note-taking tool' in the use of hypermedia thus placing hypermedia on a firmer pedagogical foundation.

## 2 THE ROLE OF HYPERMEDIA IN HIGHER EDUCATION

There is potential for hypermedia to support knowledge acquisition, through expansion of a learner's semantic network [Jonassen 1990]. One survey of academics shows a perception that computer - based learning, which arguably includes hypermedia, can allow students to learn at their own pace [Laurillard et al., 1993]. Hypermedia offers new ways to learn through the juxtaposition of text, animation and sound and offers the potential to alter the role of teachers and learners through the creation of a new dynamic form of interactive learning [Marchionini, 1988].

In terms of computer - based learning, hypermedia is perceived to offer learners complete control over the viewing of material [Misanchuk & Schweir, 1992]. Skilled learners can benefit from complete learner control [Steinberg, 1988], [McGrath, 1992] but caution must be taken to avoid cognitive overload [Zhao et al., 1993]. Some direction may be necessary for hypermedia to be an effective educational tool so it is perceived to be of benefit by the student, e.g. [Landow, 1990], [Whalley, 1990], [Beltran, 1993], [Laurillard, 1993].

'Direction' in hypermedia can come from adding instructional or pedagogical elements and least four approaches are currently being used:

- Intelligent tutoring through the incorporation of intelligence to the hypermedia corpus: the Star Guide system [Bruillard & Weidenfeld, 1990] includes an intelligent tutor, whereas the StrathTutor hypermedia system [Kibby & Mayes, 1993] helps direct the learner through a hypermedia knowledge corpus by calculating the most appropriate node to go to next, based on those already visited.
- Creation of hybrid hypermedia systems which contain interactive sequences: [Beltran, 1993] talks of a hybrid hypermedia model that contains directive sequences.
- Offering varying degrees of restriction according to the user's level of understanding. The question of who should determine variation in the level of restriction is interesting.
- Making the teacher responsible for giving direction, i.e. locate the hypermedia where it can complement rather than supplant the teaching-learning process. [Duffy & Knuth, 1990] talk of the need for setting 'goals' or authentic tasks in hypermedia interactions.

[Nelson & Palumbo, 1992] distinguish three different uses for hypermedia: knowledge presentation; knowledge construction; and knowledge representation. Arguably a good presentation system should explicitly represent the underlying knowledge. The use of hypermedia for knowledge construction is particularly interesting as the process of constructing knowledge can enhance learning. [Beeman et al., 1987] reporting their experiences of Intermedia identify that the constructors of the course material learnt most. [Reader & Hammond, 1994] have demonstrated that student post - test scores were enhanced by using concept mapping tools alongside hypertext, arguing that students should be encouraged to use cognitive tools to structure their thoughts. There was clear agreement at the NATO ASI on Cognitive Tools for Learning [Jonassen, 1992] that hypermedia can be used as a cognitive tool. [Reynold & Danserau, 1990]'s knowledge hypermaps are based on the idea that a hypermedia corpus is a semantic net and hence display the corpus as a net on the screen.

### 3 FUNCTIONALITY OF HYPERMEDIA SYSTEMS FOR HIGHER EDUCATION

The characteristics of basic hypermedia systems, nodes, links, networks and paths, are well documented [Jonassen, 1989]. [Halasz, 1988] has expressed ideas on the contents of hypermedia systems which coincide with those of [Park, 1991]. Some of these features are already standard in development tools such as ToolBook and KnowledgePro:

Feature	Example
Interface capability with hardware	Use of Videodisc for motion sequences in applications.
Interface with a high - level language	Use of the HyperTalk language with HyperCard.
Change of Window size and location.	Developers can create applications with windows that can be altered in size, location, using ToolBook or KnowledgePro
Opening multiple windows	Developers can create applications with many overlaying windows with tools such as ToolBook or KnowledgePro

Other features are still subject to research and development:

Feature	Research Example
Guidance for Node Selection	[Tomek & Maurer, 1992] and [Kibby & Mayes, 1993] describe systems that use algorithms to select the most appropriate link.
Addition of a Browser or Map	HyperCard has a summary window facility that shows the cards visited, similarly StrathTutor [Kibby & Mayes, 1993] has a back - track facility.
Node selection by keyword search	Separating the content from the links and thus avoiding out-dated links and facilitating key word searches [Davis et al., 1993], [Stubenrauch et al., 1993], [Mulhauser, 1992].
Automatic generation of new versions	No evidence of versioning found.

Table 1. Hypermedia Features

For hypermedia to become an effective medium on a firmer pedagogical footing , extra functionality is recommended. Firstly closer links with concept mapping tools would enhance learning. The facility to extract node and network information from the hypermedia into the student's personal concept map is analogous to note-taking. [Monk, 1990] suggests users should be allowed to select frequently visited nodes for inclusion in

a 'Personal Browser'. Secondly, a tailorable navigation logger auditing nodes visited would enable better understanding of hypermedia use and enhance design [Horney, 1993]. [Misanchuk & Schweir, 1992] consider that audit trails could be used for formative evaluation, allowing teachers to check material visited against test results. [Kelly, 1993] used SKEIM to monitor student usage of a hypermedia and to provide tutorial feedback. What is to be audited and the presentation format, e.g. tables or graphs, should be definable.

#### 4 HYPERMEDIA AUTHORING IN HIGHER EDUCATION

Enthusiasm for hypermedia has not manifested a plethora of activity. [Rode & Poirot, 1989] found that 65% of even computer literate staff at the University of North Texas were not disposed to writing educational software. Surveys reported by [Hammond et al., 1992] and corroborated by [Laurillard et al., 1993] and [Barker & Banerji, 1994], cited lack of time, lack of training and lack of support staff as the main reasons for non-use of new educational technologies (including hypermedia) by academics. Institutional support for staff developing innovative teaching and learning strategies is needed [Laurillard, 1993]. Some observers, e.g. [Junkala, 1991], are more optimistic and believe that almost anybody can produce college level courseware.

Students and teachers should contribute to creating and authoring of continually evolving campus-wide hypermedia information systems [Landow, 1992], [Stubenrauch et al., 1993]. The Microcosm system developed at Southampton University [Davis et al., 1993] is an excellent attempt at this. Within these growing information systems there is still a place for discrete hypermedia applications, carefully and purposely prepared for inclusion in particular curricula. These smaller, discrete, hypermedia systems are comparable to the composite nodes of the Dexter model [Halasz & Schwartz, 1994]. The educational benefit of these smaller, discrete hypermedia corpora has been open to debate [Stubenrauch et al., 1993] but can be made effective through a directive - instructional framework.

Discrete hypermedia systems are a reflection of the creator's understanding of the subject matter. Users would probably not be expected to modify the existing corpus but could construct their own 'subset' of the corpus. They could use a concept mapping tool to make their own 'sense' of the material, extracting from the hypermedia system, as required. This ability to annotate a subset of links and nodes from the discrete or global knowledge corpora corresponds to a student's notes reflecting lecture notes and wider reading of books and journals. Indeed, [Davis et al., 1993] suggest that hypermedia material should be added to the campus - wide corpus as explanatory notes.

#### 5 HYPERMEDIA AUTHORING ENVIRONMENTS

Whether authoring campus - wide or discrete hypermedia there are several possible development routes. The most likely choice for non-programming academic staff is the use of PC - based authoring environments. There are many such environments [Barker, 1993] which already provide the basic functionality outlined above. Those with links to high - level languages can provide the other features, albeit with a high programming overhead.

There is considerable benefit to finding ways to make hypermedia development very easy in terms of encouraging the academic community to overcome its tardiness with respect to hypermedia. If authoring hypermedia were as easy as word processing but provided more effective material then more widespread use would be made, in fact it could become the preferred medium. Ease of use is stressed [Barker, 1992]. Increased use of material developed elsewhere [Laurillard, 1993] addresses the issue of hypermedia use but begs the question of its development. In an attempt to facilitate instructionally-effective hypermedia production, a number of models and systems for hypermedia authoring are appearing, e.g. the Nestor [Mulhauser, 1992] and Hypercourseware [Siviter & Brown, 1992] models and systems. Some tools have additional functionality, e.g. the NEAT system [Mayer et al., 1993] extends ToolBook offering programming-free power with a variety of metaphors. A library of reusable units of learning material which can be supplemented would facilitate courseware production [Midoro et al., 1992]. The on-line ISAAC system [McAleese & Ching, 1993] integrates instructional design help with an authoring tool., other similar systems, e.g. HyperTactics [Jonassen & Harris, 1991], work off-line.

Another way would be by concept mapping the domain. Concept maps are easy to understand and easy to draw. If an authoring environment were to allow developers to 'draw' their subject domain on a screen as a

semantic net and then add the hypermedia features it would considerably facilitate development. Future authoring environments could allow the developer to toggle between different semantic views (concept maps) of the corpus being constructed and to augment the corpus from each view. Most authoring starts with the creation of some domain material, e.g. a short video sequence, with the links added afterwards. The semantic network grows as a 'by-product' of the design process, organically and implicitly. An alternative view of authoring would be the explicit expression of the semantic links followed by the addition of the domain material. Designing systems in this way would ensure that hypermedia corpora are linked in the most 'semantically - appropriate' manner. Concept mapping would thus be a 'CASE tool' for hypermedia development analogous to the use of entity-relationship modelling in database creation with similar benefits, i.e. more easily produced, more rational applications. This is similar to the approach adopted by [Reynolds & Danserau, 1990] with their Knowledge Hypermaps and ties in with the belief that cognitive tools should be used in conjunction with hypermedia to enhance learning. Students would be able to see the teacher's view of the domain and 'construct' their own views.

One pedagogical issue relates to students viewing the teacher's concept map. In a true constructivist sense students should 'construct' their own view. It is argued however, that if students are to use hypermedia, they are more likely to benefit from seeing the teacher's more coherent, deliberate and experienced perspective than any view which has arisen haphazardly. A second issue focuses around the ability of teachers to externalise and make explicit their own understanding of a subject. Knowledge elicitation has proven to be a surprisingly difficult activity for knowledge engineers. Attempting to create concept maps of subjects for hypermedia development may prove an enlightening activity.

## 6 DISCUSSION

Academie would like to see more computer - based education. Hypermedia, if properly located within the teaching and learning process offers the learner the possibility of a stimulating learning environment. However, there are several issues that need to be resolved before the hypermedia 'weapon' finds its place in a lecturer's armoury.

Time is the major obstacle impeding the increased use of computer - based learning, i.e. the time to learn the development packages, time to prepare the material and time to integrate or restructure the syllabus around the new computer - based material. Changing institutional attitudes to the production and use of hypermedia will require concerted effort [Laurillard, 1993].

Many academic staff are now becoming proficient with wordprocessors, probably due to the advent of cheap, easy to use packages and PCs which clearly make text production more efficient. Similarly, easy to use hypermedia authoring tools which produce more effective teaching materials are likely to revolutionise hypermedia development and use. The use of hypermedia as an alternative to traditional methods will not take place until a cost-benefit analysis shows a clear advantage to hypermedia. [Davis et al., 1993] quoting [Christie, 1990] estimate that it currently takes between 100 and 150 hours to produce one hour of hypermedia instruction even for experienced developers, an experienced lecturer preparing a one hour lecture session could produce the requisite material in less than 10 hours.

Hypermedia's great weakness is the degree of learner control [Laurillard, 1993]. Giving direction when a user engages with a hypermedia system can overcome this weakness and the easiest and arguably the best way is for the direction to come from the teacher.

Concept mapping could resolve some of the pedagogical and time constraints relating to the production of educational hypermedia. Post-processing of the concept map would result in the production of a skeletal hypermedia which could be enhanced by the addition of hypermedia material. Closely linking a concept mapping tool with the hypermedia corpus would enable learners to create their own view; extracting material as they browse. This view forms their notes which could be taken away on magnetic media.

Taking a concept mapping approach raises a number of fundamental issues. Creating a 'view' of a particular subject would seem simple in theory but may be more difficult in practice. A concept map may prove a transitory rather than definitive picture of the domain [Jonassen & Marra, 1994]. In well defined subject areas, where major interrelations are generally accepted, concept mapping may be neither difficult nor transitory.

Certainly, the explicit representation a domain, however transitory, can only be seen as beneficial to promoting debate.

Externalising knowledge through concept mapping is one thing, doing this directly on a computer is another. The analogy here is of people who create with pen and paper and use the computer to present the creative work. Pen and paper are the creative medium. Better word processing packages can facilitate composition directly at the keyboard. To similarly facilitate the development of hypermedia would seem a sensible and, through concept mapping, tangible, goal.

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## THE APPLICATION OF CONCEPT MAPPING TO HYPERMEDIA AUTHORING

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**Abstract:** The development of computer-based learning packages is an extremely time consuming process for subject specialists inexperienced in hypermedia authoring. Considerable difficulties can arise as a consequence of 'cognitive overload' for two reasons: (1) having to organise the content: and (2) having to represent this using an appropriate hardware / software environment.

Unfortunately, most hypermedia authoring tools are either extremely prescriptive (and so, can constrain developers) or else, they are extremely complicated to use. The strategic importance of a very simple approach to hypermedia authoring therefore cannot be ignored.

There is a considerable similarity between the technique of concept mapping (as a means of knowledge representation) and the uses of hypermedia (as a means of knowledge emulation). Both techniques represent knowledge domains diagrammatically using graph structures that involve a set of nodes that are connected together by means of labelled and directed arcs. Obviously, the expressiveness of any concept mapping tool that is used for hypermedia authoring must be sufficient to reflect the comprehensive range of hypermedia structures that developers have to produce. Given that this is the case, a potential developer should be able to a selected concept mapping tool in order to explore the knowledge domain of interest; then by means of a suitable 'post-processing' system the resultant model could be compiled into an appropriate skeletal hypermedia knowledge corpus.

The paper explores the similarity between concept mapping and hypermedia modelling of a knowledge corpus. It attempts to evaluate the functionality of the currently available PC-based concept mapping tools in order to determine their potential for use as intermediaries in the hypermedia authoring processes. Some recommendations are then made on the ways in which concept mapping tools could be augmented in order to produce a software systems that is sufficiently expressive for the tasks involved in hypermedia authoring-but which reduces the cognitive overhead for potential developers.

## INTRODUCTION

Hypermedia is a cognitive tool, allowing students to explore and make sense of a knowledge corpus 'constructing' meaning in self motivated and self directed fashion, developing metacognitive skills (Jonassen; 1992, Spiro et al.; 1991). For many, the use of advanced information technologies in higher education is seen as inevitable (McFarlane; 1990), for governments such use can underpin the strategic development of open and distance learning and support efficient academic delivery. In the UK £33.5 million has been invested in initiatives like TLTP and CTI (Darby; 1993a, Darby; 1993b). Hypermedia's potential in higher education has been much discussed (Oliveira; 1992, Lennon & Maurer; 1994, Linn; 1992) and it's impact has been likened to the Gutenberg press (Thimbleby; 1992). Despite enthusiasm, few teaching staff develop hypermedia applications with development time cited as the main reason for the lack of activity. Time is taken in the organisation of the content into an appropriate format for multimedia presentation and the mastering of the authoring tool before an effective hypermedia can be developed. To do these processes simultaneously can lead to 'cognitive overload'.

The aim of this paper is to: consider hypermedia authoring; determine what makes effective educational hypermedia; explore the application of concept mapping as a 'CASE tool' in the development of educationally effective hypermedia; and examine the functionality of existing concept mapping tools to determine their suitability to this task.

## HYPERMEDIA AUTHORING IN HIGHER EDUCATION

Enthusiasm for hypermedia has not manifested a plethora of activity. Rode & Poirot (1989) found that 65% of computer literate staff at the University of North Texas were not disposed to writing educational software. Surveys reported by Hammond et al. (1992), and corroborated by Laurillard et al (1993) and Barker & Banerji (1994), cited lack of time, lack of training and lack of support staff as the main reasons for non-use of new educational technologies (including hypermedia) by academics. Institutional support for staff developing innovative teaching and learning strategies is needed (Laurillard; 1993). Some observers (e.g. Junkala; 1991) are more optimistic and believe that almost anybody can produce college level courseware.

Students and teachers should contribute to creating and authoring of continually evolving campus-wide hypermedia information systems (Ladow; 1992, Stubenrauch et al.; 1993). The Microcosm system developed at Southampton University (Davis et al.; 1993) is an excellent attempt at this. Within campus-wide information systems there is still a place for discrete hypermedia applications, carefully and purposely prepared for inclusion in particular curricula. These smaller, discrete, hypermedia systems are comparable to the composite nodes of the Dexter model (Halasz & Schwartz; 1994). The educational benefit of these smaller, discrete hypermedia corpora has been open to debate (Stubenrauch et al.; 1993) but can be made effective through a directive-instructional framework.

Discrete hypermedia systems are a reflection of the creator's understanding of the subject matter. Users would probably not be expected to modify the existing corpus but could construct their own 'subset' of the corpus. They could use a concept mapping tool to make their own 'sense' of the material, extracting from the hypermedia system, as required. This ability to annotate a subset of links and nodes from the discrete or global knowledge corpora corresponds to a student's notes, integrating lecture material with wider reading of books and journals. Indeed, Davis et al. (1993) suggest that hypermedia material should be incorporated with the campus-wide corpora as explanatory notes to the lecturer's own discrete hypermedia.

## HYPERMEDIA AUTHORIZING ENVIRONMENTS

Whether authoring campus-wide or discrete hypermedia there are several possible development routes. The most likely choice for non-programming academic staff is the use of PC-based authoring environments. There are many such environments (Barker; 1993) which already provide basic functionality. Those with links to high-level languages can provide the other more sophisticated features like interactivity, albeit with a high programming overhead.

There is considerable benefit to finding ways to make hypermedia development very easy in terms of encouraging the academic community to overcome its tardiness with respect to hypermedia. If authoring hypermedia were as easy as word processing but provided more effective material then more widespread use would be made, in fact it could become the preferred medium. Ease of use is stressed (Barker; 1992). Increased use of material developed elsewhere (Laurillard; 1993) addresses the issue of hypermedia use but begs the question of its development. In an attempt to facilitate instructionally-effective hypermedia production, a number of models and systems for hypermedia authoring are appearing, e.g. Nestor (Mulhauser; 1992) and Hypercourseware (Siviter & Brown; 1992). Some tools have additional functionality, e.g. the NEAT system (Mayer et al.; 1993) extends ToolBook® with programming-free power and a variety of metaphors. A library of reusable units of learning material which can be supplemented would facilitate courseware production (Midoro et al.; 1992). The on-line ISAAC system (McAleese & Ching; 1993) integrates instructional design help with an authoring tool - other similar systems, e.g. HyperTactics (Jonassen & Harris; 1991), work off-line.

Another way to facilitate multimedia development would be through concept mapping the domain. Concept maps are, at least superficially, easy to understand and easy to draw. If an authoring environment allowed developers to 'draw' their subject domain on a screen as a semantic net and then add the hypermedia features this would considerably facilitate development. Future authoring environments could allow toggling between different semantic views of the corpus being and augmentation from each view. Most authoring starts with the creation of some domain material, e.g. a short video sequence, and then the links are added. The semantic network grows as a 'by-product' of the design process, organically and implicitly. An alternative view of authoring would be the explicit expression of the semantic links followed by the addition of the domain material. Designing systems in this way should ensure that hypermedia corpora are linked in the most 'semantically-appropriate' manner. Concept mapping would thus be a 'CASE tool' for hypermedia development analogous to the use of entity-relationship modelling in database creation, with similar benefits, i.e. more easily produced, more rational applications. This is similar to the approach adopted by Reynolds & Danserau (1990) with their Knowledge Hypermaps and ties in with the belief that cognitive tools should be used in conjunction with hypermedia to enhance learning. Students would be able to see the teacher's view of the domain and 'construct' their own views.

One pedagogical issue relates to whether students benefit from seeing the teacher's concept map - in true constructivist sense students 'construct' their own view when learning. When students use hypermedia, they are more likely to benefit from seeing the teacher's more coherent, deliberate and experienced perspective than any view which has arisen haphazardly as a by-product of the design process. A second issue focuses around the ability of teachers to externalise and make explicit their own understanding of a subject. Knowledge elicitation has proved a surprisingly difficult activity for knowledge engineers. Attempting to create concept maps of subjects for hypermedia development may prove an enlightening activity.

## WHAT MAKES EDUCATIONALLY EFFECTIVE HYPERMEDIA?

Jonassen & Grabinger (1990) list knowledge seeking, knowledge acquisition and problem solving as the main ways in which it is possible to learn with hypermedia. Hypermedia should support search and query for knowledge seeking and retrieval. Hypermedia supports the knowledge acquisition processes of accretion, restructuring and tuning of existing cognitive schema. Complex real world problems with their multifaceted, multi-perspective issues and views can be instantiated in a Hypermedia corpus.

Laurillard (1993) is critical of the value of 'plain' hypermedia in higher education, describing it as essentially un-interactive - a sophisticated information base but not an effective tool for teaching.

There are a number of taxonomies for hypermedia structure e.g. (Leggett et al; 1990; Ross; 1990), but there is no list of preferred structures for educational hypermedia, indeed there is no reason why an application should not encompass a number of different structures. Hutchings et al (1992) present a taxonomy of educational

hypermedia with engagement (active - passive), control (student - teacher) and synthesis (presentation - creation) being the major parameters which have bearing on the quality of educational hypermedia. Current hypertext/hypermedia applications provide the learner with passive engagement, significant control and zero synthesis. Hutchings et al. (1992) advocate a move from this generation of hypermedia towards providing active engagement and constructive synthesis. Barker (1993) cites self-generated tours, annotation facilities, creation of concept maps and co-working with other users as examples of what new generation applications should contain. It would also be possible to create simulations and microworlds in a hypermedia corpus to help support problem solving. Hypermedia application to problem based learning, allowing the learner to search the domain in a variety of views, ways and perspectives, is highly desirable (Spiro et al.; 1991; Savery & Duffy; 1994) and this approach is well-grounded in educational theory (Piaget; 1977). Beltran (1993) talks of a hybrid hypermedia model that contains directive, thus interactive, sequences which enhance engagement. These approaches to hypermedia development should go some way towards addressing Laurillard's concerns.

Mayes et al. (1990) advocate that hypermedia applications should come with good search and query facilities, distinguishing between spatial and conceptual disorientation and stressing that some conceptual disorientation in the use of a hypermedia can be a good thing for learning. Problems associated with spatial disorientation - 'lost in hyperspace' - seem to receded (Landow; 1990, Ellis et al.; 1993).

The work carried out by Ellis et al (1993) indicates the need for applications to support many modes of usage - learning styles. There are a plethora of learning style taxonomies, however as Stanton and Baber (1992) note these could result from the design of the courseware used rather than reflecting any universal set of learning styles, the important principle here is that the learning environment should be sufficiently flexible to allow the user to adopt their preferred style during use.

The size of nodes appropriate to education is still subject to debate and research - McAleese (1990) gives guidelines on appropriate node size depending on the degree of consensus surrounding the knowledge domain.

In summary, more educationally effective hypermedia will come with new generation applications featuring:

- Multifaceted, multiperspective views of real world problems / issues;
- Active engagement;
- Flexible support of a number of different structures;
- Good search and query facilities;
- Support of different learning styles;
- Interactive sequences;
- Appropriate node size.

## MAPPING CONCEPT MAPS TO HYPERMEDIA

Concept maps correspond well with basic hypermedia as illustrated in table 1 below:

Concept Map		Hypermedia
Feature	Attribute	
Knowledge Chunk or Concept	Identification	Name of object Name of page Name of composite object Name of Window
	Size and Complexity	Whole screen/page Part of screen/page Set of objects Single object Single window Set of windows e.g. child/parent
	Annotation	Material attached to object, window etc.
Links	Identification	Name of button, hotword, hotregion, pull down menu option
	Direction	Single/Two way button Single/Two way Hotword Single/Two way Hotregion
	Annotation	Interim displayed content between hyperlinks
Semantic proximity of concepts (represented by thickness of directed arc or spatial proximity of concepts)		Explicit hyperlinks rather than selection from a list

Table 1: Mapping concept maps to hypermedia

How can the features required of educationally effective hypermedia be reflected in a concept map? Heeren (1992) has investigated the functions of concept mapping tools as listed below,. Unfortunately, not all these functions are to be found in any one tool.

- Submap-hierarchical
- Submap-zoom
- Outliner
- List of concepts
- List of relations
- Logical find function
- "Fileboxes for organising concepts hierarchically"
- 3D representation
- Text can be attached to concepts
- Graphics can be attached to concepts
- Text can be attached to relations
- Graphics can be attached to relations
- Selective representation of concepts and relations
- Computation and representation of concept centrality
- Dynamic path presentation
- Formulate and answer questions (self test)
- Mask concepts (self test)
- Mask relations (self test)

Some of these functions partially map to the requisite features needed in educationally effective hypermedia shown in table 2 below:

Hypermedia Feature	Concept Mapping Function
<b>Requisite for Educational Effectiveness</b>	
Multifaceted, multiperspective views of real world problems	Fileboxes for organising concepts hierarchically Sub-map hierarchical
Active engagement	Text can be attached to concepts Graphics can be attached to concepts Text can be attached to relations

Flexible support of a number of different structures	Graphics can be attached to relations Sub-map hierarchical Fileboxes for organising concepts hierarchically
Good search and query facilities	List of Concepts List of relations Logical find function
Support of different learning styles	Selective representation of concepts and relations
Interactive sequences	Formulate and answer questions (self test) Mask concepts (self test) Mask relations (self test)

**Table 2: Mapping Requisite features of educationally effective hypermedia against concept mapping tool functionality.**

Despite the above correspondences, existing concept mapping tool functions do not sufficiently facilitate educationally effective hypermedia, even if all the functions were all available in one tool. Active engagement and the provision of search and query facilities are dynamic features of a hypermedia, therefore any corresponding functionality available in concept mapping tools would be irrelevant. There is probably merit in making these functions similar in both concept maps and hypermedia for reasons of consistency and parsimony.

The interactive sequences found in some concept mapping tools, e.g. formulation of tests, masking of concepts and relations, are a starting point and post-processing into a skeletal hypermedia would be useful. Further work is required to see how interactive post-processed concept map hypermedia (PPCMH) could be.

The provision of multiple perspectives and views of a problem or domain requires different concept maps with different semantic links for each of the multiple views and perspectives. Different views/perspectives would need to be overlaid. No concept mapping tool, it seems, currently provides this facility.

PPCMH must result in applications that accommodate as wide a variety of learning styles as possible. McAleese (1990) suggests that creating the maximum number of links between the nodes of the hypermedia facilitates multiple learning styles. Multiple links in the hypermedia would correspond to multiple semantic connections in the concept map.

A concept mapping tool that has facilities for creating concept-hierarchy, submaps and submap-hierarchy should, in principle, be able to reflect any hypermedia structure.

## DISCUSSION

Academe would like to see more computer-based education. Hypermedia, if properly located within the teaching and learning process offers the learner the possibility of a stimulating learning environment. However, there are several issues that need to be resolved before the hypermedia 'weapon' finds its place in a lecturer's 'armoury'.

Time is the major obstacle impeding the increased use of computer-based learning, i.e. time to learn the development packages, time to prepare the material and time to integrate or restructure the syllabus around the new computer-based material. Many



academic staff are now becoming proficient with wordprocessors probably due to the advent of cheap, easy to use packages and PCs which clearly make text production more efficient. Similarly, easy to use hypermedia authoring tools which produce more effective teaching materials are likely to revolutionise hypermedia development and use. The use of hypermedia as an alternative to traditional methods will not take place until a cost-benefit analysis shows a clear advantage to hypermedia. (Davis et al.; 1993) quoting (Christie; 1990) estimate that it currently takes between 100 and 150 hours to produce one hour of hypermedia instruction even for experienced developers, an experienced lecturer preparing a one hour lecture session could produce the requisite material in less than 10 hours.

Concept mapping could resolve some of the pedagogical and time constraints relating to the production of educational hypermedia. Post-processing of the concept map would result in the production of a skeletal hypermedia which could be enhanced by the addition of hypermedia material and functionality. Closely linking a concept mapping tool with the hypermedia corpus would enable learners to create their own view; extracting material as they browse. This view would form notes which could be taken away on magnetic media.

Taking a concept mapping approach raises a number of fundamental issues. Creating a 'view' of a particular subject would seem simple in theory but may be more difficult in practice. A concept map may prove a transitory rather than definitive picture of the domain (Jonassen & Marra; 1994). In well defined subject areas, where major interrelations are generally accepted, concept mapping may be neither difficult nor transitory. Certainly, the explicit representation a domain, however transitory, can only be seen as beneficial to promoting debate.

Externalising knowledge through concept mapping is one thing, doing this directly on a computer is another. The analogy here is of people who create with pen and paper and use the computer to present the creative work. Pen and paper are the creative medium. Better word processing packages can facilitate composition directly at the keyboard. To similarly facilitate the development of hypermedia would seem a sensible and, through concept mapping, tangible, goal.

Creating basic hypermedia from a concept map would seem possible. Creating educationally effective hypermedia may be significantly more difficult. The main problem is enabling the representation of multiple perspectives within the same concept map and the mapping of these into the resultant hypermedia.

There is not an existent computer-based concept mapping tool which can support parallel views of a cognitive domain and its potential to facilitate hypermedia development. Implementation of PPCMH could provide the key to parallel views requisite for realising educationally effective hypermedia.

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## Authoring Semantic Hypermedia: A Concept Mapping Approach

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**Abstract:** Multimedia/hypermedia authoring is a phased process, each phase posing particular problems: learning/mastering the software; expression of a knowledge domain into a suitable structural format for 'computerisation'; identification and development of appropriate resources for inclusion in the final product and finally transposition of resource materials into a hypermedia application. Often these phases take place simultaneously increasing the already high cognitive overhead. This paper recognises the growing use of concept maps to mitigate some of the problems associated with hypermedia authoring.

There is a considerable similarity between concept maps (as a means of knowledge representation) and hypermedia structures (for knowledge emulation). The similarity is even closer for hypermedia designed to deliberately reflect the underlying structural knowledge of a domain, ie semantic hypermedia. Both techniques represent knowledge domains diagrammatically using graph structures that involve a set of nodes connected by means of labelled and directed arcs. This similarity can be exploited in the hypermedia authoring process.

Hypermedia applications designed for education must be effective in enhancing the learning process, otherwise they become nothing more than sophisticated information bases. This paper explores the functionality of computer-based concept mapping tools and educationally effective hypermedia development. There are other authoring programmes that take a graphical approach to authoring, however these focus on flow diagramming and tend to prescribe the order in which the material is viewed and activated. This paper describes *SHAPE*<sup>®</sup>, a prototype concept mapping tool interface to - Asymetrix ToolBook<sup>®</sup>. *SHAPE*<sup>®</sup> is designed to facilitate semantic hypermedia authoring whilst reducing the cognitive overhead of expressing a knowledge domain. *SHAPE*<sup>®</sup>, therefore, allows a developer to explore the knowledge domain of interest, and then, through suitable 'post-processing', compile the resultant model into a skeletal hypermedia knowledge corpus.

## PROBLEMS WITH AUTHORING

Some observers eg [1] are optimistic that almost anybody can produce college level courseware. However, enthusiasm for hypermedia (also used here to include the subset of multimedia) has not manifested a plethora of development. Rode and Poirot [2] found that 65% of computer literate staff at the University of North Texas were not disposed to writing educational software. Surveys reported by Hammond et al [3] and corroborated by Laurillard et al [4] and Barker and Banerji [5], cited lack of time, lack of training and lack of support staff as the main reasons for non-use of new educational technologies (including hypermedia) by academics. Institutional support for staff developing innovative teaching and learning strategies is needed [6].

## THE RELEVANCE OF CONCEPT MAPS FOR HYPERMEDIA DEVELOPMENT

Concept mapping of a knowledge domain offers a route for multimedia development. Concept maps are, at least superficially, easy to understand and easy to draw. If an authoring environment allowed developers to 'draw' their subject domain on a screen as a semantic net and add the hypermedia features afterwards it would considerably facilitate development.

Some recent authoring environments allow toggling between different semantic views of the corpus to some extent and some enable augmentation from each view.

Reynolds and Danserau [7] have developed their idea of Knowledge Hypermaps which are rich in graphical detail of the hypermedia. Freeman and Ryan [8], and Kommers [9] have focused on the use of concept maps to facilitate collaborative authoring. Miller [10] and Elliott et al [11] have constructed tools that sit on the front end of ToolBook® and allow the author to construct concept maps of their domain which are then 'post-processed' into hypermedia structures. Zeiliger et al [12] have added a concept mapping tool to their existing hypermedia applications.

Most authoring progresses with the creation of some domain material, eg a short video sequence, sound overlay, chunks of text and mingled with the addition of links, eg buttons, hot words. The semantic network grows as a 'by-product' of the design process, organically and implicitly. An alternative view of authoring would be the expression of the nodes and the semantic links followed by embellishment of the nodes and links through the addition of domain material. Such an approach to the design of hypermedia systems should ensure that hypermedia corpora are linked in the most 'semantically-appropriate' manner. The concept mapping approach to authoring can be considered to be a 'CASE tool' for hypermedia development, analogous to the use of entity-relationship modelling in database creation and with similar benefits ie more easily produced and more rational applications. Students should be able to explore the teaching and learning resources through the teacher's view of the domain and then 'construct' their own view(s) of the domain linking in additional materials, as appropriate.

There is an issue here of the ability of teachers to externalise their knowledge and make explicit their own understanding of a subject. Knowledge elicitation has proved surprisingly difficult for knowledge engineers in the development of expert systems. Attempting to create concept maps of subjects for hypermedia development may prove an enlightening activity for some teachers and could be similarly applied in other areas, eg expert system development, to facilitate applications development.

## CORRELATING CONCEPT MAPS WITH HYPERMEDIA

Concept maps correspond well with basic hypermedia as illustrated in Table 1 and thus provide an appropriate paradigm for exploration in hypermedia development. Heeren [13] has listed the functionality of stand-alone concept mapping tools (see Table 2) although, not all these functions can be found in one extant tool.

Table 1 here

Table 2 here

Elliott et al [14] have discussed the requisite features for the new generation of educationally effective hypermedia:

- Multifaced, multiperspective views of real world problems/issues;
- Active engagement;
- Flexible support of a number of different structures;
- Good search and query facilities;
- Support for different learning styles;
- Interactive sequences;
- Appropriate node size.

The output from any authoring tool and including ones based on concept mapping, must ensure that the product is educationally effective. Some of the features required for educationally effective hypermedia partially map to concept mapping tool functionality as shown in Table 3.

Table 3 here

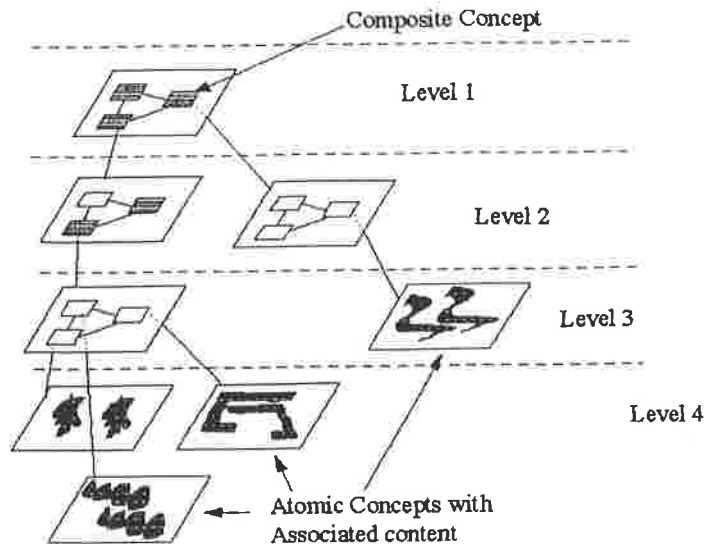
The features requisite for educationally effective hypermedia that are not supported by currently available concept mapping tools or hypermedia authoring packages, are: active engagement; the provision of multiple perspectives; support for different learning styles. Of these, active engagement is probably the most important requisite for educationally effective hypermedia. The ability to append text and graphics allows only superficial engagement. One simple solution would be to allow the learner to be the author and teacher. Once a hypermedia application has been created by a teacher, the learner should be allowed to append, edit, add and delete parts, as desired. Hypermedia should change the role of teachers and learners, creating a new dynamic of interactive learning for both teacher and student alike [14]. Support for different learning styles is dependent upon how hypermedia is applied in the teaching-learning process and thus, will also effect the level of student engagement. As Laurillard [6] points out, most current hypermedia applications are nothing more than sophisticated information access systems, ie electronic books and it is the way they are deployed within the teaching-learning process that is crucial to success. A supplementation approach rather than supplantation seeming appropriate.

The provision of multiple perspectives and views of a problem or domain would require the overlaying of concept maps, each representing a different perspective. There is not an extant concept mapping tool which provides this functionality.

Hypermedia produced from concept maps must result in applications that accommodate as wide a variety of learning styles as possible. McAleese [15] suggests that maximising the number of links between the nodes of a hypermedia application facilitates multiple learning styles. Multiple links in the hypermedia material would correspond directly to multiple semantic connections in the underlying concept map.

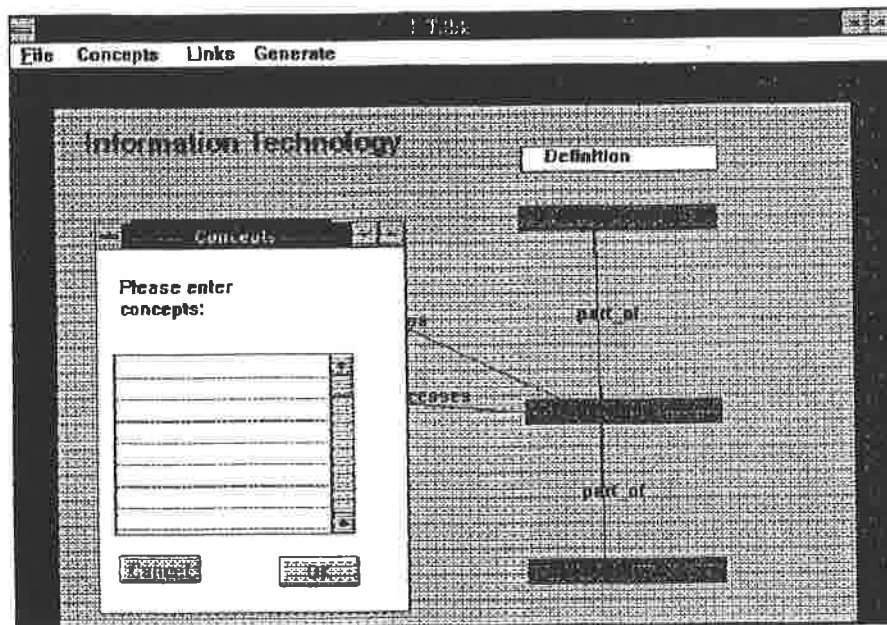
## THE OPERATION OF *SHAPE*®

*SHAPE*® is built in ToolBook® and produces skeletal ToolBook® 'books'. ToolBook® was selected because it is rapidly becoming the de facto standard for multimedia development in the UK. *SHAPE*® is a tool which acts as an interface or 'front end' to ToolBook®. *SHAPE*® is designed with a very simple interface so that the learning curve is short and hence can improve access for teaching staff who find progression beyond a word processing application a challenge. It may prove ironic to add many features and functions to *SHAPE*® only to lose the goal of low cognitive overhead. *SHAPE*® works on the principle 'top - down' design, i.e. an author starts by drawing the top level concept map of a domain which is then deconstructed into a set of second level concept maps and so on until the author has deconstructed the whole subject domain into a set of 'atomic' concepts. These atomic concepts are then post-processed to create a skeletal hypermedia with each concept having an associated screen dedicated to its content as illustrated in Figure 1.



**Figure 1: Concept Map Hierarchy in *SHAPE* showing composite and atomic concepts and associated content pages for atomic concepts**

Figure 2 shows the opening screen for *SHAPE*, which is being used to develop a concept map of the subject 'Information Technology'. Concepts can be input via the concept input box at any time during the authoring session. Once the concepts have been linked as desired it is possible to make some concepts 'composite' as indicated by the shading of the concept 'technology' in figure 2. Composite concepts become submaps in their own right hence deconstructing the concept map to the next level.



**Figure 2: Top level concept for 'Information Technology' with input dialogue box showing**

The top level concept map is then processed to create the skeletal ToolBook book. Each concept name is converted into a hotword that takes user to a newly generated template ToolBook page. Figure 3 below shows the atomic page for 'Definition'. The composite page for 'technology' is a blank



second level concept map with a hyperlink back to the top level concept map. The author subsequently adds the content into the page for each concept.

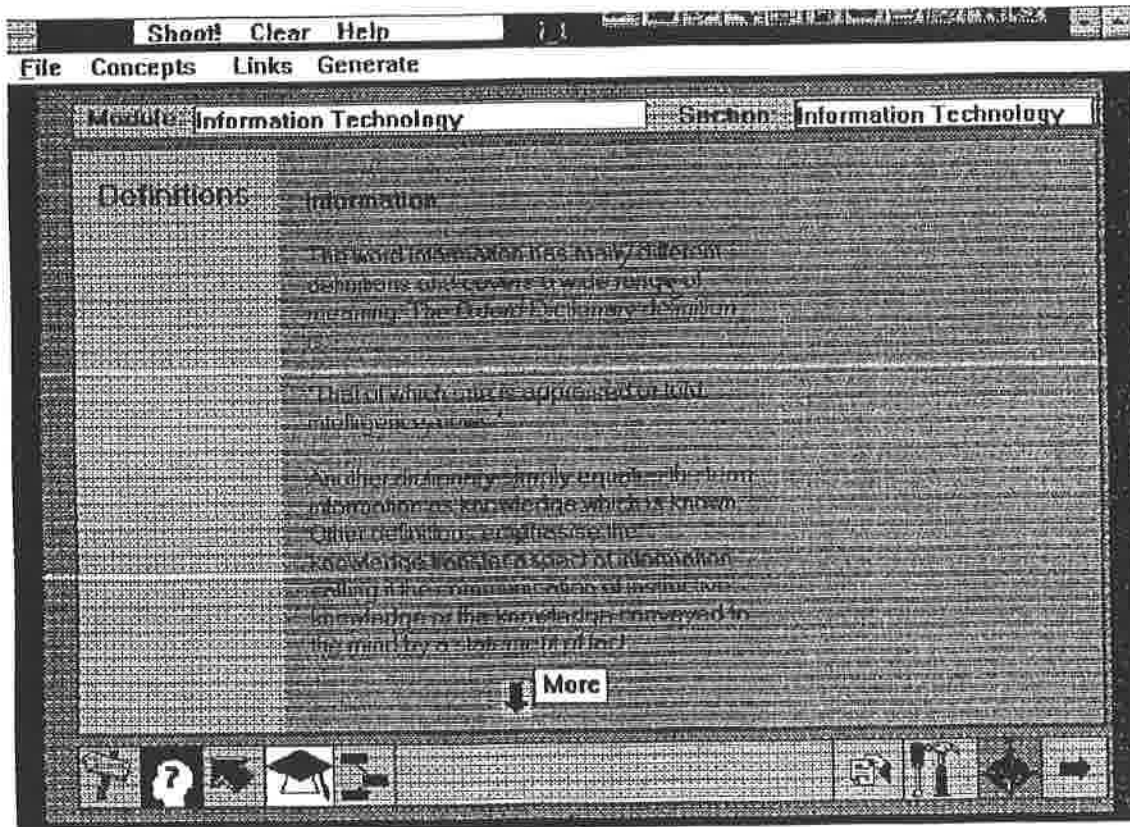


Figure 3: Content screen/page for atomic concept 'Definitions'

The semantic links between concepts are manifest as a list of optional hyperlinks to other pages as shown in figure 3 below for the concept 'Printers'.

The final product is a ToolBook® 'book' comprising of concept maps and corresponding content pages with hyperlinks corresponding to the directional arcs on the concept maps.

## ISSUES RELATING TO SHAPE®

### *Links and link direction*

SHAPE®, in common with some other concept mapping tools, has no directionality associated with the links because the semantics are in a sense reciprocal and users form their own ideas of the semantics between concepts. It is sufficient for the author to acknowledge that a significant connection exists between two or more concepts. Concepts do not necessarily need to be linked and in some cases clarity may be enhanced by not linking them, for instance the page 'People' may contain a set of concepts detailing the people likely to be involved with IT but there may be little or no relation between them.

### *Cross referencing and relating*

A facility to relate concepts at different levels within the hierarchy may be necessary. There is also a problem related to concepts bearing the same name but have very different context, content or meaning, for instance the possibility of several pages all being called 'Definition' is very likely.

### *Disorientation*

There is a possibility of user disorientation with multiple level concept maps, however there are standard search tools built into *SHAPE*® which should mitigate some disorientation.

### *Additional Functionality*

The analysis of educationally effective hypermedia above highlights the need for the development of *SHAPE*®, however as already noted there is a trade off between an easy to use tool and the likelihood of more primitive applications and a sophisticated tool that produces educationally effective hypermedia but requires considerably more effort in its use.

### *Comparisons with other Graphical Authoring Packages*

Packages like Authorware Professional™ and Icon Author™ adopt a graphical approach to authoring. The principle behind these programmes is the control flow diagram, so that the author decides beforehand what decisions the user should make and where in the hypermedia they navigate. There is some merit in controlling learner navigation particularly for novice learners, where the author/teacher can ensure particular material is activated however the danger is that learners become stifled. A concept mapping approach leads to hypermedia applications where learners can make their own navigation decisions, hence indirectly supporting them with different learning styles. The optimum solution is probably to support both types of hypermedia structure.

### **EVALUATION AND TESTING OF *SHAPE*®**

*SHAPE*® is being developed to facilitate the development of hypermedia learning materials from the learning/mastering of authoring software, expressing a knowledge domain in a suitable structural format for 'computerisation'; identification and development of appropriate resources for inclusion in the final product; and finally the transposition of resource materials into a hypermedia corpus. Therefore the focus for the evaluation of *SHAPE*® will consider each of these phases. The pedagogical evaluation of material developed with *SHAPE*® will be necessary but is beyond the scope of the current work.

### **DISCUSSION**

Many Academic organisations would welcome more material to support open and distance learning. The appropriate location of hypermedia in the teaching and learning process and appropriate enhancement offers learners the possibility of a stimulating learning environment. However, there are several issues that need to be resolved before the hypermedia 'weapon' finds its place in a lecturer's 'armoury'.

Time is the major obstacle to the increased use of computer-based learning, ie: time to learn the development packages; time to prepare the material; time to integrate or restructure a curriculum around the new computer-based material. Many academic staff are now becoming proficient with word processors probably due to the advent of cheap, easy to use packages and PCs which clearly make text production more efficient. Similarly, easy to use hypermedia authoring tools which produce more effective teaching materials would be likely to revolutionise hypermedia development and use. The use of hypermedia as an alternative to traditional methods will not take place until a cost-benefit analysis shows a clear advantage to hypermedia. Davis et al [16] quoting Christie [17] estimate that it takes between 100 and 150 hours to produce one hour of hypermedia instruction even for experienced developers, an experienced lecturer preparing a one hour lecture session could produce the requisite material in less than 10 hours. Whilst in the short term a cost-benefit analysis will show traditional approaches to have the edge, in the longer term and in the context of open and distance learning, hypermedia starts to win providing major increases in flexibility.

Concept mapping could resolve some of the pedagogical and temporal issues associated with the production of educational hypermedia. Post-processing of concept maps would result in the production of a skeletal hypermedia which could be enhanced by the addition of hypermedia material

and functionality. Closely linking a concept mapping tool with the hypermedia corpus would enable learners to create their own view(s), extracting material as they browse. This view would form notes which could be taken away on magnetic media.

The adoption of a concept mapping approach to hypermedia development raises a number of fundamental issues. Creating a 'view' of a particular subject would seem simple in theory but may be more difficult in practice. A concept map may prove a transitory, rather than definitive, picture of the domain [18]. In well-defined subject areas, where major interrelations are generally accepted, concept mapping may be neither difficult nor transitory, can only be seen as beneficial to promoting debate.

Expressing knowledge through concept mapping is one thing, doing this directly on a computer is another. The analogy here is of people who create with pen and paper and use a computer to present the creative work. Pen and paper are the creative medium. Better word processing packages can facilitate composition directly at the keyboard. Similarly, to facilitate the development of hypermedia through concept mapping would seem a sensible and tangible goal.

Creating basic hypermedia from a concept map has been achieved with the *SHAPE*® prototype. Creating educationally-effective hypermedia may be significantly more difficult. The main problem is enabling the representation of multiple perspectives within the same set of concept maps and the mapping of these into the resultant hypermedia. There are no computer-based concept mapping tools which can support parallel views of a cognitive domain and its potential to facilitate hypermedia development. Future versions of *SHAPE*® could provide the key to parallel views, one of the requisites for educationally effective hypermedia. The other vital issue relates to the way in which hypermedia is used; simply allowing a user to wander around within the hypermedia without purpose is quite futile. Some form of narrative, storey-line or guided discovery mechanism is needed in order to 'make sense' of a hypermedia corpus [14]. It is essential also that users have learning objectives and activities embedded within the hypermedia, i.e. active engagement.

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Concept Map		Hypermedia
Feature	Attribute	
Knowledge Chunk or Concept	Identification	Name of object Name of page Name of composite object Name of Window
	Size and Complexity	Whole screen/page Part of screen/page Set of objects Single object Single window Set of windows e.g. child/parent
	Annotation	Material attached to object, window etc.
Links	Identification	Name of button, hotword, hotregion, pull down menu option
	Direction	Single/Two way button Single/Two way Hotword Single/Two way Hotregion
	Annotation	Interim displayed content between hyperlinks
Semantic proximity of concepts(represented by thickness of directed arc or spatial proximity of concepts)		Explicit hyperlinks rather than selection from a list

Table 1: Mapping concept maps to hypermedia

- Sub-map hierarchical
- Submap-zoom
- Outliner
- List of Concepts
- List of relations
- Logical find function
- Fileboxes for organising concepts hierarchically
- 3D representation
- Text can be attached to concepts
- Graphics can be attached to concepts
- Text can be attached to relations
- Graphics can be attached to relations
- Selective representation of concepts and relations
- Computation and representation of concept centrality
- Dynamic path presentation
- Formulate and answer questions (self test)
- Mask concepts (self test)
- Mask relations(self test)

Table 2: Functionality of Concept Mapping Tools [13]

<b>Hypermedia Feature Requisite for Educational Effectiveness</b>	<b>Concept Mapping Function</b>
Multifaceted, multiperspective views of real world problems	Fileboxes for organising concepts hierarchically Sub-map hierarchical
Active engagement	Text can be attached to concepts Graphics can be attached to concepts Text can be attached to relations Graphics can be attached to relations
Flexible support of a number of different structures	Sub-map hierarchical Fileboxes for organising concepts hierarchically
Good search and query facilities	List of Concepts List of relations Logical find function
Support of different learning styles	Selective representation of concepts and relations
Interactive sequences	Formulate and answer questions (self test) Mask concepts (self test) Mask relations(self test)

**Table 3: Mapping Requisite features of educationally effective hypermedia against  
concept mapping tool functionality.**

# AUTHORING SEMANTIC HYPERMEDIA: A CONCEPT MAPPING APPROACH

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## 1. The Authoring Dilemma

Most teaching staff can use a word processing package and, perhaps, a drawing package, but would stall at the challenge of progressing to more complex software packages. The multimedia/hypermedia authoring process consists of a set of phases, each posing particular problems; learning/mastering the software; expression of a knowledge domain into a suitable structural format for 'computerisation'; identification and development of appropriate resources for inclusion in the final product; and finally transposition of resource materials into a hypermedia. Often these phases take place simultaneously increasing the already high cognitive overhead. This paper proposes the use concept mapping tools as way to mitigate against such cognitive overhead.

## 2. Concept Mapping in Reducing Cognitive Overhead

There is a considerable similarity between concept maps (as a means of knowledge representation) and hypermedia structures (for knowledge emulation). The similarity is even closer for hypermedia designed to deliberately reflect the underlying structural knowledge of a domain, i.e. semantic hypermedia. Both techniques represent knowledge domains diagrammatically using graph structures that involve a set of nodes connected by means of labelled and directed arcs. This similarity can be exploited in the hypermedia authoring process.

## 3. Authoring Educationally Effective Hypermedia

Hypermedia applications designed for education must be effective in enhancing the learning process, otherwise they become nothing more than sophisticated information bases. By mapping the functionality of computer-based concept mapping tools to educationally effective hypermedia the requisite functionality of concept mapping tools for hypermedia development can be identified. This mapping has resulted in *SHAPE*®, a prototype concept mapping tool interface to the de facto hypermedia authoring standard - Asymetrix Toolbook.

## 4. *SHAPE*®: Semantic Hypermedia Authoring Package for Higher Education

*SHAPE*® is designed to facilitate semantic hypermedia authoring whilst reducing the cognitive overhead of expressing a knowledge domain. *SHAPE*®, therefore, allows a developer to explore the knowledge domain of interest, and then, through suitable 'post-processing', compile the resultant model into a skeletal hypermedia knowledge corpus. There are other authoring programs that take a graphical approach to authoring, however these focus on flow diagramming and tend to prescribe the order in which the material is viewed and activated

## Supporting the Paradigm Shift: Hypermedia Construction With Concept Maps – The Easy Way Forward

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### SUMMARY

Academic organizations would welcome methodologies to help teaching staff overcome the seemingly insurmountable obstacles of time and effort requisite for structuring and developing learning support materials. This article describes an experiment comparing the use of the ubiquitous book metaphor for hypermedia authoring with a concept map-based authoring tool designed to facilitate expression of knowledge domains. Experiment showed that subjects preferred the concept mapping authoring paradigm although both metaphors produced equitable applications. Both higher spatial relations ability and Windows experience promoted amenability to concept mapping, resulting in more cognitively complex and expressive concept maps. Subjects meeting concept mapping first rated it much easier to learn and use than the book metaphor of which they were subsequently much more negative. Hypermedia authoring metaphors enabling users to 'picture' their knowledge domains are beneficial, although this is confounded by their spatial relations ability and computing experience.

### INTRODUCTION

Academic organisations would welcome materials to support the paradigm shift from teacher-centred to student-centred learning. The location and utilisation of such materials, to supplement or supplant traditional approaches and encourage increased flexibility, promote an increasingly stimulating and interactive learning environment more responsive to individual student needs. Despite the growing availability of 'off the shelf solutions' as a result of considerable investment in TLTP, CTI and related initiatives, in the UK alone, obstacles remain to the wide-spread adoption of educational technology (including hypermedia) by academics (Elliott *et al.*, 1995a). Despite some collaborative approaches to materials development, in reality, 'not invented here' is an issue and many academics prefer to develop their own individual teaching applications. Institutional support for staff developing and using innovative teaching and learning strategies is needed (Laurillard, 1993).

Hypermedia will not replace traditional methods until cost-benefit analyses clearly advantage hypermedia.

Estimates are quoted of between 100 to 150 hours to produce one hour of hypermedia instruction even for experienced developers, as opposed to less than ten hours for an experienced lecturer to prepare a one hour lecture (Elliott *et al.*, 1995a). While in the short term a cost-benefit analysis will show traditional approaches to have the edge, in the longer term and for open and distance learning, the balance changes as hypermedia shows the potential for a major increase in flexibility of delivery eroding temporal and geographical constraints which limit traditional teacher-centred delivery.

Many academic staff are now becoming proficient with word processors – probably due to the advent of cheap, easy to use packages and PCs which clearly make text production more efficient. Similarly, easy to use hypermedia authoring tools producing more effective teaching materials would probably revolutionize hypermedia development and use. Concept mapping provides an opportunity for enhanced multimedia development which facilitates the expression of the knowledge domain (Elliott *et al.*, 1995a; 1996).



This article describes the results of an experiment to compare a concept map and a book metaphor for authoring hypermedia with the aim of improving development tools.

## EXPRESSIVENESS OF METAPHOR

There is a trade off between the expressiveness and simplicity of operation for authoring metaphors. Programs that are more versatile are not usually easy to use. In order to create educationally effective hypermedia, the authoring tool needs to enable the creation of hypermedia supporting:

- multifaceted, multiperspective views of real world problems/issues;
- active engagement;
- flexible support of a number of different structures;
- good search and query facilities;
- support for different learning styles;
- interactive sequences;
- appropriate node size (Elliott *et al.*, 1995a).

Furthermore, authors need the ability to reflect sufficiently the knowledge domain underpinning their completed applications. This means being able to display information chunks in whatever form – sound, text, graphics etc, with associated navigation mechanisms – the system of hyperlinking. Some form of narrative, story-line or guided discovery mechanism is needed in order to ‘make sense’ of a hypermedia corpus (Elliott *et al.*, 1995b).

Novice authors prefer simple minimalist human-computer interfaces, ie without too much screen clutter, eg toolbars, pulldown menus, floating palettes. Tension between the simplicity of the interface and the sufficiency of expression is clear and it may be impossible to give users the power to create educationally effective hypermedia in a minimalist environment.

## AUTHORING METAPHORS

A range of authoring metaphors are available to construct educational hypermedia: the ‘book’ as in ToolBook™; the ‘control flow diagram’ as in Icon-Author™ and Authorware™; and ‘object-oriented program’ metaphors, eg Visual Basic™, Delphi™, Java™. The control flow metaphor focuses on the navigation decisions that users will make and does not allow the author to ‘see’ the developing knowledge structure. Object-oriented programming metaphors

are beyond the current abilities of most academic staff and also do not allow authors to visualize the underlying knowledge structure.

## CONCEPT MAPPING

Concept maps are used to represent subjects diagrammatically: concepts are represented by nodes linked by arcs representing the semantic relationships between concepts. Arcs can be annotated with arrows to imply directionality and the length of the arc can be used to represent the semantic distance between concepts. Concept maps have been used extensively in education in a number of ways: expressing knowledge domains; curriculum development; assessment; as ‘front ends’ to hypermedia knowledge corpora (eg McAleese, 1987). Concept mapping has ‘CASE’ tool potential for hypermedia authoring (Elliott *et al.*, 1995a), resolving some of the pedagogic and temporal issues associated with educational hypermedia production. Post-processing concept maps then produces skeletal hypermedia for supplementation with hypermedia material and functionality. Closely linking a concept mapping tool with a hypermedia corpus enables learners to create their own view(s), extracting material as they browse to develop their own notes – to be taken away on suitable media. It is recognized that simple concept maps may limit the expressiveness needed for educationally effective hypermedia and additional functionality may be required.

Adopting concept maps for hypermedia development raises fundamental issues. Creating a ‘view’ of a particular subject would seem simple in theory but may be more difficult in practice due to the transitory nature of the cognitive representation, although in well-defined subject areas, where major interrelations are generally accepted, concept mapping may be neither difficult nor transitory. There can be dangers associated with forcing ideas into inappropriate representations and concept maps may not be the most appropriate metaphor for all knowledge domains.

Expressing knowledge through concept maps is one thing, doing this directly on a computer is another. The analogy here is of people who create with pen and paper and use a computer to present their creative work. Pen and paper are the creative medium. Better word processing packages can facilitate composition directly at the keyboard. Similarly, concept map-based authoring tools, eg SHAPE<sup>c</sup>, may enhance hypermedia design at the keyboard.

### THE CONCEPT MAP-BASED METAPHOR

SHAPE<sup>o</sup> (Elliott *et al.*, 1996) is a concept mapping tool written in ToolBook<sup>TM</sup> and acts as an interface or 'front end' to ToolBook<sup>TM</sup>, producing skeletal ToolBook<sup>TM</sup> 'books' with automatically indexed, cross-referenced pages for content addition. SHAPE<sup>o</sup> is a minimalist design environment containing only essential screen-objects. SHAPE<sup>o</sup> works on the principle of 'top-down' design, ie an author starts by drawing a top level concept map of a knowledge domain and proceeds to deconstruct it into successively lower level concept maps until the desired degree of detail is achieved. The hierarchy of maps is post-processed to create skeletal hypermedia where each concept has an associated content-page and the semantic links between concepts are translated into hyperlinks between content-pages.

### THE BOOK-BASED METAPHOR

Books are collections of pages of textual material linearly arranged to form an integrated whole and with protective covers. Books are powerful, pervasive and ubiquitous vehicles for externalizing knowledge. The book metaphor was therefore a natural choice to act as a 'bench mark' against which the concept map-based metaphor could be compared. ToolBook<sup>TM</sup>, a Windows-based application, was selected because it is extensively used for multimedia development and has an explicit association with the book metaphor.

ToolBook<sup>TM</sup> was simplified for the purposes of this experiment so subjects would not have to confront the full extent of ToolBook<sup>TM</sup> but would still experience development with the book metaphor. It is fairer to refer to the simplified program as the 'The Book Metaphor' (TBM) and not as ToolBook<sup>TM</sup>. The modified program allows users to create empty standardized pages and easily, albeit manually, hyperlink to other pages.

### HYPOTHESES

Concept mapping using SHAPE<sup>o</sup> would facilitate the development of hypermedia by allowing subjects to develop pictorial representations of knowledge domains without the cognitive overhead of learning and using an authoring package and thus the Ease of Learning and Ease of Use (ELU) for SHAPE<sup>o</sup> would be much higher than TBM. Neither metaphor would produce superior hypermedia products since subjects

could only construct content-chunks or hyperlinks and both metaphors had mechanisms for this. Rating of the task match of the two metaphors to authoring hypermedia would not significantly differ. Computing skills as measured with CSM(Windows) would affect rating of task match and ELU for both metaphors and subjects with high computing skills would rate SHAPE<sup>o</sup> higher than TBM. The order of using each authoring metaphor (SHAPE<sup>o</sup>/TBM or TBM/SHAPE<sup>o</sup>) would affect ELU rating and task match, and more specifically the preference of SHAPE<sup>o</sup> over TBM would diminish for subjects using SHAPE<sup>o</sup> first as they would have already developed a better mental image of the knowledge domain. A preference for concept mapping would be associated with high spatial relations ability and previous experience with concept maps.

### METHODOLOGY

Comparison of the concept map and book-based metaphors was undertaken with teaching staff, many without previous experience of hypermedia authoring, at a University College in South Wales. Following a pilot study with five subjects, to date 15 subjects have been evaluated. The experiment has focused on authoring issues rather than on the complexity of the knowledge domain and thus subjects were asked to construct a trivial hypermedia application. It was important that the task related to a knowledge domain that was equally familiar to ensure parity for all subjects. The task chosen was to construct a skeletal hypermedia application containing at least three hyperlinks that described the faculty, its courses and staff to potential students. All subjects tested to date are situated in the same faculty and should have a similar understanding of the term 'faculty'. Subjects were not required to add content in the form of text and other media as the techniques involved are the same for both metaphors.

### EXPERIMENTAL DESIGN

#### Independent variables

Along with gender and age, previous experience of concept maps, the other independent variables measured were:

- Prior computing skill;
- Computing experience, and specifically Windows

skills, were seen as an important variable in evaluating the two authoring metaphors due to the skills transfer between programs. More experienced users of Windows programs should be able to learn a new Windows application more rapidly. To measure computer skill, subjects completed the Computer Skills Metric for Windows (CSM(Windows)) (Elliott *et al.*, 1997) which consists of a Computer Skills Inventory (CSI) identifying Windows experience together with five practical skills tests;

- Spatial ability. It was hypothesized that a subject's spatial ability would affect the ease with which they constructed a concept map of a knowledge domain. Thus the spatial relations element of the Technical Skills Battery (The Psychological Corporation, 1996) was administered prior to the experiment;
- Order of use of packages; after subjects have attempted the task using one metaphor they will have developed a mental 'picture' of the subject domain which could influence their understanding of the task when using the other. To compensate for this subjects were randomly placed into two groups which used the metaphors in different order.

#### Dependent variables

The dependent variables were: ELU, Task-Match and Motivation-to-Continue (measured using Likert scale-based questionnaires).

#### EXPERIMENTAL PROCEDURE

After measuring CSM(Windows) and spatial relations, subjects were randomly divided in two groups, one using TBM then SHAPE<sup>c</sup> and the other using SHAPE<sup>c</sup> then TBM. Each session was undertaken consistently using a set of researcher-administered prompts. Subjects learnt to use each application by completing the task described above. Following the learning session, subjects were asked to complete an ELU and task-match questionnaire. After completing the exercise with one authoring metaphor subjects attempted the exercise with the other metaphor.

#### RESULTS

The mean ELU for SHAPE<sup>c</sup> was significantly higher ( $83.31 \pm 10.40$  (mean  $\pm$  SE of mean)) than for TBM ( $69.7 \pm 11.38$ ) (Paired t-test,  $t = -3.7$ ,  $P = 0.002$ ). Figure 1 plots ELU scores for TBM and SHAPE<sup>c</sup> against CSI score.

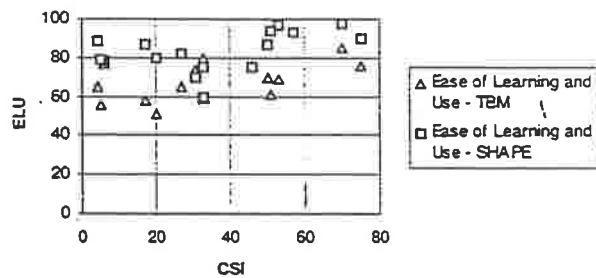


Figure 1 ELU for SHAPE<sup>c</sup> and TBM against CSI of CSM(Windows) score

There was a significant correlation between a subject's CSI score and their ELU rating of TBM (Pearson correlation,  $r = 0.54$ ,  $P = 0.03$ ) but not between CSI score and ELU rating for SHAPE<sup>c</sup> ( $r = 0.46$ ,  $P = 0.07$ ), indicating that SHAPE<sup>c</sup> is rated easier than TBM whatever a subject's computer skill.

There was no significant difference between task match for TBM ( $5.75 \pm 1.24$  (mean  $\pm$  SE of mean)) and SHAPE<sup>c</sup> ( $6.38 \pm 0.72$ ) (paired t-test,  $t = -1.84$ ,  $P = 0.086$ ). The order of learning affected the ELU ratings for TBM: subjects who learned SHAPE<sup>c</sup> first, rated the ELU for TBM significantly lower (mean = 64.00) than those who learned TBM first (mean = 75.37) (t-test,  $t = 2.25$ ,  $P = 0.041$ ).

There was a significant correlation between the number of links (Pearson correlation,  $r = 0.65$ ,  $P = 0.008$ ) and concepts ( $r = 0.51$ ,  $P = 0.049$ ) created using SHAPE<sup>c</sup> and spatial relations ability. Interestingly, there was no significant correlation between the number of hyperlinks (Pearson correlation,  $r = 0.04$ ,  $P = 0.896$ ) and pages ( $r = 0.22$ ,  $P = 0.462$ ) created with TBM and spatial relations ability, indicating that there was a definite relationship between spatial relations ability and aptitude to represent knowledge diagrammatically. There was also significant correlations between previous use of concept maps and the task match of SHAPE<sup>c</sup> (Pearson correlation,  $r = 0.68$ ,  $P = 0.016$ ) although previous use of concept maps did not affect ELU rating of SHAPE<sup>c</sup> (Pearson correlation,  $r = 0.53$ ,  $p = 0.074$ ). Subjects expressed a higher motivation to continue with SHAPE<sup>c</sup> than TBM.

#### DISCUSSION

This study compared the use of concept mapping and book-based metaphors for hypermedia authoring by

teaching staff. While the study is limited by a small sample size and use of a task involving the development of a trivial application which could pose problems in relation to scaling up to a full scale project, it clearly shows that concept mapping is significantly easier to learn and use than the book metaphor, although both approaches were seen as equitable in achieving the objectives of the exercise. This study thus supports the use of graphical interfaces to express knowledge domains, allowing users to 'draw' their subject areas on the screen. A development tool should take account of user aptitudes, in this case prior computing skills and spatial ability. Subjects with higher spatial relations ability created more links between concepts and hence hyperlinks than those with lower spatial relation abilities. Subjects who used SHAPE<sup>c</sup> first were subsequently much more negative about TBM, finding it clumsy and 'with too much going on' on the screen.

There is a clearly a trade off between displaying too much information on the screen which can confuse and too little which can disorientate and SHAPE<sup>c</sup> is no different. Subjects observed that they felt lost in the hierarchy of concept maps created and several requested the aid of an 'overview map' so that they could 'see where they were'. This enhancement will be implemented in future versions of SHAPE<sup>c</sup>.

## CONCLUSIONS

Subjects preferred concept mapping to the book-based metaphor although they recognized that both create equitable hypermedia products. The preference was heightened for subjects with previous experience of concept mapping and higher spatial relation scores. Windows skills had an effect on how easy they rated the book metaphor but not the concept mapping metaphor. Subjects with higher spatial relations ability created more complex concept maps with more links and levels but there was no similar correlation with the complexity of the applications created with the book metaphor. The order of learning of the metaphors affected ELU rating, ie subjects using concept mapping first were subsequently much more negative about the book metaphor. Despite the ubiquity of the book metaphor, diagrammatic knowledge representation using concept mapping is beneficial and can facilitate hypermedia authoring.

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## BIOGRAPHICAL NOTES

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## Development of the Computer Skills Metric for Windows

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**Abstract:** This paper describes the development of a metric for Windows 3.x computer skills. The metric consists of a Usage and Skill Level Inventory and a Computer-based Skills Test. The Usage and Skill Level Inventory rates previous experience of using Windows 3.x programs and generic Windows skills. The Computer-based Skills Test is a set of trivial tasks designed to reflect Windows skill. The two parts independently assess self-declared experience and actual performance in Windows. The results of the evaluation of the metric so far suggest that for the group of higher education teaching staff there is a significant ( $P < 0.05$ ) correlation between Inventory score and performance in the Skills Test, whereas for students the correlation is non-significant. Explanations for this disparity are explored and recommendations are made to improve the metric.

### Introduction

Work at University of Wales Institute Cardiff in hypermedia authoring has focused on the development of *SHAPE* - a Semantic Hypermedia Authoring Package for higher Education which is designed to use concept mapping techniques to reduce the cognitive overhead of expressing a knowledge domain and produce a skeletal hypermedia knowledge corpus which can be 'fleshed out' by the addition of multimedia materials, e.g. text, graphics, video clips [Elliott et al 1995], [Elliott et al 1996]. *SHAPE* has currently been produced as an interface to the standard authoring package Asymetrix ToolBook™ which is a Windows-based product. Thus, in evaluating the ease of learning and ease of use of *SHAPE*, one runs into problems associated with the transferability of Windows skills. Windows, like other graphical user interfaces (GUIs) e.g. Macintosh Desktop, was specifically designed to provide a consistent user interface using menu symbols or names already familiar to the user to facilitate more rapid learning [Foley et al 1994] and thus Windows experience/expertise was an independent variable which needed to be controlled, since subjects with a greater Windows experience should be better able to engage with a new Windows-based program more rapidly.

This paper describes the development of a metric for assessing an individual's Windows skill. The metric, Computer Skills Metric for Windows (CSM(Windows)), is defined here as a person's transferable skill of using Windows and Windows-based packages, excluding Windows 95 and Windows 95-based products on personal computers. Van Vliet et al [Van Vliet et al 1994] point out that there have been a number of attempts to develop tests to measure computer skill, although each is intended for particular subject group and computer skill. In their experiment Van Vliet et al found that self appraisal tests used alone can introduce a leniency bias where subjects inflate their own skills and Van Vliet et al concluded that to get a true picture of skill, a number of different measures should be triangulated to give a more accurate assessment.

### Definition of Computer Skill

A simple definition of skill has eluded both behavioural and cognitive psychologists although defining characteristics of skill include: a wide behavioural domain in which behaviours are assumed to be complex; an understanding that skills are gradually learned through training; and attaining a goal is dependent upon motor behaviour and processes. Gattiker [Gattiker, 1992] categorises the meaning of the term 'skill' in relation to its potential ease of transferability and reasons that computer-interface-skills have low transferability.

Each individual is equipped with innate motor behavioural abilities and an ability for cognitive processing (abstract reasoning, problem solving, etc.) which they can develop generally or achieve specific tasks/jobs.

CSM(Windows) measures both motor-behavioural (e.g. mouse and keyboard) skills and cognitive process abilities (e.g. finding/knowning the correct icon, command sequences, menus). Subjects with a high skill level in Windows generally, should be able to rapidly orient themselves in an unknown Windows program, provided that the objective of the unknown program is fairly easy to understand.

From observations of four cohorts of students taking a course in basic computer skills over a four year period a list of elementary skills for using Windows and Windows-based packages has been compiled:

Psycho-motor skills:	Cognitive Processes:
<ul style="list-style-type: none"> <li>• Single click with left mouse button</li> <li>• Double click with left mouse button</li> <li>• Drag and drop</li> <li>• Select from button types, menu options, dialogue boxes as required</li> <li>• Input via keyboard</li> </ul>	<ul style="list-style-type: none"> <li>• Successfully carry out a sequence of the above activities to complete a task e.g. draw a shape on the screen</li> <li>• Learn a sequence of the above activities to complete a task</li> <li>• Search for assistance to carry out an action and follow instructions</li> <li>• Understand/create/update/delete file and catalogue structures</li> <li>• Understand salient aspects of hardware: hard drive; floppy drive</li> <li>• Understand the 'computer processing paradigm': the limitations of computers; their apparent pedantry; and the necessary sequence of operations</li> </ul>

### The CSM (Windows) Metric

The metric is computer-based and has two parts: a Usage and Skill Level Inventory, and a Computer-based Skills Test (a battery of 5 exercises that aim to test the list of motor-behavioural and cognitive processing skills above). The philosophy behind the inclusion of an inventory and a test-battery was that each part could help validate the other.

#### Usage and Skill Level Inventory

This is designed to find how extensively subjects use Windows and Windows-based applications and is completed by the subject under the supervision of the researcher. The inventory asks salient questions about the subject's experience in terms of experience of using Windows and Windows-based applications. It is recognised that even if a subject uses Windows all the time they may still have a low skill level. The last inventory question asks subjects about their perceived skill level is on a scale from None to Very High.

#### Computer-based Skills Test

The exercises are monitored exercises which incorporate typical Windows-based tasks. Whilst it is recognised that the exercises also test other cognitive factors, such as problem solving skills, the tasks are designed to be trivial as possible with simple instructions printed on the screen to reduce cognitive overhead. The underpinning hypothesis is that subjects with prior Windows skills should complete more of the exercises more quickly than those without. CSM (Windows) calculates the time taken and the percentage of each exercise completed.

#### Use of help facility

A standard help facility is available throughout the exercises to help subjects complete them although no help is given on basic Windows skills. Use of the help facility is seen as an important Windows skill so any use of the help menu, particularly in exercises 3, 4 and 5 which are more complex exercises are counted and registered by the system.

### The Exercises:

The exercises attempt to measure different aspects of Windows skill however it was anticipated that there would be some overlap of these aspects. It was therefore of interest to see the extent to which the results of the exercises co-varied. Significant covariance between the exercises would suggest that one exercise could be substituted for another if necessary. The table below explains what each exercise is designed to measure.

	Tests ability to:
1	'Drag and drop'. The cursor changes when dragging the shapes which is a familiar Windows requirement. If subjects do not know how to 'drag and drop' they will not be able to complete this exercise.
2	Click to move the cursor into the text entry box and keyboard knowledge. Subjects are asked to copy type a short paragraph that includes some of the less commonly used keyboard characters that require the use of the shift key, etc.. The time to complete this exercise should be directly related to typing ability (for non-typists). The program measures any mistakes that subjects make in carrying out the task.
3	Construct objects on screen, using a series of commands and pull-down menus / tool-buttons / mouse - activities.
4	Carry out a sequence of activities using a command-driven interface. This exercise attempts to test a subject's understanding of the computing paradigm, i.e. the logical sequence of activities and the need for precision in syntax in specifying an action/command. Subjects with a background in general computing should be able to carry out this test better than those who without.
5	Carry out a bogus task using a number of standard Windows features: double-clicking; restoring and minimising objects; using option buttons and sliders; selecting files. Although subjects will not understand the task they should, if they are proficient at using Windows, be able to carry it out. CSM (Windows) measures which elements of the exercise has been completed

### Procedure

CSM (Windows) has been used by 97 subjects to date, 74 first year students who had just completed a course in basic computer skills and Information Technology and 23 higher education lecturing staff. The program was administered to the students in a computer laboratory and they were told that the results were confidential, would only to be used for research purposes and would have no effect on their assessed mark for the course. The program was administered to lecturing staff in a similar fashion with the assurance that the results were confidential and would be used for research purposes only.

### Results

The results are presented as a comparison between the two subject groups because of the differences observed between them.

### Reliability

A Cronbach alpha test was carried out on the two parts of CSM(Windows) and the results showed that the Inventory was reliable, probably because it has so many component elements, whereas the exercises are less reliable, probably because there are only 5 elements.

### Usage and Skill Level Inventory

Table 1 shows the median and interquartile range (IQR) for experience for the use of Windows and Windows-based programs for staff and student groups. The higher the median score the higher the experience and self-declared expertise in that area.



Windows Program:	Student				Staff			
	Usage (Median)	IQR	Declared skill (Median)	IQR	Usage (Median)	IQR	Declared skill (Median)	IQR
Word-processing	3.00	1.00	3.00	1.00	3.00	2.25	2.50	2.25
Spreadsheets	1.00	1.00	2.00	1.00	1.00	1.25	2.00	4.00
Databases	0.00	1.00	1.00	2.00	0.00	1.00	0.50	2.00
Email	1.00	2.00	2.00	3.00	2.00	2.00	3.00	2.00
DTP/Drawing	1.00	1.00	1.00	1.00	0.50	1.25	1.00	3.25
Windows utilities			1.00	2.00			1.00	4.00
Other programs	-	-	0.00	0.00	-	-	4.00	5.25

Table 1: Median and IQR values for usage of typical Windows applications by staff and students

The mean overall accumulated inventory score for staff was 38.59 with a standard deviation of 25.45 and for students the mean was 28.59 with standard deviation of 10.05, the difference between the two groups was not significant (Student's t test,  $t=1.8$ ,  $P=0.085$ ).

### Computer-based Skills Test

Table 2 Compares the mean times and mean fraction-completed of each exercise by staff and students.

	Time to complete exercise				Fraction-completed for each exercise			
	Staff	Student	Comparison between groups		Staff	Student	Comparison between groups	
	$\bar{x} \pm SD$	$\bar{x} \pm SD$	t	P	$\bar{x} \pm SD$	$\bar{x} \pm SD$	t	P
1	22.41 $\pm$ 12.25	21.82 $\pm$ 6.70	0.21	0.83	1.00 $\pm$ 0.00	1.00 $\pm$ 0.00	-	-
2	100.80 $\pm$ 50.99	101.20 $\pm$ 28.60	-0.05	0.96	1.00 $\pm$ 0.00	0.99 $\pm$ 0.09	0.67	0.50
3	100.05 $\pm$ 90.98	127.80 $\pm$ 58.92	-1.70	0.09	0.55 $\pm$ 0.51	0.75 $\pm$ 0.43	-1.71	0.10
4	222.45 $\pm$ 195.19	349.15 $\pm$ 236.80	-2.29	0.02	0.55 $\pm$ 0.51	0.45 $\pm$ 0.49	0.79	0.43
5	91.63 $\pm$ 46.76	289.95 $\pm$ 185.56	-4.95	0.00	0.50 $\pm$ 0.51	0.47 $\pm$ 0.30	0.28	0.78

Table 2: Mean values of times and fraction-completed for each exercise for the two subject groups and Independent samples t - test values comparing the two subject groups

Table 3 shows the Pearson correlation coefficient between the mean times and fraction-completed for each exercise and the inventory score:

Exercise:	Students				Staff			
	Time		Fraction-completed		Time		Fraction-completed	
	r	P	r	P	r	P	r	P
1	-0.27	0.02	-0.11	0.35	-0.63	0.00	-	-
2	-0.12	0.29	0.1	0.39	-0.48	0.02	-	-
3	-0.201	0.86	0.16	0.16	0.14	0.54	0.73	0.00
4	-0.02	0.89	0.10	0.37	0.35	0.10	0.73	0.00
5	-0.005	0.96	0.16	0.17	0.17	0.45	0.56	0.00

Table 3: Pearson correlation coefficients between the mean times and fraction-completed for each exercise and the inventory score for the two subject groups



### Correlations between the exercises

Some of the between-exercise correlations for exercise times for staff (between exercises 1 and 2 ( $r=0.66$ ), 3 and 4 ( $r=0.80$ ) and 4 and 5 ( $r=0.45$ )) and students (between exercises 1 and 2 ( $r=0.29$ ), 2 and 3 ( $r=0.28$ ), 2 and 4 ( $r=0.31$ ), 3 and 4 ( $r=0.31$ ) and 4 and 5 ( $r=0.28$ )) are significant ( $p<0.05$ ). There were very few significant correlations between the exercises for fraction-completed.

### Use of the help facility

Table 4 below shows the mean number of times help used and its correlation with the inventory score for each subject group

	Staff	Students
Mean usage of help facility	4.30	6.55
Standard deviation of usage of help facility	6.50	6.62
Correlation of use of help with inventory score	-0.09	0.03
Significance of correlation of use of help with inventory score	0.67	0.80
Correlation of use of help with overall completion Rate	0.39	0.22
Significance of correlation of overall completion rate	0.07	0.06

**Table 4:** Mean number of times help used during exercise and correlation with the inventory score for each subject group

### Discussion

The staff inventory scores covered a wider range of values than the students even though the sample was smaller. This is not surprising since the students (mean age 20) represent a more homogeneous group with less overall experience of computers. The application skills were similar for both groups, however staff had greater experience in email, other Windows programs and Windows utilities. The responses to the questions appeared to be a fair reflection of both groups computer experience. The differences between the overall inventory scores was not significant because of the wide variation of the staff group and the homogeneity of the student group.

The differences between timings for exercises 1 and 2 for staff and students was not significant, however it was for the other exercises. The differences between the fraction-completed for staff and students for all exercises were not significant, indicating that although their timings for the exercises differed they did not complete anymore. All subjects completed exercise 1 and the timings correlate with the inventory score significantly for both groups, indicating that exercise 1 is a measure of a subject's Windows expertise. Students spent considerably more time trying to complete exercises 3,4 and 5 than did the staff. This may be because the students felt that they were 'competing' with their peers and did not want to be seen to have failed whereas the staff seemed more circumspect about their performance. Another reason might be that since the average age of the staff group was greater ie less 'attuned' to computers and the group had proportionally more low inventory scores so they were less confident and gave up quicker. Another confounding factor could be that this group of students had just completed an introductory course in using Windows-based programs. These factors need further study.

The times taken to complete the exercises 1 and 2, 3 and 4, and 4 and 5 co-varied significantly in both groups. There was a significant correlation for fraction-completed for the student group only between exercise 4 and 5. The picture for the staff group is very different with significant correlations between exercise 3, 4 and 5. These covariances point to overlaps in the skills being measured and will require further analysis isrequired to explain the observations.

Students were more inclined to use the help facility than staff suggesting that they were again more confident in using computers. There was no correlation between use of the help facility and inventory score and use of help

and completion rate for either group, suggesting that use of help is idiosyncratic and does not have a bearing on the success of subject in a new computer situation.

The correlation between student performance in the exercises and their inventory score was not significant, but it was for staff. Accounting for this discrepancy is difficult - if the exercise were badly designed one would not expect a high correlation for either group. If the exercises are viewed simply as problems, one might expect subjects with good problem solving skills to do better. A measure of the students' generic problem solving skills is not readily available, however performance in an assignment not closely related to computer skill has been made available. This assignment required students to analyse the information technology needs of a known organisation. The correlation between their performance in this assignment and the fraction-completed of the exercises is significant ( $r=0.33$ ,  $P=0.005$ ). Interestingly there are no significant correlation between their assignment mark and the inventory scores, use of the help facility and the times spent on each task, suggesting that it was the students' problem solving skills that largely dictated their success in the exercises and not their experience in using computers. Subjects were asked to rate their overall skill from none the very high in using Windows, this correlated significantly for both groups with the inventory score (students  $r=0.66$ ,  $P=0.00$ , staff  $r=0.93$ ,  $P=0.00$ ) indicating that their answers were consistent and supported by the reliability analysis.

### Conclusions and further research

Both students and staff seemed to be honest in their answers to the Usage and Skill Level Inventory which reliably reflects their usage and skill in using Windows and Windows-based packages. Although, as [Von Vliet et al 1996] note, there is a danger of an 'inflationary bias in the results of self-appraisal tests if they are to be used for a formal evaluation of performance. There was a good correlation between staff inventory scores and their performance in the exercises but almost none for the students. A possible explanation for this may be that students are more comfortable with computers than staff, are more tenacious and more willing to experiment. Another reason might be that Windows has become transparent to the students and it is only their problem solving abilities that are being assessed.

The degree to which Windows is transparent to students and the exercises only measuring problem solving skill needs to be explored. The co-variances between the exercises needs to be further studied to discover what are the overlapping components of Windows skill. The lack of correlation between the use of the help facility and performance in the exercises for either group is a salutary lesson for help facility designers and could be investigated further.

CSM(Windows) will be re-examined and refined following this initial evaluation, but the usage and skill level, inventory has been found to be a good measure of a subject's experience of Windows.

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# Appendix B

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## Appendix B: Summary of Raw results

### Independent Variables- Summary Values

Subject	Gender 1=Female 2=Male	Age	Spatial Relations	CSI	Order of Learning 1=SHAPE/TBM 3=TBM/ SHAPE°
S18	1	50	18	46	1
S35	0	46	24	20	3
S28	1	35	9	33	3
S08	1	49	20	53	3
S37	1	42	26	5	3
S20	0	30	36	50	1
S36	0	50	11	4	1
S04	0	36	46	27	3
S05	0	37	32	51	3
S10	0	48	19	31	1
S12	0	46	32	33	1
S25	0	43	26	17	3
S03	0	55	13	6	1
S02	0	25	39	70	1
S26	0	37	29	57	3
S11	0	49	28	75	1
Average	-	43.14	25.50	30.14	-
Standard Deviation	-	6.29	10.26	22.44	-
Median	-	-	-	-	-
Range	-	-	-	-	-

## Independent Variables- Summary Values (Continued)

Subject	Prior Experience of Concept Maps	Pre-session understanding of TBM	Pre-Session understanding of <i>SHAPE</i> ®	Intrinsic Motivation	Extrinsic Motivation
S18	1	3	3	3.27	3.13
S35	3	2	3	2.73	2.20
S28	1	1	2	2.47	2.60
S08	1	3	3	3.80	2.20
S37	1	1	2.5	3.47	2.13
S20	3	3	3	3.13	2.87
S36	2	1	3	2.53	2.00
S04	1	1	1	3.20	2.80
S05	3	2	4	3.00	2.07
S10	3	2	3	2.40	2.60
S12	0.5	1	3	2.80	2.47
S25	1	1	3	3.20	3.13
S03	1	1	3	3.00	2.33
S02	4	4	4	3.13	3.20
S26	3	3	3	2.87	2.40
S11	1	3	3	3.33	2.47
Average	-	-	-	3.02	2.54
Standard Deviation	-	-	-	0.38	0.39
Median	1	2	3	-	-
Range	3.5	3	3	-	-

## Dependent Variables:Ease of Learning and Use - Summary Values

Subject	EU TBM	EU SHAPE®	EL TBM	EL SHAPE
S18	40	39	36	36
S35	27	42	24	38
S28	31	39	28	36
S08	35	51	34	46
S37	30	42	26	37
S20	36	44	34	43
S36	32	45	33	43
S04	34	41	31	41
S05	31	50	30	44
S10	38	39	36	31
S12	42	32	38	28
S25	36	44	22	43
S03	41	42	36	36
S02	47	52	38	46
S26	53	51	40	42
S11	37	47	39	43
Average	36.88	43.75	32.81	39.56
Standard Deviation	6.67	5.46	5.49	5.24
Median	-	-	-	-
Range	-	-	-	-

**Dependent Variables: Understanding, Task Match and Motivation - Summary Values**

Subjects	Post-Session Understanding TBM	Post-Session Understanding SHAPE®	Task match TBM	Task match SHAPE®	Motivation to Continue TBM	Motivation to Continue to Continue SHAPE®
S18	3.5	3	6	6	3.5	3.5
S35	3	4	5	7	1	2
S28	1	3	4	6	1	3
S08	3.5	3.5	7	7	3	4
S37	1	3	5	6	2	3
S20	3	4	6	6	2	3.5
S36	2	3.5	5	6	2	3.5
S04	2.5	3	5	6	3	3
S05	3	4	4	8	3	4
S10	2	2	6	6	3.5	3
S12	2	3	6	5	4	3
S25	1	3	4	6	2	4
S03	3	4	7	6	3	3
S02	4	4	7	7	4	4
S26	3	4	8	7	4	4
S11	4	4	7	7	3	4
Average	-	-	-	-	-	-
Standard Deviation	-	-	-	-	-	-
Median	3	3.5	6	6	3	3.5
Range	3	2	4	3	3	2

## Dependent Variables: Output Summary Values

Subject	Number of Concepts SHAPE®	Number of Pages TBM	Number of Links SHAPE®	Number of Links TBM	Number of levels SHAPE®
S18	8.00	7.00	2.00	2.00	3.00
S35	12.00	4.00	8.00	1.00	3.00
S28	27.00	5.00	1.00	2.00	4.00
S08	22.00	4.00	6.00	3.00	2.00
S37	10.00	5.00	6.00	3.00	3.00
S20	25.00	26.00	5.00	4.00	3.00
S36	11.00	6.00	7.00	4.00	2.00
S04	56.00	3.00	18.00	2.00	5.00
S05	17.00	16.00	10.00	2.00	3.00
S10	5.00	5.00	3.00	3.00	2.00
S12	16.00	4.00	7.00	5.00	2.00
S25	12.00	9.00	6.00	2.00	3.00
S03	18.00	7.00	5.00	2.00	3.00
S02	17.00	13.00	8.00	0.00	4.00
S26	20.00	5.00	17.00	4.00	4.00
S11	11.00	10.00	8.00	4.00	3.00
Average	-	-	-	-	-
Standard Deviation	-	-	-	-	-
Median	16.5	5.5	6.5	2.5	3
Range	51	23	17	5	3



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# Appendix C

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## Appendix C Ease of Learning and Ease of Use Questionnaire

The Ease of Learning and Ease of Use questionnaire is computer based, below is a paper version for TBM

Name: \_\_\_\_\_ Learning the Package TBM

Mark the point which best represents your attitude when reflecting on your experiences of learning this program

1	TBM was easy to learn	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	TBM was not easy to learn
2	I liked learning TBM	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	I didn't like learning TBM
3	I gained a lot learning TBM	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	I didn't gain anything learning TBM
4	I felt comfortable learning TBM	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	I didn't feel comfortable learning TBM
5	I found TBM difficult to understand	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	I found TBM easy to understand
6	The ideas behind TBM were difficult to appreciate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The ideas behind TBM were easy to appreciate
7	When TBM was explained it was obvious what to do	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	When TBM was explained it was not obvious what to do next
8	TBM is no more difficult than other Windows based programs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	TBM is more difficult than other Windows based program
9	I often became confused learning TBM	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	I did not become confused learning TBM

10	It took too much time to learn TBM	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	It didn't take too much time to learn TBM
11	I could easily understand how TBM resulted in a hypermedia application	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	I could not understand how TBM resulted in a hypermedia application
12	The time and effort learning TBM were well spent	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The time and effort learning TBM were not well spent

Name: \_\_\_\_\_ Using the Package TBM

Mark the point which best represents your attitude when reflecting on your experiences of using this program

1	It was easy to use TBM	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	It was difficult to use TBM
2	I liked using TBM	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	I didn't like using TBM
3	I had no difficulty understanding how to use TBM	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	I had difficulty understanding how to use TBM
4	The set of operations one needed to use were easy to remember	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The set of operations one needed to use were difficult to remember
5	The set of operations one needed to use TBM were easy to carry out	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The set of operations one needed to use TBM were difficult to carry out
6	It was obvious what to do next	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	It was not obvious what to do next
7	I became confused trying to complete the task	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	I did not become confused trying to complete the task
8	I did not have a clear picture of how TBM would lead to a final application	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	I had a clear picture of how TBM would lead to a final application
9	TBM made it difficult to complete the task	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	TBM made it easy to complete the task
10	I really felt I had accomplished something using TBM	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	I didn't really feel I had accomplished anything using TBM
11	I felt frustrated using TBM	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	I did not feel frustrated using TBM
12	I felt comfortable using TBM	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	I felt uncomfortable using TBM

13	TBM was fun	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	TBM was not fun
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14	It took too much time to use TBM	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	It didn't take too much time to use TBM
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# Appendix D

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## Appendix D Script for One-to-One Training Sessions

### Final Script used in study:

#### *SHAPE*® Session Interview

Name: \_\_\_\_\_

Explanation of what I am doing

I am looking at the problems that lecturing staff have with the development of multimedia or hypermedia applications for their teaching programs. More specifically I am looking at how to make the process of developing hypermedia easier for lecturers to accomplish. What I want you to do is to carry out a simple exercise to develop a basic application using a program called *SHAPE*® and another called ToolBook®. This session will run as follows:

- I will ask you some questions and want you to complete a number of exercises.
- Then I will ask you to complete a test which measures your spatial ability.
- Then there will be a training period during which time you will develop a simple multimedia application using *SHAPE*®.
- Following the training period I will ask you some other questions.
- The process will then be repeated using the other ToolBook®.

I would now like to show you an example of a multimedia application.

(Demonstrate Click\_IT)

How would you now rate your understanding of hypermedia/multimedia?

<b>Very Low:</b> Only what has just been demonstrated to me	<b>Low:</b> Vaguely heard of the idea before being shown the demonstration.	<b>Fair:</b> I have seen several applications	<b>High:</b> I am very familiar with the idea of hypermedia and have used several applications
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(Demonstrate a hyperlink)

How would you now rate your understanding of hyperlinking?

<b>Very Low:</b> Only what has just been demonstrated to me	<b>Low:</b> Vaguely heard of the idea before being shown the demonstration.	<b>Fair:</b> I have seen and used hyperlinks	<b>High:</b> I am very familiar with the idea
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(Show example concept map) Explanation of concepts and links

How would you now rate your understanding of concept maps?

<b>Some familiarity:</b> Seen a few concept maps but never drawn one.	<b>Reasonable familiarity:</b> I have drawn a few and I understand their use.	<b>Fairly familiar:</b> I use them occasionally and understand what they do.	<b>Very familiar:</b> I use them often
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Explanation of the use of *SHAPE*®

*SHAPE*® utilises concept maps to create the structure of the material you wish to turn into a multimedia application. *SHAPE*® works by first creating a set of concept maps of your teaching material, these are then converted into a set of pages like I showed you above. The textual content etc can then be added. (Show diagram of the layering of concept maps)

How would you now rate your understanding of the use of *SHAPE*®?

<b>None:</b> I don't understand the use of <i>SHAPE</i> ®	<b>Low:</b> I am still unclear what <i>SHAPE</i> ® does	<b>Fair:</b> I think I understand what <i>SHAPE</i> ® does?	<b>High:</b> I understand the use of <i>SHAPE</i> ® well
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Explanation of the Task

The task I want you to attempt is to develop a multimedia application that describes the faculty i.e. the people the structure and activities etc. The application will be used by potential students to learn more about the faculty, ie a computerised brochure. In creating the application I want you to have included information about

- The structure of the faculty
- The people of the faculty and what they do
- The Schools and their activities
- The courses run by the faculty
- Anything else you think merits inclusion

I want you to create at least three hyperlinks that you think are needed for users to navigate between related material e.g. Schools and courses.

It will not be necessary to complete the whole exercise, only as much as is required to describe down to the details of your school.



Post-*SHAPE*® Session Interview

How would you now rate your understanding of the use of *SHAPE*®?

**None:** I don't understand the use of *SHAPE*®

**Low:** I am still unclear what *SHAPE*® does

**Fair:** I think I understand what *SHAPE*® does?

**High:** I understand the use of *SHAPE*® well

Describe to me what *SHAPE*® does?

What general impressions did you have using *SHAPE*®?

How easy did you find the ideas behind *SHAPE*® to grasp?

Was there anything confusing about using *SHAPE*® ?

Was there anything about *SHAPE*® you would change?

I'd like you to comment on the follow screens

How well do you think *SHAPE*® allowed you to achieve the objectives of the exercise?

How well do you think *SHAPE*® would allow you to produce an application for your own teaching?

Was there anything about *SHAPE*® that made it difficult or unsatisfactory in producing an application that matched the objectives of the exercise?

Was there anything about *SHAPE*® that made it easy in producing an application that matched the objectives of the exercise?

After having learnt to use *SHAPE*® do you have any general thoughts on what makes a program easy to learn?

After having learnt to use *SHAPE*® do you have any general thoughts on what makes a program easy to use?

How motivated are you to continue to use *SHAPE*® to develop an application for your own teaching?

**Very little:** I don't feel very inclined to continue at all

**A little:** I am interested but I don't have the time or inclination to continue

**Fair:** I am interested and I would like to continue if I had the time

**High:** I am very interested I will make an effort to continue

What would prevent you from using *SHAPE*® to create an application for your own teaching

Please could you mark your answers to the following statements (EoL and EoA)

### TBM Session

I want you to repeat the same exercise using TBM.

Explanation of the use of TBM.

TBM is a commercial program designed to create multimedia applications like the one I have just shown you. TBM uses conventional books as the metaphor for designing your application. This essentially means that you, the designer create pages or screens of content with text pictures, sound etc and then add the hyperlinks to connect one page of content to another.

How would you now rate your understanding of the use of TBM?

<b>Very Low:</b> Only what has just been explained to me	<b>Low:</b> Vaguely heard of the idea before the explanation	<b>Fair:</b> I have seen TBM but have not used it and understand its use	<b>High:</b> I have used TBM and I am familiar with its use
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I have made some alterations to TBM to make the task as simply as possible.

### Post-TBM Session Interview

How would you now rate your understanding of the use of TBM?

<b>Very Low:</b> Only what has just been explained to me	<b>Low:</b> Vaguely heard of the idea before the explanation	<b>Fair:</b> I have seen TBM but have not used it and understand its use	<b>High:</b> I have used TBM and I am familiar with its use
--	--	--	---

Describe to me what TBM does?

What general impressions did you have using TBM?

How easy did you find the ideas behind TBM to grasp?

Was there anything confusing about using TBM ?

Was there anything about TBM you would change?

I'd like you to comment on the follow screens

How well do you think TBM allowed you to achieve the objectives of the exercise?

How well do you think TBM would allow you to produce an application for your own teaching?

Was there anything about TBM that made it difficult or unsatisfactory in producing an application that matched the objectives of the exercise?

Was there anything about TBM that made it easy in producing an application that matched the objectives of the exercise?

After having learnt to use TBM do you have any general thoughts on what makes a program easy to learn?

After having learnt to use TBM do you have any general thoughts on what makes a program easy to use?

How motivated are you to continue to use TBM to develop an application for your own teaching?

<b>Very little:</b> I don't feel very inclined to continue at all	<b>A little:</b> I am interested but I don't have the time or inclination to continue	<b>Fair:</b> I am interested and I would like to continue if I had the time	<b>High:</b> I am very interested I will make an effort to continue
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What would prevent you from using TBM to create an application for your own teaching

Please could you mark your answers to the following statements (EoL and EoA)

#### Post Sessions Interview

How do you think TBM and *SHAPE*<sup>®</sup> compare with each other in terms of:

- ease of leaning;
- ease of use; and
- suitability to produce an application that matches the defined task?

**Initial Script used in Pilot Study:****Pre-learning SHAPE-Session - Interview**

Do you know what hypermedia is?

Do you know what multimedia is?

Do you know what a concept map is?

Do you know what Toolbook is? Have you ever used it and how extensively?

How will you use the product of this work?

Explanation of what I am doing

**Post Learning SHAPE Session - Interview**

What general impression did you have using SHAPE?

How easy did you find the ideas behind SHAPE to grasp?

Was there anything confusing about using SHAPE?

If you were to rate the ease with which you learned to use SHAPE what would it be?

Very easy compared to learning a word processor	Easy compared to learning a word processor	About the same compared to learning a word processor	Hard compared to learning a word processor	Very hard compared to learning a word processor
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After having learnt to use SHAPE do you have any general thoughts on what makes a program easy to learn?

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# Appendix E

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## Appendix E NUD.IST Hierarchical Category Tree of Analysis of One-to-One Training Sessions

Q.S.R. NUD.IST Power version, revision 3.0.4 GUI.  
Licensee: geoff.

PROJECT: INTRVWS, User Geoff Elliott, 11:05 am, 17 Aug, 1998.

```

(1) /cognition
(1 1) /cognition/structuring
(1 1 1) /cognition/structuring/csm
(1 1 1 1) /cognition/structuring/csm/low
(1 1 1 2) /cognition/structuring/csm/intermediate
(1 1 1 3) /cognition/structuring/csm/High
(1 1 2) /cognition/structuring/sp rel
(1 1 2 1) /cognition/structuring/sp rel/low
(1 1 2 2) /cognition/structuring/sp rel/intermediate
(1 1 2 3) /cognition/structuring/sp rel/high
(1 1 3) /cognition/structuring/learn-order
(1 1 3 1) /cognition/structuring/learn-order/t-s
(1 1 3 2) /cognition/structuring/learn-order/s-t
(1 1 4) /cognition/structuring/paper
(1 1 6) /cognition/structuring/SHAPE
(1 1 7) /cognition/structuring/TBM
(2) /Ease
(2 1) /Ease/Eol
(2 1 1) /Ease/Eol/Accomodation
(2 1 1 1) /Ease/Eol/Accomodation/SHAPE
(2 1 1 2) /Ease/Eol/Accomodation/TBM
(2 1 2) /Ease/Eol/Transparency
(2 1 2 1) /Ease/Eol/Transparency/SHAPE
(2 1 2 2) /Ease/Eol/Transparency/TBM
(2 1 3) /Ease/Eol/Accomplishment
(2 1 3 1) /Ease/Eol/Accomplishment/SHAPE
(2 1 3 2) /Ease/Eol/Accomplishment/TBM
(2 2) /Ease/eou
(2 2 1) /Ease/eou/Accomodation
(2 2 1 1) /Ease/eou/Accomodation/SHAPE
(2 2 1 2) /Ease/eou/Accomodation/TBM
(2 2 2) /Ease/eou/Transparency
(2 2 2 1) /Ease/eou/Transparency/issues
(2 2 2 1 1) /Ease/eou/Transparency/issues/misconceptions
(2 2 2 1 2) /Ease/eou/Transparency/issues/practice
(2 2 2 1 3) /Ease/eou/Transparency/issues/linking
(2 2 2 1 3 1) /Ease/eou/Transparency/issues/linking/SHAPE
(2 2 2 1 3 2) /Ease/eou/Transparency/issues/linking/TBM
(2 2 2 1 4) /Ease/eou/Transparency/issues/design
(2 2 2 1 5) /Ease/eou/Transparency/issues/logic
(2 2 2 2) /Ease/eou/Transparency/purpose
(2 2 2 2 1) /Ease/eou/Transparency/purpose/shape
(2 2 2 2 2) /Ease/eou/Transparency/purpose/TBM
(2 2 2 2 3) /Ease/eou/Transparency/purpose/task match
(2 2 2 2 3 1) /Ease/eou/Transparency/purpose/task
match/SHAPE
(2 2 2 2 3 2) /Ease/eou/Transparency/purpose/task match/TBM
(2 2 2 2 4) /Ease/eou/Transparency/purpose/Instantaniety
(2 2 2 3) /Ease/eou/Transparency/operation
(2 2 2 3 1) /Ease/eou/Transparency/operation/Reports
(2 2 2 3 1 2) /Ease/eou/Transparency/operation/Reports/s-t
(2 2 2 3 1 3) /Ease/eou/Transparency/operation/Reports/t-s

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(2 2 2 3 1 4)
/Ease/eou/Transparency/operation/Reports/SHAPE
(2 2 2 3 1 5)      /Ease/eou/Transparency/operation/Reports/TBM
(2 2 2 3 2)        /Ease/eou/Transparency/operation/Mental Model
(2 2 2 3 3)        /Ease/eou/Transparency/operation/Logic of
Operation
(2 2 2 3 4)        /Ease/eou/Transparency/operation/Operational
Momentum
(2 2 2 3 5)        /Ease/eou/Transparency/operation/Noise-
Economy of Dialogue
(2 2 2 3 6)        /Ease/eou/Transparency/operation/Consistency
(2 2 2 3 6 1)
/Ease/eou/Transparency/operation/Consistency/External
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/Ease/eou/Transparency/operation/Consistency/Internal
(2 2 3)            /Ease/eou/Accomplishment
(2 2 3 1)          /Ease/eou/Accomplishment/SHAPE
(2 2 3 2)          /Ease/eou/Accomplishment/TBM
(2 2 4)            /Ease/eou/task match
(2 2 4 1)          /Ease/eou/task match/SHAPE
(2 2 4 2)          /Ease/eou/task match/TBM
(3)                /Focus Group
(3 1)              /Focus Group/SHAPE
(3 2)              /Focus Group/Web Maker
(3 3)              /Focus Group/Authorware
(3 4)              /Focus Group/Frontpage
(3 5)              /Focus Group/ToolBook®
(3 6)              /Focus Group/Post session
(3 7)              /Focus Group/Greg's interview
(3 8)              /Focus Group/Analysis
(3 8 1)            /Focus Group/Analysis/Usability
(3 8 2)            /Focus Group/Analysis/mental model match
(3 8 3)            /Focus Group/Analysis/transparency of
operation
(3 8 4)            /Focus Group/Analysis/knowledge
(3 8 5)            /Focus Group/Analysis/linking
(3 8 6)            /Focus Group/Analysis/learnability
(3 8 7)            /Focus Group/Analysis/operational momentum
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(3 8 10)           /Focus Group/Analysis/task match
(3 8 11)           /Focus Group/Analysis/transparency of purpose
(3 8 12)           /Focus Group/Analysis/complexity
(3 8 13)           /Focus Group/Analysis/accomodation
(4)                /Subjects
(4 1)              /Subjects/s12pc
(4 2)              /Subjects/s02tg
(4 3)              /Subjects/s03rw
(4 4)              /Subjects/s05ms
(4 5)              /Subjects/s10pb
(4 6)              /Subjects/s11tc
(4 7)              /Subjects/s18aj
(4 8)              /Subjects/s25ar
(4 9)              /Subjects/s36kt
(4 10)             /Subjects/s20rk
(4 11)             /Subjects/s37hj
(4 12)             /Subjects/s26ts
(4 13)             /Subjects/s08fb
(4 14)             /Subjects/s35db
(4 15)             /Subjects/s28ds
(4 16)             /Subjects/s04mj
(6)                /Base

```

```

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(6 1 6 5) /Base/Ability/C-Skill/High
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(6 2 2) /Base/Gender/Female
(6 3) /Base/Age
(6 3 1) /Base/Age/20-30
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rel/Intermediate
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order/t-s
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order/s-t
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```



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(7 5 1 4) /Project/TBM/questions/CONFUSION
(7 5 1 5) /Project/TBM/questions/change
(7 5 1 6) /Project/TBM/questions/objectives
(7 5 1 7) /Project/TBM/questions/oteaching
(7 5 1 8) /Project/TBM/questions/difficult
(7 5 1 9) /Project/TBM/questions/easy
(7 5 1 10) /Project/TBM/questions/EOL
(7 5 1 11) /Project/TBM/questions/EOU
(7 5 1 12) /Project/TBM/questions/Motivation
(7 5 1 13) /Project/TBM/questions/Barriers
(7 5 1 14) /Project/TBM/questions/Understanding
(7 5 2) /Project/TBM/Pictures
(7 5 2 1) /Project/TBM/Pictures/pict1
(7 5 2 2) /Project/TBM/Pictures/pict2
(7 5 2 3) /Project/TBM/Pictures/pict3

```

(7 5 2 4)	/Project/TBM/Pictures/pict4
(7 5 2 5)	/Project/TBM/Pictures/pict5
(7 5 2 6)	/Project/TBM/Pictures/pict6
(7 5 2 7)	/Project/TBM/Pictures/pict7
(7 5 2 8)	/Project/TBM/Pictures/pict8
(7 5 2 9)	/Project/TBM/Pictures/pict9
(7 5 3)	/Project/TBM/Develop
(7 5 3 1)	/Project/TBM/Develop/Entering TBM
(7 5 3 2)	/Project/TBM/Develop/Opening Screen TBM
(7 5 3 3)	/Project/TBM/Develop/Creating Pages
(7 5 3 4)	/Project/TBM/Develop/Content Page
(7 5 3 5)	/Project/TBM/Develop/Creating Links
(7 5 3 6)	/Project/TBM/Develop/Navigation

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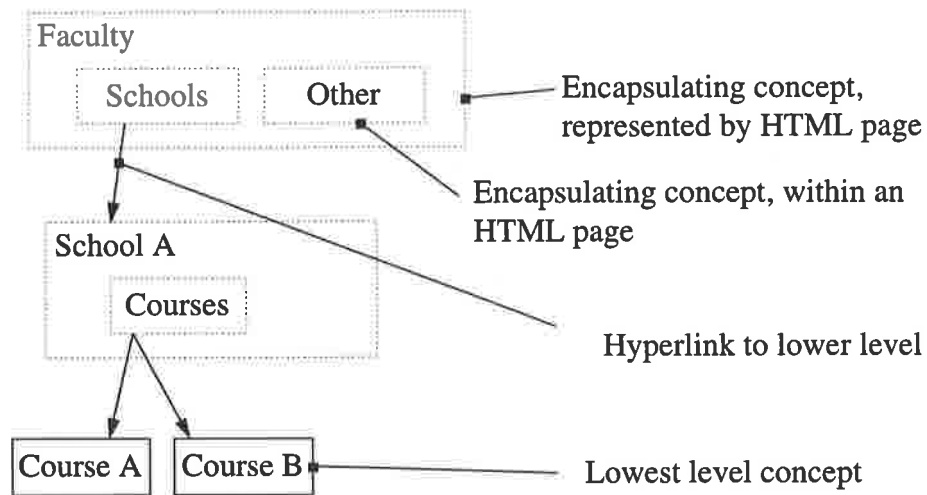
# Appendix F

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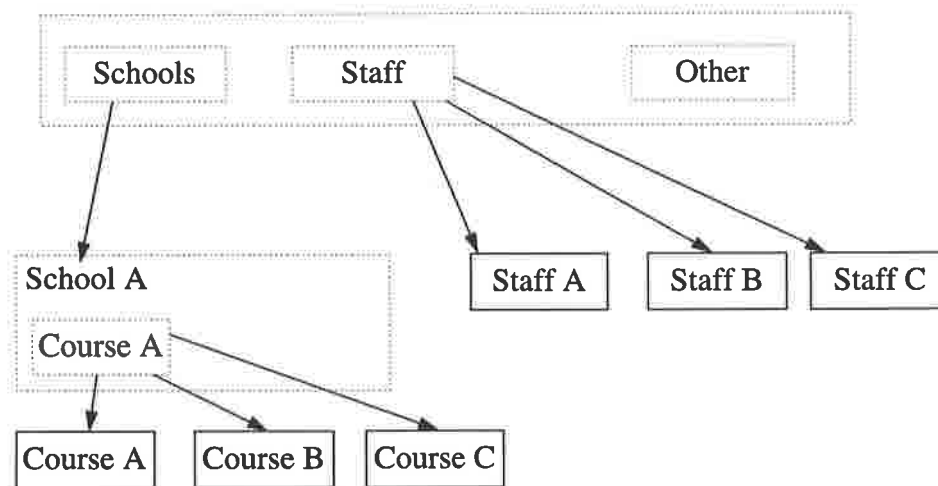
---

## Appendix F Representation of Web Sites

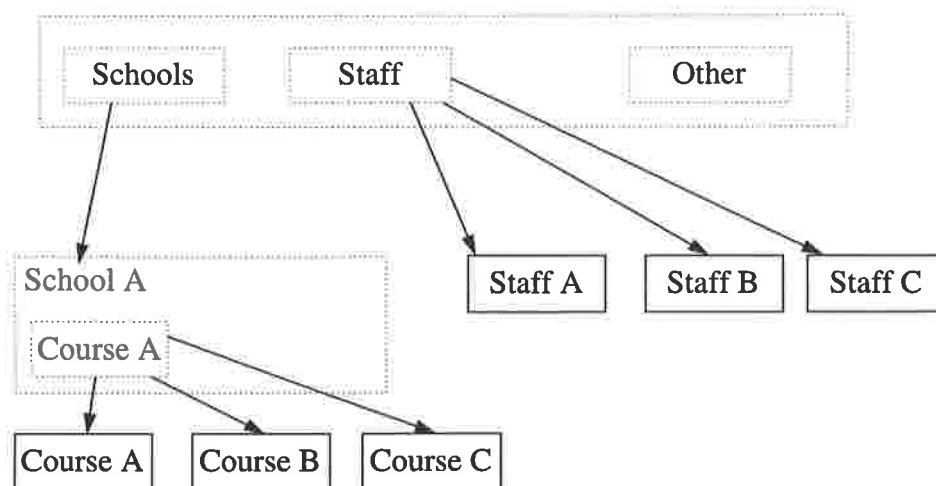
Syntax used in representations of Web sites



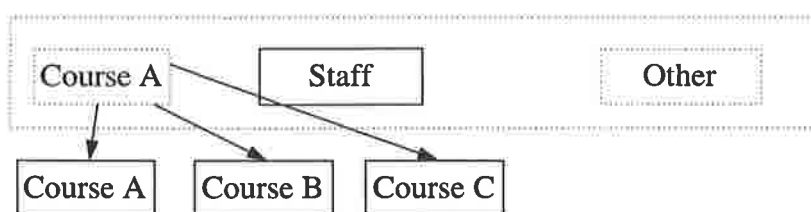
Cheltenham and Gloucester College of Higher Education, Faculty of Business and Social Studies ([www.chelt.ac.uk](http://www.chelt.ac.uk)).



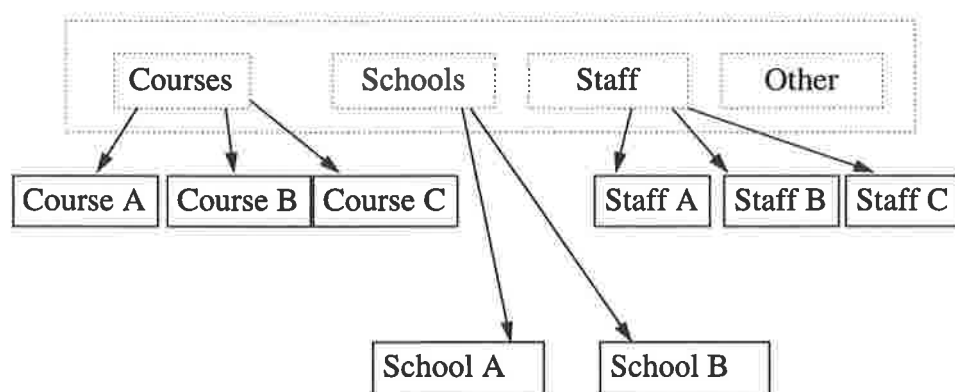
Bath Spa University College, Faculty of Humanities ([www.bathspa.ac.uk/ehs1.html](http://www.bathspa.ac.uk/ehs1.html)).



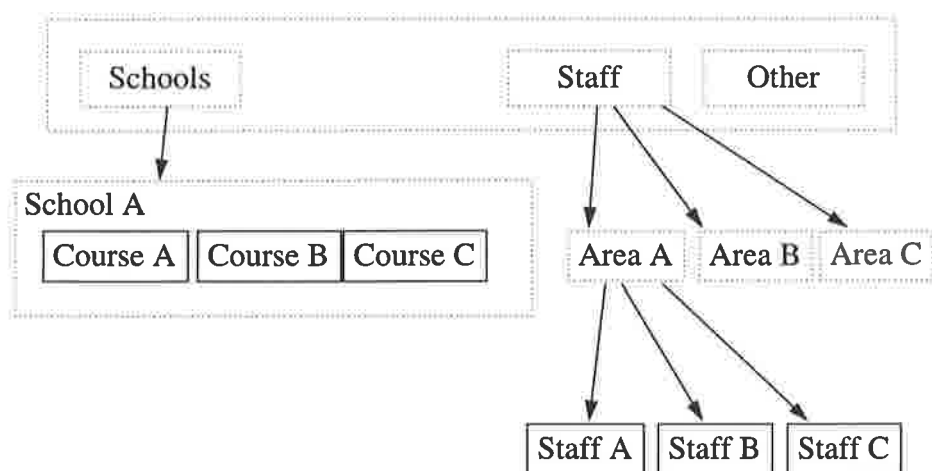
**Southampton Institute of Higher Education Social Science Faculty ([www.southampton-institute.ac.uk/extranet](http://www.southampton-institute.ac.uk/extranet))**



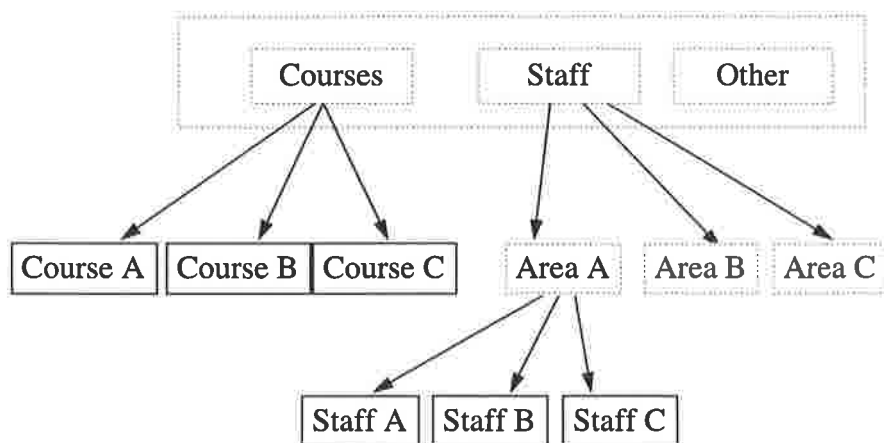
**Cardiff University Business School ([www.cardiff.ac.uk/uwcc/carbs/carbs.html](http://www.cardiff.ac.uk/uwcc/carbs/carbs.html))**



Swansea Institute of Higher Education, Faculty of Education and Humanities  
([www.sihe.ac.uk/educate/humanities/EDFAC](http://www.sihe.ac.uk/educate/humanities/EDFAC)).



Glamorgan University Business School ([www.glam.ac.uk/bus](http://www.glam.ac.uk/bus))



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# Appendix G

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## Appendix G Results of Content Analysis

The content analysis was done on a piece of A3 paper, a small font size has been used in order to reproduce it .

Subject	TBM versus Ideal				SHAPE <sup>®</sup> versus Ideal				TBM versus SHAPE <sup>®</sup>
	Nodes	Links/Levels	Estimate of Match (Percent)	Idiosyncrasies	Nodes	Links/Levels	Estimate of Match (Percent)	Idiosyncrasies	
S36	Non staff represented No management represented	None	55	Careers and Student life feature	No staff	Courses goes straight to courses in L and T	55	Mention of UWIC knowing best.	Similar concepts No hierarchy with TBM Similar at top level
S03	Schools represented at top level. No other standard nodes represented	Faculty down to one level	40	Focused on schools rather than anything else	Non-standard approach on discipline areas on staff	2 levels although muddled	50	Emphasis on research and consultancy	Not very similar, SHAPE <sup>®</sup> is a better match with standard model
S11	Matches standard quite well	Faculty down 2 levels	60	None	Creates hierarchy of people. Schools, courses not represented	Trivial interconnections	55	Separation of structure from everything else. Schools not represented	.TBM is a better match with standard model
S35	No courses	None	50	Emphasis on organisations, no mention of courses	No mention of courses, organisational emphasis	Good horizontal linking detailed breakdown of committees	50	Emphasis on committees	Same only SHAPE <sup>®</sup> output more developed
S28	Good match with standard	1 level, no links	60	No Links	Good match with standard at top level but a long list of items held with courses	One horizontal link	60	S28 creates lists of items that students might be interested in but no links	Similar at top level and TBM output would be the same if continued.
S26	Good match with standard	1 level	65	None	Schools represented at top level	S26 attempted to link concepts in a ring 4 levels.	60	Use of layout of concepts to represent a concept	Staff represented at top level in TBM but within schools with SHAPE. Equally good match



S25	Good match with standard	1 level	60	None	Good match	3 levels	65	no	Very similar and good match with standard
S20	Good match with standard	2 levels	60	Lectures are central. Big list of 'rooms' and 'resources' and 'degrees' rather than staff	Fair match with standard but irregular hierarchy	3 levels	60	emphasis on working parties	TBM and <i>SHAPE</i> ® differed but both with 60% match with standard.
S18	Good match with standard	2 levels	55	No staff	Good match with courses within schools	3 levels	60	no people	Very similar <i>SHAPE</i> ® more developed.
S12	Good match with standard	1/2 levels	60	Staff referred to as personalities.	Courses represented at top level and under schools, dito for research and consultancy	2 levels, more extend than standard but includes standard nodes	60	Emphasis on research and consultancy	TBM matches well but <i>SHAPE</i> ® representation includes extensions.
S10	Limited mention of staff or management	2 levels	55	Emphasis on admissions reflecting role as admissions tutor	Dito as TBM	Dito as TBM	50	Emphasis on facilities	Schools and courses feature but TBM emphasises admissions whereas <i>SHAPE</i> ® emphasises facilities. TBM is a better fit.
S04	Good match with standard	~2 levels	60	None	Good match, staff situated in schools	5 levels	60	S04 tried to link teachers to courses but the picture became too complex. Very people oriented.	<i>SHAPE</i> ® much richer and very people oriented whereas TBM version isn't.
S08	Good match with standard	1 level	55	None	Staff, courses, schools represented, but complex hierarchy of categories used	2/3 levels	55	tendency to categorise and represent structure separately. (S08 teaches systems etc)	TBM and <i>SHAPE</i> ® similar but <i>SHAPE</i> ® is a richer picture
S05	Good match with standard	3 levels	60	None	Good fit	Lots of horizontal links, 3 levels	50	None	TBM and <i>SHAPE</i> ® similar but <i>SHAPE</i> ® is a richer picture
S37	Limited match with standard	1 level	45	Odd choice of nodes	Better match than TBM, although course content at top level	3 levels, good horizontal linking	50	As per TBM	TBM and <i>SHAPE</i> ® similar but <i>SHAPE</i> ® is a richer picture Both have same idiosyncratic nodes
S02	No mention of	?	45	Emphasis on	Personnel within	3 levels	55	None	TBM and <i>SHAPE</i> ® similar

	staff				research centres	schools. Good match with standard					but <i>SHAPE</i> <sup>®</sup> is a richer picture
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# Appendix H

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## Appendix H Focus Group Procedure and Questions

### Setting the Scene

The participants were given the context text below to read and were then told the following:

- Thank you for agreeing to participate in this study
- The context for this study are the barriers confronting HE staff developing hypermedia
- The objectives of this study are:
  1. Assess the usability, learnability and utility of a number of hypermedia authoring programs based on different paradigms
  2. Investigate what makes a program suitable for HE staff to author hypermedia
  3. Investigate the issues surrounding creating-on-paper versus creating-on-computer
  4. Validate or otherwise the factors developed in the previous study
- You are invited to comment at any stage

### Procedure

The paradigm and process of construction of each program will be explained to the focus group participants and any comments they make will be recorded. A demonstration exercise is conducted by attempting to build a specific application. Following the demonstration exercise, a set of open questions are asked. Participants are also invited to ask if they are unsure of any terms used or the meaning of the questions. The four programs will be assessed in one session. After examining each program the discussion will be opened up for debate, mediated by the researcher.

The programs under examination are:

HAPs based on concept map:

**SHAPE**

Webmapper

HAP based on Icon/Control flow:

Authorware

Book-based HAP:

ToolBook®

Program. \_\_\_\_\_ . Evaluator. \_\_\_\_\_

### Knowledge

Can you see the structure of the knowledge?	None <input type="checkbox"/>	Fragments <input type="checkbox"/>	All <input type="checkbox"/>	Switchable <input type="checkbox"/>
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What types of knowledge can be represented?	None <input type="checkbox"/>	Declarative <input type="checkbox"/>	procedural <input type="checkbox"/>	Metaknowledge <input type="checkbox"/>
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### Construction

What are the methods of construction?	Code <input type="checkbox"/>	Dialogue boxes <input type="checkbox"/>	Diagrammatic <input type="checkbox"/>	Other <input type="checkbox"/>
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Can links be labeled/supplemented?	Labeled <input type="checkbox"/>	Supplemented <input type="checkbox"/>
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What link types are supported?	Non-typed <input type="checkbox"/>	User-definable <input type="checkbox"/>	Set types <input type="checkbox"/>	Text to text <input type="checkbox"/>	Media to media <input type="checkbox"/>
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Are links 'visible'?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
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How intuitive is hyperlinking?	Very intuitive <input type="checkbox"/>	Reasonably intuitive <input type="checkbox"/>	Confusing <input type="checkbox"/>	Very un-intuitive <input type="checkbox"/>
How intuitive is hyperlinking for a learner?	Very intuitive <input type="checkbox"/>	Reasonably intuitive <input type="checkbox"/>	Confusing <input type="checkbox"/>	Very un-intuitive <input type="checkbox"/>

### Usability

How obvious are the operations of this program?	High <input type="checkbox"/>	Medium <input type="checkbox"/>	Low <input type="checkbox"/>
How obvious are the operations of this program for a learner?	High <input type="checkbox"/>	Medium <input type="checkbox"/>	Low <input type="checkbox"/>

How well does the program 'carry' you through?	High <input type="checkbox"/>	Medium <input type="checkbox"/>	Low <input type="checkbox"/>
How well do you think the program	High <input type="checkbox"/>	Medium <input type="checkbox"/>	Low <input type="checkbox"/>

will 'carry' the learner through?			
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How much do you feel the program is making decisions for you?	High <input type="checkbox"/>	Medium <input type="checkbox"/>	Low <input type="checkbox"/>
How much do you feel the program would make decisions for the learner?	High <input type="checkbox"/>	Medium <input type="checkbox"/>	Low <input type="checkbox"/>

How 'logical' is the overall operation of this program?	High <input type="checkbox"/>	Medium <input type="checkbox"/>	Low <input type="checkbox"/>
How 'logical' do you think the overall operation of this program will be for the learner?	High <input type="checkbox"/>	Medium <input type="checkbox"/>	Low <input type="checkbox"/>

How well does this program match how you would expect it to operate?	High <input type="checkbox"/>	Medium <input type="checkbox"/>	Low <input type="checkbox"/>
How well do you think this program will match how the learner would expect it to operate?	High <input type="checkbox"/>	Medium <input type="checkbox"/>	Low <input type="checkbox"/>

How consistent are the operations of this program?	High <input type="checkbox"/>	Medium <input type="checkbox"/>	Low <input type="checkbox"/>
How consistent do you think the learner will find the operations of this program?	High <input type="checkbox"/>	Medium <input type="checkbox"/>	Low <input type="checkbox"/>

How much unnecessary detail is there on the screen for the learner?	High <input type="checkbox"/>	Medium <input type="checkbox"/>	Low <input type="checkbox"/>
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How at ease are you with this program?	High <input type="checkbox"/>	Medium <input type="checkbox"/>	Low <input type="checkbox"/>
How at ease would the user be with this program?	High <input type="checkbox"/>	Medium <input type="checkbox"/>	Low <input type="checkbox"/>

Do you think this program gives you a sense of accomplishment?	High <input type="checkbox"/>	Medium <input type="checkbox"/>	Low <input type="checkbox"/>
Do you think this program will give the learner a sense of accomplishment?	High <input type="checkbox"/>	Medium <input type="checkbox"/>	Low <input type="checkbox"/>

### Utility

To what extent do you get a sense of how the final product will look like while you use this program?	High <input type="checkbox"/>	Medium <input type="checkbox"/>	Low <input type="checkbox"/>
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To what extent do you think a learner would get a sense of how the final product will look like while they use this program?	High <input type="checkbox"/>	Medium <input type="checkbox"/>	Low <input type="checkbox"/>
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How well does this program create a product that matches the task?	High <input type="checkbox"/>	Medium <input type="checkbox"/>	Low <input type="checkbox"/>
How easily does this program create a product that matches the task for the learner?	High <input type="checkbox"/>	Medium <input type="checkbox"/>	Low <input type="checkbox"/>

### Post-Session Discussion

#### Cues

- Comparison of the usability, utility and learnability of the programs under study?
- What makes knowledge construction easy?
- How can you make a hypermedia authoring program more usable for HE staff?
- How can you get staff to create at the screen?
- What do you think of the concept of *Transparency of Operation*?
- What do you think of the concept of *Operational Momentum*?
- What do you think of the concept of *Transparency of Purpose*?

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**Context - Abstracted from a paper published in I.E.T.I:**

Elliott, G. J., Jones, Eleri and Barker, P. (1997). Supporting the Paradigm Shift: Hypermedia Construction with Concept Maps - The Easy Way Forward. *Innovations in Education and Training International*, 34, 4.

Many academic organisations would welcome more materials to support the paradigm shift from teacher-centredness to student-centredness and, in particular, to support open and distance learning. The appropriate location and utilisation of teaching and learning support materials within the educational process, either to supplement or supplant traditional approaches, offers the potential for an increasingly stimulating and interactive learning environment which is more responsive to the needs of individual students. Despite the growing availability of 'off the shelf solutions' as a result of considerable investment in TLTP, CTI and related initiatives, in the UK alone, there are still a number of obstacles to the wide-spread adoption of educational technology (including hypermedia) by academics including lack of time, lack of training and lack of support staff (Hammond et al 1992; Laurillard et al 1993b; Barker and Banerji 1994). Although there have been a number of collaborative approaches to educational technology development (Dobson 1993), in reality, many academic staff would prefer to develop their own individual teaching applications.

Whilst some observers, e.g. (Junkala 1991), are optimistic that almost anybody can produce college level courseware. Rode and Poirot (1991) found that 65% of computer literate staff at the University of North Texas were not disposed to writing educational software. Institutional support for staff developing innovative teaching and learning strategies is needed (Laurillard 1993a).

However, enthusiasm for hypermedia (also used here to include the subset of multimedia) has not manifested a plethora of development.

The use of hypermedia as an alternative to traditional methods will not take place until a cost-benefit analysis shows a clear advantage to hypermedia. Davis et al (Davis et al 1993) quoting Christie (Christie 1990) estimate that it takes between 100 and 150 hours to produce one hour of hypermedia instruction even for experienced developers, an experienced lecturer preparing a one hour lecture session could produce the requisite material in less than 10 hours. Whilst in the short term a cost-benefit analysis will show traditional approaches to have the edge, in the longer term and in the context of open and distance learning, the balance changes as hypermedia shows the potential for a major increase in flexibility of delivery and erosion of the temporal and geographical constraints which dog traditional teacher-centred delivery.

Many academic staff are now becoming proficient with word processors probably due to the advent of cheap, easy to use packages and PCs which clearly make text production more efficient. Similarly, easy to use hypermedia authoring tools which produce more effective teaching materials would be likely to revolutionise hypermedia development and use.

**EXPRESSIVENESS OF METAPHOR**



There is a trade off between the expressiveness of an authoring metaphor and its simplicity of operation, Chapanis (Chapanis 1991) calculates that 'versatility' is negatively correlated to other ease of use parameters, i.e. programs that are versatile (i.e. more complex) are not usually easy to use. To create educationally effective hypermedia, the authoring tool needs to allow the author the ability to create hypermedia that has the following identified features (Elliott et al 1995a):

- Multifaceted, multiperspective views of real world problems/issues;
- Active engagement;
- Flexible support of a number of different structures;
- Good search and query facilities;
- Support for different learning styles;
- Interactive sequences;
- Appropriate node size.

Furthermore, authors need the ability to sufficiently reflect the knowledge domain underpinning their completed applications. This means being able to display information chunks in whatever form - sound, text graphics etc., with associated navigation mechanisms - the system of hyperlinking. Some form of narrative, storyline or guided discovery mechanism is needed in order to 'make sense' of a hypermedia corpus (Elliott et al 1995b). It is essential also that users have learning objectives and activities embedded within the hypermedia, i.e. active engagement.

Recommendations from others, e.g. (Molich & Nielsen 1990), show that novice authors prefer simple minimalist human - computer interfaces, i.e. without too much functionality displayed on the screen in the form of toolbars, pulldown menus and floating pallets etc. The tension between simplicity of interface and sufficiency of expressiveness is clear and may be impossible to give users the power to create educationally-effective hypermedia without increased sophistication of tools.

### **AUTHORING METAPHORS**

A range of authoring metaphors are used to construct educational hypermedia, the book metaphor of e.g. ToolBook<sup>®</sup>, the control flow diagram e.g. IconAuthor<sup>™</sup> Authorware<sup>™</sup> and the object oriented program metaphors e.g. Visual Basic<sup>™</sup>, Visual C<sup>™</sup>, Delphi<sup>™</sup>, Java<sup>™</sup>. The control flow metaphor, adopted in IconAuthor and Authorware, tends to dictate the navigation decisions that users will make and does not allow the author to 'see' the developing knowledge structure. The object oriented programming metaphor is beyond the current abilities of most academic staff and also does not allow the author to visualise the underlying knowledge structure.

### **CONCEPT MAPPING**

Concept maps have been used extensively in education as a means of expressing knowledge domains (Okebukola 1992), evaluating student misconceptions (Ross and Munby 1991), as study aids, curriculum development (Barenholz and Tamir 1992) even as a form of assessment (Beyerbach and Smith 1990). Concept maps are being increasingly used as 'front ends' to hypermedia knowledge corpora, (Reynolds &

Danserau 1990), (Miller 1995) and (Elliott et al 1996). Concept maps are viewed by some as useful ways to access hypermedia (Gaines & Shaw 1995), (McAleese 1987). Concept mapping could resolve some of the pedagogical and temporal issues associated with the production of educational hypermedia. It is possible to post-process concept maps to produce skeletal hypermedia which can be supplemented with hypermedia material and functionality. Closely linking a concept mapping tool with a hypermedia corpus would enable learners to create their own view(s), extracting material as they browse and allow them to form their own notes, to be taken away on suitable magnetic media. It is recognised that simple concepts maps are not sufficiently expressive to allow for the features of educationally-effective hypermedia and additional functionality may be required

The adoption of a concept mapping approach to hypermedia development raises a number of fundamental issues. Creating a 'view' of a particular subject would seem simple in theory but may be more difficult in practice. A concept map may prove a transitory, rather than definitive, picture of the domain (Jonassen et al 1994). In well-defined subject areas, where major interrelations are generally accepted, concept mapping may be neither difficult nor transitory. Reader (Reader 1996) warns of the dangers of forcing ideas into representations that are inappropriate, concept maps no exception and are probably not the most appropriate representational system for all knowledge domains or are insufficiently expressive as discussed below.

Expressing knowledge through concept mapping is one thing, doing this directly on a computer is another. The analogy here is of people who create with pen and paper and use a computer to present the creative work. Pen and paper are the creative medium. Better word processing packages can facilitate composition directly at the keyboard. Similarly, to facilitate the development of hypermedia through concept mapping would seem a sensible and tangible goal.

### **Definition of Hypermedia**

For the purposes of this study hypermedia is defined as the the interlinking of computer based media units using hyperlinks ie hotwords, hot regions, hot media etc which allows a human 'viewer' or user of the hypermedia to navigate around the units of media. Computer based media includes text, sound, video, graphics, movement, pictures, diagrams i.e. any media which humans use to convey meaning and can be communicated via a computer screen.

There are many other hypermedia definitions however the one above is right for the puposes of this study.

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# Appendix I

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## Appendix I Raw Results of Principle Components Analysis

### Ease of Learning *SHAPE*®

#### FACTOR ANALYSIS

Analysis number 1 Listwise deletion of cases with missing values

Kaiser-Meyer-Olkin Measure of Sampling Adequacy = .38018

Bartlett Test of Sphericity = 177.34182, Significance = .00000

Extraction 1 for analysis 1, Principal Components Analysis (PC)

#### Initial Statistics:

Variable	Communality	*	Factor	Eigenvalue	Pct of Var	Cum Pct
VAR00001	1.00000	*	1	6.30515	52.5	52.5
VAR00002	1.00000	*	2	1.71616	14.3	66.8
VAR00003	1.00000	*	3	1.42699	11.9	78.7
VAR00004	1.00000	*	4	.95390	7.9	86.7
VAR00005	1.00000	*	5	.55123	4.6	91.3
VAR00006	1.00000	*	6	.47338	3.9	95.2
VAR00007	1.00000	*	7	.28206	2.4	97.6
VAR00008	1.00000	*	8	.13884	1.2	98.7
VAR00009	1.00000	*	9	.08722	.7	99.5
VAR00010	1.00000	*	10	.05049	.4	99.9
VAR00011	1.00000	*	11	.01090	.1	100.0
VAR00012	1.00000	*	12	.00368	.0	100.0

PC extracted 3 factors.

#### Factor Matrix:

	Factor 1	Factor 2	Factor 3
VAR00001	.93111	-.00569	-.07923
VAR00002	.91744	-.15031	.03470
VAR00004	.89291	-.00964	-.21385
VAR00010	.85216	.19454	-.08008
VAR00007	.83774	-.15621	.17942
VAR00012	.76713	-.34388	-.22864
VAR00005	.74084	.51914	.01229
VAR00011	.69696	-.51187	.02439
VAR00009	.59078	.46348	.55787
VAR00006	.37259	.68276	.11638
VAR00003	.36123	.05811	-.78462
VAR00008	.36024	-.54505	.58460

#### Final Statistics:

Variable	Communality	*	Factor	Eigenvalue	Pct of Var	Cum Pct
VAR00001	.87328	*	1	6.30515	52.5	52.5
VAR00002	.86549	*	2	1.71616	14.3	66.8
VAR00003	.74949	*	3	1.42699	11.9	78.7
VAR00004	.84311	*				
VAR00005	.81850	*				
VAR00006	.61852	*				

VAR00007 .75840 \*

Variable	Communality	*	Factor	Eigenvalue	Pct of Var	Cum Pct
VAR00008	.76861	*				
VAR00009	.87506	*				
VAR00010	.77044	*				
VAR00011	.74836	*				
VAR00012	.75902	*				

VARIMAX rotation 1 for extraction 1 in analysis 1 - Kaiser Normalization.

VARIMAX converged in 6 iterations.

Rotated Factor Matrix:

	Factor 1	Factor 2	Factor 3
VAR00002	.86593	.33779	-.03945
VAR00012	.85856	.02909	.14512
VAR00011	.84903	-.07078	-.15001
VAR00001	.82151	.43064	.11381
VAR00004	.80572	.36991	.23896
VAR00007	.78277	.33532	-.18231
VAR00010	.65681	.55611	.17259
VAR00009	.22681	.83184	-.36286
VAR00005	.39348	.79465	.17946
VAR00006	-.01730	.77785	.11475
VAR00003	.37669	.00004	.77949
VAR00008	.50756	-.10275	-.70742

Factor Transformation Matrix:

	Factor 1	Factor 2	Factor 3
Factor 1	.86954	.49197	.04319
Factor 2	-.48020	.82184	.30657
Factor 3	-.11533	.28732	-.95087

## Ease of Learning TBM

## F A C T O R   A N A L Y S I S

Analysis number 1   Listwise deletion of cases with missing values

Kaiser-Meyer-Olkin Measure of Sampling Adequacy = .50755

Bartlett Test of Sphericity = 152.69719, Significance = .00000

1-tailed Significance of Correlation Matrix:

' . ' is printed for diagonal elements.

	VAR00001	VAR00002	VAR00003	VAR00004	VAR00005
VAR00001	.				
VAR00002	.00053	.			
VAR00003	.07120	.00840	.		
VAR00004	.00010	.00240	.11328	.	
VAR00005	.00009	.00676	.03837	.00021	.
VAR00006	.04622	.15392	.01883	.05823	.00428
VAR00007	.00472	.10153	.17565	.03709	.00788
VAR00008	.01571	.02578	.46837	.06008	.11865
VAR00009	.00000	.00322	.03104	.00086	.00025
VAR00010	.00103	.02429	.27679	.02429	.02028
VAR00011	.02710	.14933	.04096	.19916	.01114
VAR00012	.25541	.26864	.00376	.17520	.02028
	VAR00006	VAR00007	VAR00008	VAR00009	VAR00010
VAR00006	.				
VAR00007	.04049	.			
VAR00008	.50000	.37501	.		
VAR00009	.02361	.00444	.02868	.	
VAR00010	.00584	.01364	.01554	.00557	.
VAR00011	.00052	.01954	.33965	.01354	.03882
VAR00012	.00006	.24836	.15623	.22292	.17520
	VAR00011	VAR00012			
VAR00011	.				
VAR00012	.03882	.			

Extraction   1 for analysis   1, Principal Components Analysis (PC)

Initial Statistics:

Variable	Communality	*	Factor	Eigenvalue	Pct of Var	Cum Pct
VAR00001	1.00000	*	1	6.32919	52.7	52.7
VAR00002	1.00000	*	2	2.09833	17.5	70.2
VAR00003	1.00000	*	3	1.07128	8.9	79.2
VAR00004	1.00000	*	4	.76289	6.4	85.5
VAR00005	1.00000	*	5	.63653	5.3	90.8
VAR00006	1.00000	*	6	.42490	3.5	94.4
VAR00007	1.00000	*	7	.22838	1.9	96.3
VAR00008	1.00000	*	8	.19665	1.6	97.9
VAR00009	1.00000	*	9	.13654	1.1	99.0
VAR00010	1.00000	*	10	.08600	.7	99.8
VAR00011	1.00000	*	11	.01921	.2	99.9
VAR00012	1.00000	*	12	.01009	.1	100.0

PC extracted 3 factors.

Factor Matrix:

	Factor 1	Factor 2	Factor 3
VAR00001	.90356	-.32195	-.01115
VAR00005	.88984	.04764	.04536
VAR00009	.88888	-.20833	-.01619
VAR00004	.78093	-.26792	.20213
VAR00010	.74715	-.18845	-.36866
VAR00002	.73757	-.29626	.46308
VAR00006	.72985	.56818	-.19225
VAR00007	.67942	.00833	-.44067
VAR00011	.67246	.37900	-.33167
VAR00003	.59132	.42225	.55264
VAR00012	.48700	.78227	.17432
VAR00008	.43063	-.70509	.02603

Final Statistics:

Variable	Communality	*	Factor	Eigenvalue	Pct of Var	Cum Pct
VAR00001	.92020	*	1	6.32919	52.7	52.7
VAR00002	.84623	*	2	2.09833	17.5	70.2
VAR00003	.83336	*	3	1.07128	8.9	79.2
VAR00004	.72249	*				
VAR00005	.79614	*				
VAR00006	.89247	*				
VAR00007	.65587	*				
VAR00008	.68327	*				
VAR00009	.83377	*				
VAR00010	.72965	*				
VAR00011	.70585	*				
VAR00012	.87951	*				

VARIMAX rotation 1 for extraction 1 in analysis 1 - Kaiser Normalization.

VARIMAX converged in 9 iterations.

Rotated Factor Matrix:

	Factor 1	Factor 2	Factor 3
VAR00002	.87258	.04049	.28843
VAR00001	.81094	.50267	.09947
VAR00004	.78003	.27317	.19857
VAR00008	.73253	.11555	-.36512
VAR00009	.73016	.51814	.17936
VAR00005	.60093	.51764	.40874
VAR00007	.28413	.75634	.05560
VAR00011	.09927	.73521	.39428
VAR00010	.47863	.70664	-.03492
VAR00006	.08058	.69713	.63244
VAR00012	-.06787	.30502	.88423
VAR00003	.37395	.01216	.83269

Factor Transformation Matrix:

Factor 1	Factor 2	Factor 3	
Factor 1	.68713	.61131	.39263
Factor 2	-.60438	.18103	.77586
Factor 3	.40321	-.77041	.49385

Ease of Use *SHAPE*®

## F A C T O R   A N A L Y S I S

Analysis number 1   Listwise deletion of cases with missing values

Kaiser-Meyer-Olkin Measure of Sampling Adequacy = .53273

Bartlett Test of Sphericity = 124.64758, Significance = .00002

Extraction   1 for analysis   1, Principal Components Analysis (PC)

## Initial Statistics:

Variable	Communality	*	Factor	Eigenvalue	Pct of Var	Cum Pct
VAR00013	1.00000	*	1	6.21756	51.8	51.8
VAR00014	1.00000	*	2	1.60073	13.3	65.2
VAR00015	1.00000	*	3	1.05494	8.8	73.9
VAR00016	1.00000	*	4	.94270	7.9	81.8
VAR00017	1.00000	*	5	.60344	5.0	86.8
VAR00018	1.00000	*	6	.47628	4.0	90.8
VAR00019	1.00000	*	7	.46191	3.8	94.6
VAR00022	1.00000	*	8	.29287	2.4	97.1
VAR00023	1.00000	*	9	.17582	1.5	98.6
VAR00024	1.00000	*	10	.10702	.9	99.4
VAR00025	1.00000	*	11	.05481	.5	99.9
VAR00026	1.00000	*	12	.01193	.1	100.0

PC   extracted   3 factors.

## Factor Matrix:

	Factor 1	Factor 2	Factor 3
VAR00026	.89172	-.08313	.02070
VAR00024	.83509	-.24530	.22382
VAR00013	.81703	-.05036	-.12321
VAR00022	.73432	-.06089	-.49795
VAR00014	.72595	-.51961	.22107
VAR00017	.71880	-.49975	.19761
VAR00023	.71813	-.21066	-.41515
VAR00015	.68658	.56087	.08077
VAR00025	.66968	.09523	.04984
VAR00019	.60565	.54210	-.40296
VAR00018	.59417	.35273	.19893
VAR00016	.56493	.47048	.51967

## Final Statistics:

Variable	Communality	*	Factor	Eigenvalue	Pct of Var	Cum Pct
VAR00013	.68525	*	1	6.21756	51.8	51.8
VAR00014	.84587	*	2	1.60073	13.3	65.2
VAR00015	.79249	*	3	1.05494	8.8	73.9
VAR00016	.81055	*				
VAR00017	.80548	*				
VAR00018	.51703	*				
VAR00019	.82306	*				
VAR00022	.79089	*				
VAR00023	.73244	*				



## F A C T O R   A N A L Y S I S

Variable	Communality	* Factor	Eigenvalue	Pct of Var	Cum Pct
VAR00024	.80765	*			
VAR00025	.46003	*			
VAR00026	.80250	*			

VARIMAX    rotation    1 for extraction    1 in analysis    1 - Kaiser Normalization.

VARIMAX converged in 7 iterations.

Rotated Factor Matrix:

	Factor 1	Factor 2	Factor 3
VAR00014	.90099	.10726	.15027
VAR00017	.87503	.10732	.16820
VAR00024	.78594	.36409	.23954
VAR00026	.64508	.42011	.45813
VAR00016	.21928	.87044	-.06925
VAR00015	.09183	.80345	.37219
VAR00018	.21263	.65733	.19932
VAR00025	.38824	.44463	.33406
VAR00022	.35578	.12089	.80604
VAR00019	-.10808	.53065	.72787
VAR00023	.47476	.04132	.71087
VAR00013	.52643	.33990	.54091

Factor Transformation Matrix:

	Factor 1	Factor 2	Factor 3
Factor 1	.65214	.52800	.54399
Factor 2	-.68219	.72170	.11733
Factor 3	.33064	.44762	-.83085

## Ease of Use TBM

## ----- FACTOR ANALYSIS -----

Analysis number 1 Listwise deletion of cases with missing values

Kaiser-Meyer-Olkin Measure of Sampling Adequacy = .51386

Bartlett Test of Sphericity = 144.74653, Significance = .00000

1-tailed Significance of Correlation Matrix:

' . ' is printed for diagonal elements.

	VAR00013	VAR00014	VAR00015	VAR00016	VAR00017
VAR00013	.				
VAR00014	.00026	.			
VAR00015	.06846	.13081	.		
VAR00016	.09090	.07120	.00029	.	
VAR00017	.20898	.26800	.02992	.10709	.
VAR00018	.18899	.05100	.00116	.00023	.01577
VAR00019	.00016	.00084	.05504	.08160	.24910
VAR00022	.09844	.00301	.39487	.39487	.06905
VAR00023	.00334	.00596	.06997	.02533	.10709
VAR00024	.00000	.00003	.04164	.04913	.20217
VAR00025	.04401	.00462	.09341	.06170	.04853
VAR00026	.05402	.11328	.25541	.25541	.24066
	VAR00018	VAR00019	VAR00022	VAR00023	VAR00024
VAR00018	.				
VAR00019	.11985	.			
VAR00022	.12242	.07664	.		
VAR00023	.07983	.00035	.02247	.	
VAR00024	.15458	.00000	.05318	.00084	.
VAR00025	.03799	.03314	.00558	.00558	.03511
VAR00026	.24166	.08121	.05823	.01687	.05718
	VAR00025	VAR00026			
VAR00025	.				
VAR00026	.50000	.			

Extraction 1 for analysis 1, Principal Components Analysis (PC)

Initial Statistics:

Variable	Communality	*	Factor	Eigenvalue	Pct of Var	Cum Pct
VAR00013	1.00000	*	1	5.93345	49.4	49.4
VAR00014	1.00000	*	2	2.24862	18.7	68.2
VAR00015	1.00000	*	3	1.26476	10.5	78.7
VAR00016	1.00000	*	4	.88637	7.4	86.1
VAR00017	1.00000	*	5	.49329	4.1	90.2
VAR00018	1.00000	*	6	.45069	3.8	94.0
VAR00019	1.00000	*	7	.25622	2.1	96.1
VAR00022	1.00000	*	8	.21138	1.8	97.9
VAR00023	1.00000	*	9	.11698	1.0	98.8
VAR00024	1.00000	*	10	.08843	.7	99.6
VAR00025	1.00000	*	11	.04127	.3	99.9
VAR00026	1.00000	*	12	.00853	.1	100.0

PC extracted 3 factors.

Factor Matrix:

	Factor 1	Factor 2	Factor 3
VAR00024	.88006	-.26806	-.31105
VAR00014	.85054	-.22829	-.02454
VAR00023	.84569	-.18051	.02193
VAR00019	.83324	-.24094	-.29557
VAR00013	.81774	-.28938	-.31819
VAR00025	.71561	.11486	.36396
VAR00026	.35205	-.70761	.17764
VAR00018	.60381	.67264	.14532
VAR00015	.60781	.63542	-.21133
VAR00016	.62265	.62947	-.23212
VAR00022	.60610	-.26413	.62960
VAR00017	.48191	.33788	.54610

Final Statistics:

Variable	Communality	Factor	Eigenvalue	Pct of Var	Cum Pct
VAR00013	.85368	1	5.93345	49.4	49.4
VAR00014	.77614	2	2.24862	18.7	68.2
VAR00015	.81785	3	1.26476	10.5	78.7
VAR00016	.83780				
VAR00017	.64464				
VAR00018	.83815				
VAR00019	.83969				
VAR00022	.83353				
VAR00023	.74826				
VAR00024	.94312				
VAR00025	.65776				
VAR00026	.65621				

VARIMAX rotation 1 for extraction 1 in analysis 1 - Kaiser Normalization.

VARIMAX converged in 6 iterations.

Rotated Factor Matrix:

	Factor 1	Factor 2	Factor 3
VAR00024	.94429	.18977	.12417
VAR00013	.90779	.14758	.08842
VAR00019	.88849	.19130	.11697
VAR00014	.78833	.14522	.36549
VAR00023	.74376	.17453	.40573
VAR00026	.53677	-.52684	.30087
VAR00016	.29177	.86183	.09964
VAR00015	.26900	.85621	.11136
VAR00018	.10645	.80303	.42657
VAR00022	.35124	-.13959	.83107
VAR00017	.00622	.36297	.71613
VAR00025	.36727	.30261	.65673

Factor Transformation Matrix:

	Factor 1	Factor 2	Factor 3
Factor 1	.79049	.40137	.46264
Factor 2	-.46528	.88474	.02743
Factor 3	-.39830	-.23694	.88612

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# Appendix J

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## Appendix J Analysis of Raw Results of Principle Components Analysis

### Ease of Learning

Table A below shows the comparison of the items loaded against each of the factors of each HAP from a PCA of the Ease of Learning scale. Items above the solid bar have highest loadings against that factor, items below have loadings above 0.30.

Factor	TBM	SHAPE
1	2	2
	1	12
	4	11
	8	1
	9	4
	5	7
	10	10
	3	5
		3
		8
2	7	9
	11	5
	10	6
	6	2
	1	1
	9	4
	5	7
	12	10
3	12	3
	3	8
	8	9
	5	
	11	
	6	

**Table A Comparison of items loaded against each factor for each HAP for Ease of Use.**

The items which had the best overall weightings against each factor from the scales for both HAP were selected as shown in table B below

1	2	I liked learning 'X'
	1	'X' was easy to learn
	4	I felt comfortable learning 'X'
	10	It took too much time to learn 'X'
2	6	The ideas behind 'X' were difficult to appreciate
	9	I often became confused learning 'X'
	10	It took too much time to learn 'X'
	5	I found 'X' difficult to understand
	7	When 'X' was explained it was obvious what to do
3	3	I gained a lot learning 'X'
	8	'X' is no more difficult than other Windows based programs

**Table B. Final list of items best loaded against each factor.**

## Ease of Use

Table C below shows the comparison of the items loaded against each of the factors of each HAP from a PCA of the Ease of Learning scale. Items above the solid bar have highest loadings against that factor, items below have loadings above 0.30.

Factor	TBM	SHAPE
1	24	14
	13	17
	19	24
	14	<u>26</u>
	23	25
	<u>26</u>	22
	22	23
	25	13
2	16	16
	15	15
	<u>18</u>	18
	26	<u>25</u>
	17	24
	25	26
		19
3		13
	22	22
	17	19
	<u>25</u>	23
	14	<u>13</u>
	23	26
	26	15
	18	25

**Table C. Comparison of items loaded against each factor for each HAP for Ease of Use.**

The items which had the best overall weightings against each factor from the scalees for both HAPs were selected as shown in table D below:

1	24	I felt comfortable using 'X'
	14	I liked using 'X'
	13	It was easy to use 'X'
	26	It took too much time to use 'X'
2	15	I had no difficulty understanding how to use 'X'
	16	The set of operations one needed to use were easy to remember
	18	It was obvious what to do next
	26	It took too much time to use 'X'
3	22	I really felt I had accomplished something using 'X'
	23	I felt frustrated using 'X'
	25	'X' was fun

**Table D. Final list of items best loaded against each factor for Ease of Use**



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# Appendix K

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## Appendix K Evidential Data Bits Indexed on Transparency of Operation

### Mental Model Match

Q.S.R. NUD.IST Power version, revision 3.0.4 GUI.  
Licensee: geoff.

PROJECT: INTRVWS, User Geoff Elliott, 5:44 pm, 17 Aug, 1998.

```
*****
(2 2 2 3 2)          /Ease/eou/Transparency/operation/Mental Model
*** No Definition
*****
+++ ON-LINE DOCUMENT: s03rw
+++ Retrieval for this document: 5 units out of 282, = 1.8%
++ Text units 67-71:

67  *Picture TBM 6: Page for Support Staff

68
69  G: What did you do next?
70
71  We put in the heading in there at the top but I'm not sure how you did
    it. TO get au fait with this I would have to do it a number of times.
    I think I have a mental block on learning these sorts of things.
*****
+++ ON-LINE DOCUMENT: s04mj
+++ Retrieval for this document: 3 units out of 559, = 0.54%
++ Text units 389-391:

389  * Confusion TBM G: Was there anything confusing about using ToolBook® ?

390
391  Well I thinks its which bits go in the content and are related-to cos
    othwise if its wrong you find that you end up going round in circles.
*****
+++ ON-LINE DOCUMENT: s05ms
+++ Retrieval for this document: 9 units out of 412, = 2.2%

145  *Picture SHAPE® 9 CTRL-Clicked concept
++ Text units 149-157:
149  I would then decide whether each concept was atomic or (pauses) composite
150
151  G: What did you feel about the idea of atomic/composite?
152
153  I didn't understand what atomic means, its not a word I would ever use.
    I am familiar with the idea of owners and owned
154
155  G; How long did it take to understand what atomic means?
156
157  Composite means there are other levels underneath atomic means you are at
    the lowest level, - detail level
*****
+++ ON-LINE DOCUMENT: s08fb
+++ Retrieval for this document: 16 units out of 561, = 2.9%
++ Text units 37-39:

37  *General SHAPE® What general impressions did you have using SHAPE®?

38
39  I can see its potential. You have to build up something. My only
    negative comment would be a help menu. My feeling is that coming from a
    computing background where I'm used to top-down design, I can think in
    that way but then actually building up that on the computer as-you-go,
    its not quite as easy to see the top-down design you are doing on paper
    (where) its easier to see the thing developing, this way tends to be a
    bit piecemeal.
++ Text units 374-386:

374  *General TBM What general impressions did you have using ToolBook®?

375
376  I didn't find it particularly easy it wasn't very intuitive. I found it
    frustrating
377
```

```

378 G; Why
379
380 There seem to be there's quite alot of pulldown menus which you would
    have to go behind the menus to find out what you have to do.
381
382 It's fairly easy to get lost but then that could well have been because
    having used SHAPE® which to me seemed to have more strcuture to it
383
384 *Ideas TBM How easy did you find the ideas behind ToolBook® to grasp?
385
386 Eventually it was ok. There was one or two things there I didn't think
    were easy again its that idea of top-down design whcih obviuosly tBM
    doesn't do.
+++++
+++ ON-LINE DOCUMENT: s11tc
+++ Retrieval for this document: 6 units out of 291, = 2.1%
++ Text units 58-60:

58 *Ideas TBM How easy were the ideas to grasp?
59
60 Well pretty easy but thats because I am familiar with the concepts
    already I'm not familiar with ToolBook® and the way it does it but it
    looks as how you would expect it to.
++ Text units 125-127:

125 *EOU TBM What makes a program easy to use
126
127 A program that once youv'e learned the fundamentals the extra bells and
    whistles follow along the same pattern so you don't have to adopt a
    another dialogue strategy the other features follow the same style.
+++++
+++ ON-LINE DOCUMENT: s18aj
+++ Retrieval for this document: 8 units out of 387, = 2.1%
++ Text units 346-353:

346 *Easy SHAPE: Was there anything about SHAPE® that made it easy in
    producing an application that matched the objectives of the exercise?
347
348 The use of graphics makes it easier?
349
350 G: Why?
351
352
353 Its the way I think I suppose when I'm creating the structure I like to
    keep the structure in my mind and this is a strcuture I'm creating.
+++++
+++ ON-LINE DOCUMENT: s20rk
+++ Retrieval for this document: 7 units out of 583, = 1.2%
++ Text units 60-66:

60 *General TBM What general impressions did you have using ToolBook®?
61
62 Could be more userfriendly
63
64 G: In what sense
65
66 I automatically wanted to structure it with a main headings and
    subheadings but nothing allowed me to do that.
+++++
+++ ON-LINE DOCUMENT: s36kt
+++ Retrieval for this document: 3 units out of 578, = 0.52%
++ Text units 195-197:

195 *Difficult TBM Was there anything about ToolBook® that made it difficult
    or unsatisfactory in producing an application that matched the objectives
    of the exercise?
196
197 If there was an idiot proof introduction to TBM it wouldn't be to
    difficult. It doesn't seem that completicated. If you don't know what
    words to ask you can't get into it.
+++++
+++ Total number of text units retrieved = 57

```

```

+++ Retrievals in 8 out of 27 documents, = 30%.
+++ The documents with retrievals have a total of 3653 text units,
    so text units retrieved in these documents = 1.6%.
+++ All documents have a total of 9235 text units,
    so text units found in these documents = 0.62%.
+++++

```

## Logic of Operation

Q.S.R. NUD.IST Power version, revision 3.0.4 GUI.  
Licensee: geoff.

PROJECT: INTRVWS, User Geoff Elliott, 5:44 pm, 17 Aug, 1998.

```

*****
(2 2 2 3 3)           /Ease/eou/Transparency/operation/Logic of Operation
*** No Definition
+++++
+++ ON-LINE DOCUMENT: s03rw
+++ Retrieval for this document: 3 units out of 282, = 1.1%
++ Text units 25-27:

25  *Confusion TBM Was there anything confusing about using ToolBook® ?

26
27  Yes the confusion I had was the operates - what I had to press.
+++++
+++ ON-LINE DOCUMENT: s04mj
+++ Retrieval for this document: 6 units out of 559, = 1.1%
++ Text units 306-308:

306 *Easy SHAPE® Was there anything about SHAPE® that made it easy in producing
    an application that matched the objectives of the exercise?

307
308 Straightforward to follow
++ Text units 314-316:

314 *EOU SHAPE® After having learnt to use SHAPE® do you have any general
    thoughts on what makes a program easy to use?

315
316 Same transparency and logic of operation
+++++
+++ ON-LINE DOCUMENT: s10pb
+++ Retrieval for this document: 3 units out of 416, = 0.72%
++ Text units 79-81:

79  *Confusion TBM: Was there anything confusing about using TBM?

80
81  No its straight forward its just knowing what to do
+++++
+++ ON-LINE DOCUMENT: s28ds
+++ Retrieval for this document: 6 units out of 572, = 1.0%
++ Text units 60-65:

60  *General SHAPE® What general impressions did you have using SHAPE®?

61
62  I think if you want to do it properly you really need to sit down and
    think it through and the links between different things. I think I would
    feel more confident doing it on paper first. But I can see its value in
    relation to education and lecturing

63
64  Its quite user friendly and it allows you to go through it in a logical
    way.

65
+++++
+++ ON-LINE DOCUMENT: s35db
+++ Retrieval for this document: 5 units out of 528, = 0.95%
++ Text units 29-33:

29  *General SHAPE® What general impressions did you have using SHAPE®?

```

30  
 31 It seemed to be working pretty well it didn't seem to interrupt the thinking that I was having about the topic. There was the odd occasion where I felt I was being driven down a kind of knowledge system and in fact I was already beginning to see how things at different levels could be interrater rather than simply be functions of the previous level. I think I needed the instruction, the icons still did not have any meaning to me.

32  
 33 Maybe its the power of the cmapping that exposes these hierarchies of thinking which makes it more threatening and a testament to its usefulness that it should make you feel like that. If you'd asked me to write a text about the faculty I wouldn't feel like that.

+++++  
 +++ ON-LINE DOCUMENT: s36kt  
 +++ Retrieval for this document: 5 units out of 578, = 0.87%  
 ++ Text units 97-101:

97 \*Picture TBM 3 Opening page of ToolBook®

98  
 99 G: What do you do here?  
 100  
 101 You have to go to object I think although I wouldn't have done that, I would have gone onto file assuming I wanted to open something I assume file is something that is already there, I couldn't see the logic of object.

+++++  
 +++ Total number of text units retrieved = 28  
 +++ Retrievals in 6 out of 27 documents, = 22%.  
 +++ The documents with retrievals have a total of 2935 text units, so text units retrieved in these documents = 0.95%.  
 +++ All documents have a total of 9235 text units, so text units found in these documents = 0.30%.  
 +++++

## Operational Momentum

Q.S.R. NUD.IST Power version, revision 3.0.4 GUI.  
 Licensee: geoff.

PROJECT: INTRVWS, User Geoff Elliott, 5:44 pm, 17 Aug, 1998.

\*\*\*\*\*  
 (2 2 2 3 4) /Ease/eou/Transparency/operation/Operational Momentum  
 \*\*\* No Definition  
 +++++  
 +++ ON-LINE DOCUMENT: s05ms  
 +++ Retrieval for this document: 3 units out of 412, = 0.73%  
 ++ Text units 224-226:

224 \*Objectives SHAPE: How well do you think **SHAPE**® allowed you to achieve the objectives of the exercise?

225  
 226 I haven't done the detail and how easy it is to put in the bells and whistles at the detail level but its easy to do that (the structure).

+++++  
 +++ ON-LINE DOCUMENT: s08fb  
 +++ Retrieval for this document: 12 units out of 561, = 2.1%  
 ++ Text units 289-291:

289 \*Difficult **SHAPE**® Was there anything about **SHAPE**® that made it difficult or unsatisfactory in producing an application that matched the objectives of the exercise?

290  
 291 As long as the person using it can flick backwards and forwards and doesn't get lost in where they are going there's no problem. As long that's made quite clear how to go backwards and forwards there's no problem.

++ Text units 374-382:

374 \*General TBM What general impressions did you have using ToolBook®?

375  
 376 I didn't find it particularly easy it wasn't very intuitive. I found it

```

frustrating
377
378 G; Why
379
380 There seem to be there's quite alot of pulldown menus which you would
have to go behind the menus to find out what you have to do.
381
382 It's fairly easy to get lost but then that could well have been because
having used SHAPE® which to me seemed to have more structure to it
+++++
+++ ON-LINE DOCUMENT: s10pb
+++ Retrieval for this document: 3 units out of 416, = 0.72%
++ Text units 79-81:

79 *Confusion TBM: Was there anything confusing about using TBM?

80
81 No its straight forward its just knowing what to do
+++++
+++ ON-LINE DOCUMENT: s12pc
+++ Retrieval for this document: 1 unit out of 341, = 0.29%

325 *Comparison How do you think ToolBook® and SHAPE® compare with each other
++ Text units 330-330:
330 My initial reaction is that I preferred Tbook cos it was easier to use
but I think if I went into SHAPE® a lot more you could probably get a
better picture of whatb your structuring quicker cos you can see your
concept titles. In the long run I thibk SHAPE® would give me a better
module package but it would tak eme longer to get there. I would
probably find Tbook easier to use but I would probably have to go back
and make amendments. I got a feeling with SHPA that if you did it
properley to start you wouldn't end up going back to it as much.
+++++
+++ ON-LINE DOCUMENT: s18aj
+++ Retrieval for this document: 7 units out of 387, = 1.8%
++ Text units 80-85:

80 *Picture TBM 3 Opening page of ToolBook®

81
82 Its a blank page waiting for some input although its not very clear.
83
84 G: Would you know what to do next?
85 I'd probably go into the help menu
93 *Picture TBM 5 Page input box
++ Text units 100-100:
100 Probably now, from this point on I could probably create some more work
it was being faced with a blank page I couldn't remember how to get
started There wasn't a cursor blinking
+++++
+++ ON-LINE DOCUMENT: s20rk
+++ Retrieval for this document: 5 units out of 583, = 0.86%
++ Text units 76-80:

76 *Change TBM G: Was there anything about ToolBook® you would change?

77
78 To be able to structure your pages or being able to show the links or the
main frame. The remembering where the page and the history functions was
a little bit annoying.

79
80 G: I'd like you to comment on the follow screens
+++++
+++ ON-LINE DOCUMENT: s25ar
+++ Retrieval for this document: 4 units out of 391, = 1.0%
++ Text units 215-218:

215 *Easy SHAPE: Was there anything about SHAPE® that made it easy in
producing an application that matched the objectives of the exercise?

216
217 I quite liked the idea of the boxes and move things around
218
+++++
+++ ON-LINE DOCUMENT: s26ts
+++ Retrieval for this document: 4 units out of 561, = 0.71%
++ Text units 391-394:

391 *Ideas TBM How easy did you find the ideas behind ToolBook® to grasp?

```

392  
 393 Same as before but a slightly different way of presenting the info I  
 thibk think the general understanding of achievement of where you wanted  
 to get to is there but a slightly differnt method of achieving it, rather  
 than seeing the links physically your having to know more precisingly  
 where you want to go after when you're in a praticular level. In other  
 words you have to have the whole thing mapped out at the start

394  
 ++++++  
 +++ ON-LINE DOCUMENT: s35db  
 +++ Retrieval for this document: 5 units out of 528, = 0.95%  
 ++ Text units 29-33:

29 \*General **SHAPE**® What general impressions did you have using **SHAPE**®?

30  
 31 It seemed to be working pretty well it didn't seem to interrupt the  
 thinking that I was having about the topic. There was the odd occasion  
 where I felt I was being driven down a kind of knowledge system and in  
 fact I was already beginning to see how things at different levels could  
 be interrated rather than simply be functions of the previous level. I  
 think I needed the instrcution, the icons still did not have any meaning  
 to me.

32  
 33 Maybe its the power of the cmapping that exposes these hierarchies of  
 thinking which makes it more threatening and a testament to its  
 usefulness that it should make you feel like that. If you'd asked me to  
 write a text about the faculty I wouldn't feel like that.

+++++  
 +++ ON-LINE DOCUMENT: s36kt  
 +++ Retrieval for this document: 2 units out of 578, = 0.35%  
 ++ Text units 541-542:

541 \*EOL **SHAPE**® After having learnt to use **SHAPE**® do you have any general  
 thoughts on what makes a program easy to learn?

542 What I quite liked was when I typed the words in it came up automatically  
 with a series of boxes you could see what was going on. I wasn't quite  
 sure how I was going to move them around but I felt I had to move them  
 around so I could see the next logical stage.

+++++  
 +++ ON-LINE DOCUMENT: s37hj  
 +++ Retrieval for this document: 6 units out of 549, = 1.1%  
 ++ Text units 384-386:

384 \* Confusion TBM G: Was there anything confusing about using ToolBook® ?

385  
 386 The difference between this and **SHAPE**® because with this you have to  
 remember more becuae it goes onto the nexrt page and you havn't got the  
 information there . With the concept maps you've got more information in  
 front of you.

++ Text units 388-390:

388 \*Change TBM G: Was there anything about ToolBook® you would change?

389  
 390 NO, is a bit more connfusing, you have to use the program more and if  
 you're not a computer person it might be more off-putting.

+++++  
 +++ Total number of text units retrieved = 52  
 +++ Retrievals in 11 out of 27 documents, = 41%.  
 +++ The documents with retrievals have a total of 5307 text units,  
 so text units retrieved in these documents = 0.98%.  
 +++ All documents have a total of 9235 text units,  
 so text units found in these documents = 0.56%.  
 +++++

### Noise/Economy of Dialogue

Q.S.R. NUD.IST Power version, revision 3.0.4 GUI.  
 Licensee: geoff.

PROJECT: INTRVWS, User Geoff Elliott, 5:45 pm, 17 Aug, 1998.

```

*****
(2 2 2 3 5) /Ease/eou/Transparency/operation/Noise-Economy of Dialogue
*** No Definition
+++++
+++ ON-LINE DOCUMENT: s05ms
+++ Retrieval for this document: 9 units out of 412, = 2.2%
++ Text units 242-244:

242 *Easy SHAPE: Was there anything about SHAPE® that made it easy in
    producing an application that matched the objectives of the exercise?

243
244 Not too many buttons
++ Text units 302-307:

302 *General TBM: What general impressions did you have using TBM?

303 I found it confusing
304
305 G: Why
306
307 I understand the concept but I don't like the screens I don't like way
    that its says I am on page 3, what's page 3 what's page 1 and 2 I don't
    understand any of that. I've got all these blank pages sitting in from
    of me - what are they for - I don't want to see those.
+++++
+++ ON-LINE DOCUMENT: s08fb
+++ Retrieval for this document: 10 units out of 561, = 1.8%
++ Text units 298-300:

298 *EOL SHAPE® After having learnt to use SHAPE® do you have any general
    thoughts on what makes a program easy to learn?

299
300 A small set of instrcutions also error messages - walk back
++ Text units 374-380:

374 *General TBM What general impressions did you have using ToolBook®?

375
376 I didn't find it particularly easy it wasn't very intuitive. I found it
    frustrating
377
378 G; Why
379
380 There seem to be there's quite alot of pulldown menus which you would
    have to go behind the menus to find out what you have to do.
+++++
+++ ON-LINE DOCUMENT: s10pb
+++ Retrieval for this document: 13 units out of 416, = 3.1%
++ Text units 172-174:

172 *EOU TBM After having learnt to use ToolBook® do you have any general
    thoughts on what makes a program easy to use?

173
174 The more basic it is the more
++ Text units 246-252:

246 *Ideas SHAPE: How esy did you find the ideas behind SHAPE® to grasp?

247
248 I little bit more difficult
249
250 G; Why was that?
251
252 I seems to be a little bit more complicated.
++ Text units 390-392:

390 *EOU SHAPE: After having learnt to use SHAPE® do you have any general
    thoughts on what makes a program easy to use?

391
392 Easy steps/ small steps. simple steps
+++++
+++ ON-LINE DOCUMENT: s20rk
+++ Retrieval for this document: 5 units out of 583, = 0.86%
++ Text units 76-80:

```



```

76  *Change TBM G: Was there anything about ToolBook® you would change?
77
78  To be able to structure your pages or being able to show the links or the
    main frame. The remembering where the page and the history functions was
    a little bit annoying.
79
80  G: I'd like you to comment on the follow screens
+++++
+++ ON-LINE DOCUMENT: s25ar
+++ Retrieval for this document: 2 units out of 391, = 0.51%
++ Text units 258-259:

258  *Confusion TBM: Was there anything confusing about using TBM?

259  Sheer quantity of information available at the top , 'history' confused
    me a bit - I wasn't too sure the business about the author and the other
    one. I understood the idea behind it but whether I could have found it
+++++
+++ ON-LINE DOCUMENT: s28ds
+++ Retrieval for this document: 7 units out of 572, = 1.2%
++ Text units 325-328:

325  *EOL SHAPE® After having learnt to use SHAPE® do you have any general
    thoughts on what makes a program easy to learn?

326
327  Not having too many different commands.
328
++ Text units 544-546:

544  *EOU TBM After having learnt to use ToolBook® do you have any general
    thoughts on what makes a program easy to use?

545
546  Too much invleved language - you have to use the language
+++++
+++ ON-LINE DOCUMENT: s36kt
+++ Retrieval for this document: 9 units out of 578, = 1.6%
++ Text units 204-207:

204  *EOL TBM After having learnt to use ToolBook® do you have any general
    thoughts on what makes a program easy to learn?

205
206  Limited number of instructions/options.
207
++ Text units 209-213:

209  *EOU TBM After having learnt to use ToolBook® do you have any general
    thoughts on what makes a program easy to use?

210
211  Simplicity
212
213  G: What do you mean by simplicity
+++++
+++ Total number of text units retrieved = 55
+++ Retrievals in 7 out of 27 documents, = 26%.
+++ The documents with retrievals have a total of 3513 text units,
    so text units retrieved in these documents = 1.6%.
+++ All documents have a total of 9235 text units,
    so text units found in these documents = 0.60%.
+++++

```

## Internal Consistency

Q.S.R. NUD.IST Power version, revision 3.0.4 GUI.  
Licensee: geoff.

PROJECT: INTRVWS, User Geoff Elliott, 5:46 pm, 17 Aug, 1998.

```

*****
(2 2 2 3 6 2)          /Ease/eou/Transparency/operation/Consistency/Internal
*** No Definition
*****

```

```

+++ ON-LINE DOCUMENT: s11tc
+++ Retrieval for this document: 3 units out of 291, = 1.0%
++ Text units 125-127:

125  *EOU TBM   What makes a program easy to use

126
127  A program that  once youv'e learned the fundamentals the extra bells and
      whistles follow along the same pattern so you don't have to adopt a
      another dialogue strategy the other  features follow the same style.
+++++
+++ ON-LINE DOCUMENT: s18aj
+++ Retrieval for this document: 3 units out of 387, = 0.78%
++ Text units 154-156:

154  *EOU TBM After having learnt to use ToolBook® do you have any general
      thoughts on what makes a program easy to use?

155
156  Familiarity with certain icons  and navigation methods.
+++++
+++ ON-LINE DOCUMENT: s20rk
+++ Retrieval for this document: 13 units out of 583, = 2.2%
207  *Difficult TBM Was there anything about ToolBook® that made it difficult
++ Text units 209-221:
209  Lack of concept map - hierachy
210

211  *Easy TBM  Was there anything about ToolBook® that made it easy in
      producing an application that matched the objectives of the exercise?

212
213  Fairly straightforward and there was a logic to it but if you got into a
      fairly big application you will need a piece a paper
214

215  *EOL TBM  After having learnt to use ToolBook® do you have any general
      thoughts on what makes a program easy to learn?

216
217  Needs a sort of logic to it and its structure and menus so that fif you
      need to get back to something its fairly easy to find out where -
      Obviousness.
218

219  *EOU TBM After having learnt to use ToolBook® do you have any general
      thoughts on what makes a program easy to use?

220
221  Consistency, different objects don't have different rules - standardised.
+++++
+++ Total number of text units retrieved = 19
+++ Retrievals in 3 out of 27 documents, = 11%.
+++ The documents with retrievals have a total of 1261 text units,
      so text units retrieved in these documents = 1.5%.
+++ All documents have a total of 9235 text units,
      so text units found in these documents = 0.21%.
+++++

```

## External Consistency

Q.S.R. NUD.IST Power version, revision 3.0.4 GUI.  
Licensee: geoff.

PROJECT: INTRVWS, User Geoff Elliott, 5:45 pm, 17 Aug, 1998.

```

*****
(2 2 2 3 6 1)      /Ease/eou/Transparency/operation/Consistency/External
*** No Definition
+++++
+++ ON-LINE DOCUMENT: s05ms
+++ Retrieval for this document: 2 units out of 412, = 0.49%
++ Text units 254-255:

```

254 \*EOU SHAPE: After having learnt to use **SHAPE**® do you have any general  
thoughts on what makes a program easy to use?

255 Consistent with other programs - balloons , hot buttons  
+++++  
+++ ON-LINE DOCUMENT: s12pc  
+++ Retrieval for this document: 3 units out of 341, = 0.88%  
++ Text units 130-132:

130 \*EOU TBM After having learnt to use ToolBook® do you have any general  
thoughts on what makes a program easy to use?

131

132 Same answer as easy to learn - Windows format being able to use a mouse  
and the visual display.  
+++++  
+++ ON-LINE DOCUMENT: s18aj  
+++ Retrieval for this document: 7 units out of 387, = 1.8%  
++ Text units 149-152:

149 \*EOL TBM After having learnt to use ToolBook® do you have any general  
thoughts on what makes a program easy to learn?

150

151 Conforms to general Windows approach. if you're familiar with Windows  
you can navigate your way around reasonably well.

152  
++ Text units 154-156:

154 \*EOU TBM After having learnt to use ToolBook® do you have any general  
thoughts on what makes a program easy to use?

155

156 Familiarity with certain icons and navigation methods.  
+++++  
+++ Total number of text units retrieved = 12  
+++ Retrievals in 3 out of 27 documents, = 11%.  
+++ The documents with retrievals have a total of 1140 text units,  
so text units retrieved in these documents = 1.1%.  
+++ All documents have a total of 9235 text units,  
so text units found in these documents = 0.13%.  
+++++

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# Appendix L

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## Appendix L Evidential Databits Indexed on Effect of Computer Skill

### Low Computer Skill

#### SHAPE<sup>®</sup>

Q.S.R. NUD,IST Power version, revision 3.0.4 GUI.  
Licensee: geoff.

PROJECT: INTRVWS, User Geoff Elliott, 6:46 pm, 17 Aug, 1998.

\*\*\*\*\*

(7 4 1 1 1) /Project/SHAPE/questions/Define/csm/Low

\*\*\* Definition:

See memo for node definition.

\*\*\*\*\*

+++ ON-LINE DOCUMENT: S03RW

+++ Retrieval for this document: 10 units out of 282, = 3.5%

++ Text units 121-130:

121 \*Define SHAPE<sup>®</sup> Describe to me what SHAPE<sup>®</sup> does?

122

123 SHAPE<sup>®</sup> takes concetps and allows you to break them down into differnt  
concetps and differnt relationships between those. You take a cocnetp  
and break it down into lower levels. A cocnetp may be misleading because  
it could be just a subject.

124

125 G: And whet happens then

126

127 A better understanding how the whole thing is interlinked.

128

129 G: What happens to those links?

130

\*\*\*\*\*

+++ ON-LINE DOCUMENT: S04mj

+++ Retrieval for this document: 6 units out of 559, = 1.1%

++ Text units 48-53:

48 \*Define SHAPE<sup>®</sup> Describe to me what SHAPE<sup>®</sup> does?

49

50 It provides a file which gives info on a particular topic in a  
hierarchical fashion so it will start ith the most general concept and  
then break that down to another lower level of concepts particualarly one  
you want and that will break it down even further and so on and so on  
until you have got down to the lowest level where it will actually give  
you the info you want.

51

52 It allows you - people don't necessarily know whta you want or how its  
going to be described cos you're trying to find something and you can't  
find it in the index cos the index its under is slightly different  
wording and able to go in and look around fairly easy and find out how  
its been descirbed and where its been put.

53

\*\*\*\*\*

+++ ON-LINE DOCUMENT: S25AR

+++ Retrieval for this document: 7 units out of 391, = 1.8%

++ Text units 5-11:

5 \*Define SHAPE: Describe to me what SHAPE<sup>®</sup> does?

6

7 SHAPE<sup>®</sup> will create a piece of work that is built up of different concepts.  
the top concepts can then be broken down into subsidiary levels and the  
links between those subsidiary levels can all be hyperlinked together.  
Ant there for it is possible once the thing is created to jump from one  
to the other where ever direct links made and you can also move to  
separate pages.

8

9 G: And what would the final result be

10

11 The final result would be a concept document that can be linked

\*\*\*\*\*

```
+++ ON-LINE DOCUMENT: S35db
+++ Retrieval for this document: 6 units out of 528, = 1.1%
++ Text units 23-28:
```

23 \*Define **SHAPE**<sup>®</sup> Describe to me what **SHAPE**<sup>®</sup> does?

24  
25 It offers a vehicle of sequential ordering of info and converts some thoughts about important concepts that relate to a subject and puts them into a kind of hierarchical structure that offers the opportunity to connect one level to another level. and then within levels it also offers the opportunity to show how different subconcepts link together.

26  
27 To translate a curriculum into some multimedia application.  
28

```
+++++
+++ ON-LINE DOCUMENT: S36kt
+++ Retrieval for this document: 8 units out of 578, = 1.4%
++ Text units 268-275:
```

268 \*Define **SHAPE**<sup>®</sup> Describe to me what **SHAPE**<sup>®</sup> does?

269  
270 It basically allows in an IT version of concept mapping it allows links to be made between concepts or 'bungs' of relevant information

271  
272 G: What is the purpose of it?  
273

274 I assume its like an index if you look up something it tells you what is linked to it.

275  
+++++
+++ ON-LINE DOCUMENT: S37hj
+++ Retrieval for this document: 9 units out of 549, = 1.6%
++ Text units 48-56:

48 \*Define **SHAPE**<sup>®</sup> Describe to me what **SHAPE**<sup>®</sup> does?

49  
50 It enables the user to develop ideas and concepts using this particular packages and technology.

51  
52 G: To what purpose?  
53

54 Brings teaching out of the Victorian age and assists with the breakdown of the fear of computers.

55  
56  
+++++
+++ Total number of text units retrieved = 46
+++ Retrievals in 6 out of 27 documents, = 22%.
+++ The documents with retrievals have a total of 2887 text units,
so text units retrieved in these documents = 1.6%.
+++ All documents have a total of 9235 text units,
so text units found in these documents = 0.50%.
+++++

## TBM

Q.S.R. NUD.IST Power version, revision 3.0.4 GUI.  
Licensee: geoff.

PROJECT: INTRVWS, User Geoff Elliott, 6:48 pm, 17 Aug, 1998.

(7 5 1 1 2 1) /Project/TBM/questions/Define/csm/Low

\*\*\* Definition:

See memo for node definition.

```
+++++
+++ ON-LINE DOCUMENT: S03RW
+++ Retrieval for this document: 8 units out of 282, = 2.8%
++ Text units 9-16:
```

9 \*Define TBM Describe to me what ToolBook<sup>®</sup> does?

```

10
11 It creates a means of communication information on the computer between
12 different pages which are not -- Are linked.
13
14 G: What purpose would that be for?
15 For any form of communication
16
17 ++++++
18 +++ ON-LINE DOCUMENT: S04mj
19 +++ Retrieval for this document: 4 units out of 559, = 0.72%
20 ++ Text units 376-379:
21
22 376 *Define TBM Describe to me what ToolBook® does?
23
24 377
25 378 It provides by a book so I suppose rather than a map it provides an index
26 379
27 ++++++
28 +++ ON-LINE DOCUMENT: S35db
29 +++ Retrieval for this document: 4 units out of 528, = 0.76%
30 ++ Text units 357-360:
31
32 357 *Define TBM Describe to me what ToolBook® does?
33
34 358
35 359 It enables you to create pages of a book and then to decide whether there
36 are any direct links between
37
38 360
39 ++++++
40 +++ ON-LINE DOCUMENT: S36kt
41 +++ Retrieval for this document: 4 units out of 578, = 0.69%
42 ++ Text units 50-53:
43
44 50 *Define TBM Describe to me what ToolBook® does?
45
46 51
47 52 It allows in 'booked' form, people to switch from material at the end of
48 the book to material at the beginning of the book without necessary
49 turning all of the pages a cross referencing system. A sort of layering
50 process
51
52 53
53 ++++++
54 +++ ON-LINE DOCUMENT: S37hj
55 +++ Retrieval for this document: 8 units out of 549, = 1.5%
56 ++ Text units 368-375:
57
58 368 *Define TBM Describe to me what ToolBook® does?
59
60 369
61 370 TBM allows you as an author to produce pages that you can move ideas from
62 one to another and provide links with.
63
64 371
65 372 G; For what purpose
66 373
67 374 To take general ideas and formulate and expand them.
68 375
69 ++++++
70 +++ Total number of text units retrieved = 28
71 +++ Retrievals in 5 out of 27 documents, = 19%.
72 +++ The documents with retrievals have a total of 2496 text units,
73 so text units retrieved in these documents = 1.1%.
74 +++ All documents have a total of 9235 text units,
75 so text units found in these documents = 0.30%.
76 ++++++

```

## Intermediate Computer Skill

### SHAPE®

Q.S.R. NUD.IST Power version, revision 3.0.4 GUI.  
Licensee: geoff.

PROJECT: INTRVWS, User Geoff Elliott, 6:47 pm, 17 Aug, 1998.

```

*****
(7 4 1 1 1 2)          /Project/SHAPE/questions/Define/csm/Intermediate
*** Definition:
See memo for node definition.
*****
+++ ON-LINE DOCUMENT: S10PB
+++ Retrieval for this document: 7 units out of 416, = 1.7%
++ Text units 234-240:

234  *Define SHAPE® Describe to me what SHAPE® does?

235
236  Its just developing to a topic, its like a family tree which relates to
    it or there.  It's like you have a specific objective and you have got
    these objectives underneath attached to it and all interrelated.  It gives
    you an overview of all the sub topics related to the major topic.

237
238  G: Does it do the same as ToolBook®, or less or more?
239
240  Probably a little bit more in depth.
*****
+++ ON-LINE DOCUMENT: S12PC
+++ Retrieval for this document: 6 units out of 341, = 1.8%
++ Text units 181-186:

181  *Define SHAPE® Describe to me what SHAPE® does?

182
183  Like the other (Tbook) is the actual mechanism for putting the structure
    in place.  Where as with the other one tyou were developing pages with
    this one your'e developing concepts.  The principle is the same you are
    dividing the faculty into various headings and sub dividing them again.

184
185
186
*****
+++ ON-LINE DOCUMENT: S18aj
+++ Retrieval for this document: 5 units out of 387, = 1.3%
++ Text units 203-207:

203  *Define SHAPE: Describe to me what SHAPE® does?

204
205  It allows you to set up a framework for a hierarchy of sections and pages
    within sections.

206
207
*****
+++ ON-LINE DOCUMENT: S20rk
+++ Retrieval for this document: 9 units out of 583, = 1.5%
++ Text units 271-279:

271  *Define SHAPE® Describe to me what SHAPE® does?

272
273  Creates concept maps, - it looks as if it sits on top of TBM and so you
    can diagrammatically show the various links between the sections and
    hierachy of each page.

274
275  G: Why
276
277  To make TBM more userfriendly.
278  Its what you would use TBM for - for creating online interactive book -
    or pages.

279
*****
+++ ON-LINE DOCUMENT: S28ds
+++ Retrieval for this document: 12 units out of 572, = 2.1%
++ Text units 48-59:

48  *Define SHAPE® Describe to me what SHAPE® does?

49
50  It allows someone to look at an issue or subject in stages and it allows
    them to find their own way around it and look at aspects of it they
    choose to it allows them to be selective in the way they look at a topic
    or an issue.

51
52  G: What is the end result

```



```

53
54   They are autonomous in terms of what aspects of a subejct they look at.
55
56   G: Whata is the product?
57
58   You cover a subject from more or less every angle.
59
+++++
+++ Total number of text units retrieved = 39
+++ Retrievals in 5 out of 27 documents, = 19%.
+++ The documents with retrievals have a total of 2299 text units,
    so text units retrieved in these documents = 1.7%.
+++ All documents have a total of 9235 text units,
    so text units found in these documents = 0.42%.
+++++

```

## TBM

Q.S.R. NUD.IST Power version, revision 3.0.4 GUI.  
Licensee: geoff.

PROJECT: INTRVWS, User Geoff Elliott, 6:48 pm, 17 Aug, 1998.

```

*****
(7 5 1 1 2 2)      /Project/TBM/questions/Define/csm/Intermediate
*** Definition:
See memo for node definition.
+++++
+++ ON-LINE DOCUMENT: S10PB
+++ Retrieval for this document: 3 units out of 416, = 0.72%
++ Text units 63-65:

```

63 \*Define TBM: Describe to me what TBM does?

```

64
65   I suppose its like a database of information and how all this information
    can be related very quickly
+++++
+++ ON-LINE DOCUMENT: S12PC
+++ Retrieval for this document: 5 units out of 341, = 1.5%
++ Text units 48-52:

```

48 \*Define TBM Describe to me what ToolBook® does?

```

49
50   Tbook enables you to put together the whole thing so if your developing a
    course or information brochure of the faculty whatever, then Tbook is the
    mechanism for putting the structure into place, with pages the
    hyperlinks, etc
51
52
+++++
+++ ON-LINE DOCUMENT: S18AJ
+++ Retrieval for this document: 3 units out of 387, = 0.78%
++ Text units 50-52:

```

50 \*Define TBM: Describe to me what TBM does?

```

51
52   It allows you to set up a framework for something which is analogous to a
    book the frame work would then dictate what was in chapters and pages
    within chapters and allows you to link between pages within a chapter.
+++++
+++ ON-LINE DOCUMENT: S20rk
+++ Retrieval for this document: 9 units out of 583, = 1.5%
++ Text units 51-59:

```

51 \*Define TBM Describe to me what ToolBook® does?

```

52
53   A virtual book (ie the product)
54
55   (Rod is fixed on the idea that TBM is only a book)
56
57   A tool for creating a book
58

```

59

```

+++++
+++ ON-LINE DOCUMENT: S28ds
+++ Retrieval for this document: 4 units out of 572, = 0.70%
++ Text units 386-389:

```

386 \*Define TBM Describe to me what ToolBook® does?

387

388 Its the same as **SHAPE®** it allows you to look at topic and break it down into subheadings and design a package around a subject.

389

```

+++++
+++ Total number of text units retrieved = 24
+++ Retrievals in 5 out of 27 documents, = 19%.
+++ The documents with retrievals have a total of 2299 text units,
    so text units retrieved in these documents = 1.0%.
+++ All documents have a total of 9235 text units,
    so text units found in these documents = 0.26%.
+++++

```

## High Computer Skill

### **SHAPE®**

Q.S.R. NUD.IST Power version, revision 3,0.4 GUI,  
Licensee: geoff.

PROJECT: INTRVWS, User Geoff Elliott, 6:47 pm, 17 Aug, 1998.

```

*****
(7 4 1 1 1 3) /Project/SHAPE/questions/Define/csm/High
*** Definition:
See memo for node definition.
+++++
+++ ON-LINE DOCUMENT: S05ms
+++ Retrieval for this document: 12 units out of 412, = 2.9%
++ Text units 20-31:

```

20 \*Define SHAPE: Describe to me what **SHAPE®** does?

21

22 It organises - it organises your thoughts and it organises course content, top down.

23

24 G: For what purpose what is the end result

25

26 The end result is your course content, you end up with your course notes your course media,

27

28 G: How does **SHAPE®** do that?

29

30 It does it by organising course into a series of topic headings and then breaks those down into ..... concepts and then you break those edown again

31

```

+++++
+++ ON-LINE DOCUMENT: S08FB
+++ Retrieval for this document: 4 units out of 561, = 0.71%
++ Text units 33-36:

```

33 \*Define **SHAPE®** Describe to me what **SHAPE®** does?

34

35 It strcutures access to information in such a way that it aids/guides a student throught a particular learning process.

36

```

+++++
+++ ON-LINE DOCUMENT: S11tc
+++ Retrieval for this document: 4 units out of 291, = 1.4%
++ Text units 147-150:

```

147 \*Define **SHAPE®** Describe what **SHAPE®** does

148  
149 It allows the user to express concepts at various levels, takes some  
concept and move them down to a lower level and express links between  
those concepts or interrelations which results in the generation of Tbook  
pages which have their links embedded in them due to the definitions which  
have been produced in SHAPE.

150  
+++++  
+++ ON-LINE DOCUMENT: S26ts  
+++ Retrieval for this document: 9 units out of 561, = 1.6%  
++ Text units 48-56:

48 \*Define *SHAPE*<sup>®</sup> Describe to me what *SHAPE*<sup>®</sup> does?

49  
50  
51 Allows one to have one particular area of interest and we have been able  
to associate different levels of information associated with that  
interest and we use the example of the faculty as the example and we have  
been able to branch off and look at the parts that make up the faculty so  
we looked at the various schools from that we looked at the various  
courses we are using *SHAPE*<sup>®</sup> to - well its a maps isn't it so your're  
mapping out well its a contour map I suppose.

52  
53 G: What is the end product  
54  
55 What we've got is a network of information which you can move to if you  
want to find more out about particular area so you go to different level  
which tells you more detail.

56  
+++++  
+++ Total number of text units retrieved = 29  
+++ Retrievals in 4 out of 27 documents, = 15%.  
+++ The documents with retrievals have a total of 1825 text units,  
so text units retrieved in these documents = 1.6%.  
+++ All documents have a total of 9235 text units,  
so text units found in these documents = 0.31%.  
+++++

## TBM

Q.S.R. NUD.IST Power version, revision 3.0.4 GUI.  
Licensee: geoff.

PROJECT: INTRVWS, User Geoff Elliott, 6:48 pm, 17 Aug, 1998.

```
*****
(7 5 1 1 2 3)      /Project/TBM/questions/Define/csm/High
*** Definition:
See memo for node definition.
*****
+++ ON-LINE DOCUMENT: S05MS
+++ Retrieval for this document: 3 units out of 412, = 0.73%
++ Text units 298-300:

298  *Define TBM: Describe to me what TBM does?

299
300  It basically creates pages within a book for an aid to sectionalise and
    organise your course and also allow the person to explore linked items.
*****
+++ ON-LINE DOCUMENT: S08FB
+++ Retrieval for this document: 4 units out of 561, = 0.71%
++ Text units 370-373:

370  *Define TBM Describe to me what ToolBook® does?

371
372  TBM allows you to set up individual pages of information which can be
    linked to other pages. It can also be set up as a hierarchy so again you
    can direct students in to a certain path.
373
*****
+++ ON-LINE DOCUMENT: S11tc
+++ Retrieval for this document: 4 units out of 291, = 1.4%
++ Text units 50-53:

50  *Define TBM Describe what ToolBook® does?

51
52  ToolBook® allows you to you to define pages within a book, conceptual
    pages and to define links between these pages as many links as one might
    like to do I suppose and allows you to enter information on to those
    pages.
53
*****
+++ ON-LINE DOCUMENT: S26ts
+++ Retrieval for this document: 8 units out of 561, = 1.4%
++ Text units 379-386:

379  *Define TBM Describe to me what ToolBook® does?

380
381  Its an application that allows you to create pages of info about a
    certain topic and going from that topic or area enables you to record
    further info about the structures within that area and going down from
    there and building up the info about each different level in the overall
    structure.
382
383  G; For what purpose
384
385  For the user to find out to be able to find out info on what a particular
    book is giving you info and and enables you to track through that info
    by exploring info from each level
386
*****
+++ Total number of text units retrieved = 19
+++ Retrievals in 4 out of 27 documents, = 15%.
+++ The documents with retrievals have a total of 1825 text units,
    so text units retrieved in these documents = 1.0%.
+++ All documents have a total of 9235 text units,
    so text units found in these documents = 0.21%.
*****
```

---

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# Appendix M

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## Appendix M Evidential Data Bits Indexed on Transparency of Purpose

### Task Match

Q.S.R. NUD.IST Power version, revision 3.0.4 GUI.  
Licensee: geoff.

PROJECT: INTRVWS, User Geoff Elliott, 6:53 pm, 17 Aug, 1998.

```
*****
(2 2 2 3)          /Ease/eou/Transparency/purpose/task match
*** Definition:
Copy of node (2 2 4) and its subtree.
*****
+++ ON-LINE DOCUMENT: S02TG
+++ Retrieval for this document: 3 units out of 245, = 1.2%
234  *EOU SHAPE® Easy to Learn/use
++ Text units 238-240:
238  G; What if you were dealing with a problem that wasn't hierarchical.
      Would SHAPE® be appropriate
239
240  Yes I'd say so because you'd use atomic boxes (concepts)
*****
+++ ON-LINE DOCUMENT: S03RW
+++ Retrieval for this document: 3 units out of 282, = 1.1%
++ Text units 253-255:

253  *Oteaching SHAPE® How well do you think SHAPE® would allow you to produce
      an application for your own teaching?

254
255  Exactly the same as before but this is on a different level.
*****
+++ ON-LINE DOCUMENT: S04MJ
+++ Retrieval for this document: 16 units out of 559, = 2.9%
++ Text units 511-513:

511  *Objectives TBM How well do you think ToolBook® allowed you to achieve
      the objectives of the exercise?

512
513  Yes fine the same as SHAPE
++ Text units 543-555:

543  *Comparison How do you think ToolBook® and SHAPE® compare with each other
      in terms of:

544
545
546  ease of leaning;
547
548  SHAPE® was easier
549
550  ease of use; and
551
552  Equitable
553  suitability to produce an application that matches the defined task?
554
555  Depends upon the task Where the subject is hierarchical SHAPE® is better.
*****
+++ ON-LINE DOCUMENT: S05MS
+++ Retrieval for this document: 3 units out of 412, = 0.73%
++ Text units 373-375:

373  *Objectives TBM: How well do you think TBM allowed you to achieve the
      objectives of the exercise?

374
375  I didn't I didn't like it
*****
+++ ON-LINE DOCUMENT: S08FB
+++ Retrieval for this document: 3 units out of 561, = 0.53%
```

++ Text units 539-541:

539 \*Barrier TBM What would prevent you from using ToolBook® to create an application for your own teaching

540

541 The reulst of the prototype didn't give me what I wanted.

+++++

+++ ON-LINE DOCUMENT: S10PB

+++ Retrieval for this document: 3 units out of 416, = 0.72%

++ Text units 242-244:

242 \*General SHAPE: What general impressions did you have using SHAPE®?

243

244 Its good if you want to describe something. Its good for presentation it can give you an overview of a course. It would be ideal for an open day.

+++++

+++ ON-LINE DOCUMENT: S20RK

+++ Retrieval for this document: 4 units out of 583, = 0.69%

++ Text units 226-229:

226 \*Barrier TBM What would prevent you from using ToolBook® to create an application for your own teaching

227

228 I am not sure it can do what I would wanted it to.

229

+++++

+++ ON-LINE DOCUMENT: S35DB

+++ Retrieval for this document: 15 units out of 528, = 2.8%

++ Text units 42-50:

42 \*Change SHAPE® Was there anything about SHAPE® you would change?

43

44

45 I don't think there was anything I would change about SHAPE® but I was conscious it was making me thinking in a hierarchical way. I was beginning to getting frustrated with that limitation. Maybe that is because I don't know enought about SHAPE® can cope with what I was hinting about.

46

47 There's an issue about how a hierarchy can represent the complexities of the Faculty.

48

49 G: I'd like you to comment on the follow screens

50

++ Text units 277-282:

277 \*Oteaching SHAPE® How well do you think SHAPE® would allow you to produce an application for your own teaching?

278

279 It would work but I would have to be convinced about how the complexity of the concepts (Research Methods) can be represented. It may help to simplify some of the concept s but that may deflect from a full understanding.

280

281

282 SHAPE® is more applicable where one is trying to describe a phenomenon like Org of Tourism Industry. Where one is trying to help people to understand social systems or political structures it would serve a purpose by giving order but it may just deceive in its simplicity.

+++++

+++ ON-LINE DOCUMENT: S36KT

+++ Retrieval for this document: 6 units out of 578, = 1.0%

++ Text units 297-302:

297 \*Change SHAPE® Was there anything about SHAPE® you would change?

298

299 Maybe multilinking - if you're linking 15/20 concpets it will take you a long time. We are not teaching cul des acs (Defined links) we're not teaching Cul De Sacs we're teaching links. Everything should be linked anyway.

300

301 G: I'd like you to comment on the follow screens

302

```

+++++
+++ Total number of text units retrieved = 56
+++ Retrievals in 9 out of 27 documents, = 33%.
+++ The documents with retrievals have a total of 4164 text units,
    so text units retrieved in these documents = 1.3%.
+++ All documents have a total of 9235 text units,
    so text units found in these documents = 0.61%.
+++++

```

## Instantaneity

Q.S.R. NUD.IST Power version, revision 3.0.4 GUI.  
Licensee: geoff.

PROJECT: INTRVWS, User Geoff Elliott, 6:53 pm, 17 Aug, 1998.

```

*****
(2 2 2 2 4)          /Ease/eou/Transparency/purpose/Instantaneity
*** No Definition
+++++
+++ ON-LINE DOCUMENT: S04MJ
+++ Retrieval for this document: 3 units out of 559, = 0.54%
++ Text units 514-516:

```

514 \*Oteaching TBM How well do you think ToolBook® would allow you to produce an application for your own teaching?

515

516 It would, but the(the mechanism) relationships would need to be clearly then both packages would be the same.

```

+++++
+++ ON-LINE DOCUMENT: S08FB
+++ Retrieval for this document: 6 units out of 561, = 1.1%
++ Text units 384-386:

```

384 \*Ideas TBM How easy did you find the ideas behind ToolBook® to grasp?

385

386 Eventually it was ok. There was one or two things there I didn't think were easy again its that idea of top-down design whcih obviuosly tBM doesn't do.

++ Text units 539-541:

539 \*Barrier TBM What would prevent you from using ToolBook® to create an application for your own teaching

540

541 The reulst of the prototype didn't give me what I wanted.

```

+++++
+++ ON-LINE DOCUMENT: S12PC
+++ Retrieval for this document: 6 units out of 341, = 1.8%
++ Text units 325-330:

```

325 \*Comparison How do you think ToolBook® and *SHAPE*® compare with each other in terms of:

326

327

328 ease of leaning;

329

330 My initial reaction is that I preferred Tbook cos it was easier to use but I think if I went into *SHAPE*® a lot more you could probably get a better picture of whatb your structuring quicker cos you can see your concept titles. In the long run I thibk *SHAPE*® would give me a better module package but it would tak eme longer to get there. I would probably find Tbook easier to use but I would probably have to go back and make amendments. I got a feeling with SHPA that if you did it properley to start you wouldn't end up going back to it as much.

```

+++++
+++ ON-LINE DOCUMENT: S26TS
+++ Retrieval for this document: 9 units out of 561, = 1.6%
++ Text units 57-59:

```

57 \*General *SHAPE*® What general impressions did you have using *SHAPE*®?



58  
59 It was easy/straightforward - show the relationships once you know the  
basic moves - how to create the links its very straightforward - it gives  
you an instant result and its easy enough to change things.  
++ Text units 310-312:

310 \*Easy **SHAPE**® Was there anything about **SHAPE**® that made it easy in producing  
an application that matched the objectives of the exercise?

311  
312 Instant results  
++ Text units 518-520:

518 \*Objectives TBM How well do you think ToolBook® allowed you to achieve  
the objectives of the exercise?

519  
520 We got there eventually but because we didn't have a pictorial  
representation of what you had achieved it was probably a bit slower to  
sink in - it would have been nice to see the results straight away. But  
we were able to check using the history button where we had come from  
and what we were supposed to remember but it was slightly more difficult  
because we had to remember what the headings were required  
+++++  
+++ ON-LINE DOCUMENT: S28DS  
+++ Retrieval for this document: 5 units out of 572, = 0.87%  
++ Text units 528-530:

528 \*Oteaching TBM How well do you think ToolBook® would allow you to produce  
an application for your own teaching?

529  
530 Its seems a bit early yet (to say) you seem to need to do alot more I  
don't feel as confident

557 \*Comparison How do you think ToolBook® and **SHAPE**® compare with each other  
++ Text units 568-569:

568 I think I am biased towards **SHAPE**® but that might becuase we spent longer  
on it. We didn't seem to go as far with TBM.  
569 s28ds.doc  
+++++  
+++ ON-LINE DOCUMENT: S35DB  
+++ Retrieval for this document: 3 units out of 528, = 0.57%  
++ Text units 29-31:

29 \*General **SHAPE**® What general impressions did you have using **SHAPE**®?

30  
31 It seemed to be working pretty well it didn't seem to interrupt the  
thinking that I was having about the topic. There was the odd occasion  
where I felt I was being driven down a kind of knowledge system and in  
fact I was already beginning to see how things at different levels could  
be interrated rather than simply be functions of the previous level. I  
think I needed the instrcution, the icons still did not have any meaning  
to me.  
+++++  
+++ ON-LINE DOCUMENT: S36KT  
+++ Retrieval for this document: 3 units out of 578, = 0.52%  
++ Text units 62-64:

62 \* Confusion TBM G: Was there anything confusing about using ToolBook® ?

63  
64 No I couldn't quite see why anybody would want it - but that became  
clearer as I used it  
+++++  
+++ Total number of text units retrieved = 35  
+++ Retrievals in 7 out of 27 documents, = 26%.  
+++ The documents with retrievals have a total of 3700 text units,  
so text units retrieved in these documents = 0.95%.  
+++ All documents have a total of 9235 text units,  
so text units found in these documents = 0.38%.  
+++++

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# Appendix N

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## Appendix N Evidential Databits Indexed on Accommodation

### Evidence from One-to-One Training Sessions

Q.S.R. NUD.IST Power version, revision 3.0.4 GUI.  
Licensee: geoff.

PROJECT: INTRVWS, User Geoff Elliott, 4:09 pm, 17 Aug, 1998.

```
*****
(2 1 1) /Ease/Eol/Accommodation
*** No Definition
*****
+++ ON-LINE DOCUMENT: S03RW
+++ Retrieval for this document: 2 units out of 282, = 0.71%
++ Text units 106-107:

106 *EOL TBM After having learnt to use ToolBook® do you have any general
    thoughts on what makes a program easy to learn?

107 I don't think I've learnt TookBook - I don't think I'm qualified to
    comment
*****
+++ ON-LINE DOCUMENT: S12PC
+++ Retrieval for this document: 3 units out of 341, = 0.88%
++ Text units 191-193:

191 *Ideas SHAPE® How easy did you find the ideas behind SHAPE® to grasp?
192
193 Not easy at first. Its interesting in away because I said earlier that
    the actual illustration and symbols made it userfriendly, but this is one
    instance where the other is (more) user friendly - you need some script
    or words or phases as opposed to jiggling from boxes to boxes.
*****
+++ ON-LINE DOCUMENT: S20RK
+++ Retrieval for this document: 3 units out of 583, = 0.51%
++ Text units 72-74:

72 * Confusion TBM G: Was there anything confusing about using ToolBook® ?
73
74 Having come to it cold and quickly getting up and running with it there
    was a little confusion but that was just the learning process and getting
    used to the package.
*****
+++ Total number of text units retrieved = 8
+++ Retrievals in 3 out of 27 documents, = 11%.
+++ The documents with retrievals have a total of 1206 text units,
    so text units retrieved in these documents = 0.66%.
+++ All documents have a total of 9235 text units,
    so text units found in these documents = 0.09%.
*****
```

### Evidence from Focus Group

Q.S.R. NUD.IST Power version, revision 3.0.4 GUI.  
Licensee: geoff.

PROJECT: INTRVWS, User Geoff Elliott, 4:33 pm, 17 Aug, 1998.

```
*****
(3 8 13) /Focus Group/Analysis/accommodation
*** No Definition
*****
+++ ON-LINE DOCUMENT: CMP-RSLT
+++ Retrieval for this document: 8 units out of 185, = 4.3%
++ Text units 62-64:
62 How can you get staff to create at the screen?
```

```

63
64   m Confidence. Value - we can all see the value in using a tool, the
      students I teach can't see the value in using a wordprocessor - a
      quality document it's a nuisance for them.
++ Text units 68-72:
68   g why can't they see value?
69
70   m I think it comes down to access to machines, lack of skill- they can't
      type
71   g they can't connect to its utility
72   K thats going to be true of what you're doing here its lack of
      familiarity. I personally don't think on the screen I am a head person.
      however with wp I do because i'm competent with word processing. Before
      I would think 'how will I amend it how will I delete it' if I can't do
      those things easily then I scribble them onto a piece of paper first and
      then stick it in.
+++++
+++ ON-LINE DOCUMENT: FRNT-INT
+++ Retrieval for this document: 4 units out of 146, = 2.7%
++ Text units 110-113:
110   How at ease are you with this program?
111
112   K I don't think it's a very nice program for someone whose is coming to
      it cold.
113   gr I'd agree with that, when I first came to it I found it frightening
      well not frightening - that's the wrong word - its a bit - I was
      thinking oh my 'how am I going to get my head around this.'
+++++
+++ ON-LINE DOCUMENT: TBK-INT
+++ Retrieval for this document: 4 units out of 136, = 2.9%
++ Text units 101-104:
101   How at ease are you with this program?
102
103   m when you were demonstrating I felt quite comfortable with what you were
      doing.
104   K it is easier because your coming with an idea of what a book is.
+++++
+++ Total number of text units retrieved = 16
+++ Retrievals in 3 out of 27 documents, = 11%.
+++ The documents with retrievals have a total of 467 text units,
      so text units retrieved in these documents = 3.4%.
+++ All documents have a total of 9235 text units,
      so text units found in these documents = 0.17%.
+++++

```

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# Appendix O

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## Appendix O Evidential Data Bits Indexed on linking

Q.S.R. NUD.IST Power version, revision 3.0.4 GUI.  
Licensee: geoff.

PROJECT: INTRVWS, User Geoff Elliott, 4:30 pm, 17 Aug, 1998.

```
*****
(2 2 2 1 3) /Ease/eou/Transparency/issues/linking
*** No Definition
+++++
+++ ON-LINE DOCUMENT: S02TG
+++ Retrieval for this document: 150 units out of 245, = 61%
++ Text units 32-57:

32 *Create Links TBM (shows how to navigate throught the pages, the
    principle of adding content.)

33
34 G: (Expalnation of how to create links) Are there any links you wish to
    create
35
36 Well the obvious one would be between C of L and Schoool of L & T
37

38 *G: If you want to go to the page for L & T (Explanation of navigation to
    page) (Time creates one half of the link)

39
40 G: ( To create the electronic book structure you then need create alkl
    he links required)
41
42 (Tim creates link) ( Tim gets the name of the link wrong and has to
    check the name with the history function.)
43

44 *General TBM General impressions?

45
46 Has great potential for creating teaching material. I get slightly
    confused with all the links and so on , I know how to creat a link as
    such but uhh I think a lot of time would be taken up with designing the
    architecture on paper first before put into practice, I think I'd need
    to do that do you know what I mean? Diagrams for instance with the
    concept - trees
47
48 A lot to remember but thats like any windows package, once you've sussed
    it out its second nature.
49

50 *Ideas TBM How easy to grasp are the ideas behind ToolBook®? The page
    metaphor etc

51
52 The metaphor is great, y'know it makes a lot of sense - to have a page
    and then that links to others.The only thing is when you think of a
    normal book you think aof a sequencial reading of those pages.but with
    this its all over the place depending on where you want to get to. The
    fundamental ideas are ok but the techicalities will take some time to
    train my self.
53
54 G; What technicalities?
55
56 Operating the package,
57
++ Text units 87-166:

87 *Create Concepts SHAPE: Explantion of getting into SHAPE

88
89 G: Top level concept map?
90
91 The Faculty?
92
93 G: Whole Module
94
```

95 G: What concepts would you use at top level?  
96  
97 What top level?  
98  
99 G: Yes  
100  
101 Oh um  
102  
103 G: Would you be more inclined to start bottom up?  
104  
105 Uh Not as such but my anticipated next step would be to do the second  
strata.  
106 So when you say concepts what do you mean?  
107  
108 G: Well for example 'teacher', 'course'  
109  
110 Oh its the link is it?  
111  
112 G: No, but what you call a link and what you call a concept is  
conjectural, its up to you to decide which is the sematic relation and  
what is the concept  
113  
114 Your saying concepts instead of pages?  
115  
116 G: Yes  
117  
118 (Tim enters concepts)  
119  
120 (concepts are generated)  
121  
122 What do I do with these?  
123  
124 G: You can pick them up anddrag them around  
125  
126 I can arrange them?  
127  
128 G: Yes  
129  
130 G: You can add concepts whenever you like  
131  
132 G: So the second thing you may want to do is link the concepts  
133  
134 G: Would you want to connect any of these concepts  
135  
136 I would create a link between exec and admin.  
137  
138 \*Create Links **SHAPE**® To create a link you .....  
139  
140 (Tim creates a link)  
141  
142 (Tim confirms how to link ):  
143  
144 I do one with CTRL?  
145  
146 G: Yees  
147  
148 (Tim creates other links)  
149  
150 There are other links as well isn't there - Faculty exec 'decides' the  
budgets of the schools but they also 'instruct' and so on  
151  
152 G: So you would like to like to add another link between Faculty and  
Schools  
153  
154 Yes, can you  
155  
156 G: Yes but it will look crowded on the screen.  
157  
158 (Tim creates another link 'command' between faculty and school)  
159  
160 I suppose you'd have a link between all of these, can you do that  
161  
162 G: Yes  
163  
164 g: Are you happy with your top level?  
165  
166 Yes  
++ Text units 172-203:

172 \*G: Explantion of navigating down the hierarchy  
 173 (Tim creates concepts for schools)  
 174 G: Do you want to link these concepts?  
 175 No  
 176  
 177 G: Are any of these comeposite  
 178  
 179 Yes (Tim creates some composite concepts)  
 180  
 181 So now I generate the next level (Time gens the next level)  
 182  
 183 (*SHAPE*<sup>®</sup> gens pages)  
 184  
 185 (Tim navigates to the L & T school and creates concepts for L & T)  
 186  
 187 But this would link back to site baccuse I would like people to know  
 where the school is, do you know what I mean  
 188  
 189 G: What you would have to do is create that link manually afterwards,  
 you can't at this stage create links between levels  
 190  
 191 I wondered about that because say this was my tourism subject I would  
 want users to get back to the 'home' page.  
 192  
 193 G: Do you want to create any links  
 194  
 195 (Tim creates some links)  
 196 G: Tim you tend to use 'non-verb' constructs for your links why do you do  
 that?  
 197 I don't know, it seemed the obvious thing  
 198 (Tim makes 'courses' composite and generates the next level)  
 199  
 200 G; Are these courses composite  
 201  
 202 No I think we've reached the bottom  
 203  
 ++ Text units 218-223:  
 218 \*Ideas *SHAPE*<sup>®</sup> How easy are the ideas behind SHAPE  
 219  
 220 Very easy like with the book metaphor of ToolBook<sup>®</sup>, its concept linking,  
 once you have related links as well .....  
 221  
 222 The importance of trying it out live.  
 223  
 ++ Text units 228-233:  
 228 \*Difficult *SHAPE*<sup>®</sup> Any drawbacks with SHAPE  
 229  
 230 Well the linking but thats because its developmental so ultimately I can  
 see the relevance to the internet where it links back to the home page.  
 231  
 232 It was better than ToolBook<sup>®</sup> because its hierarchical so it allowed me to  
 describe the faculty. With ToolBook<sup>®</sup> I created all pages which were on  
 different strata, and they had to be created at the same time., I didn't  
 like that as I said I would have to sit down and describe the  
 architecture. Essentially the mapping is the architecture of design.  
 you can arrange as such that  
 233  
 ++++++  
 +++ ON-LINE DOCUMENT: S03RW  
 +++ Retrieval for this document: 53 units out of 282, = 19%  
 ++ Text units 9-16:  
 9 \*Define TBM Describe to me what ToolBook<sup>®</sup> does?  
 10  
 11 It creates a means of communication information on the computer between  
 different pages which are not -- Are linked.  
 12  
 13 G: What purpose would that be for?  
 14  
 15 For any form of communication  
 16  
 ++ Text units 73-80:



73     \*Picture TBM 7. Page for Support Staff with Link added to Leisure and  
Tourism

74

75     G: How did the text get there?

76

77     What we did next was, I don't know how we got the name in there, but we  
got a link up between that and whatever we had here.

78

79     G: How would you use this link?

80

++ Text units 121-130:

121    \*Define **SHAPE**<sup>®</sup> Describe to me what **SHAPE**<sup>®</sup> does?

122

123    **SHAPE**<sup>®</sup> takes concepts and allows you to break them down into different  
concepts and different relationships between those. You take a concept  
and break it down into lower levels. A concept may be misleading because  
it could be just a subject.

124

125    G: And what happens then

126

127    A better understanding how the whole thing is interlinked.

128

129    G: What happens to those links?

130

++ Text units 195-200:

195    \*Picture **SHAPE**<sup>®</sup> 8 Moved Concepts

196

197    G: What do you do next?

198

199    I would link them I would press 'generate'. and press that down (CTRL)  
and put the word in

200

++ Text units 207-210:

207    \*Picture **SHAPE**<sup>®</sup> 11 Enter link name

208

209

210    \*Picture **SHAPE**<sup>®</sup> 12 Several linked concepts

++ Text units 232-248:

232    \*Picture **SHAPE**<sup>®</sup> 19 Next level with atomic concepts hot.

233

234    G: What is happening here?

235

236

237

238    G: Where would these links have come from

239

240

241

242    \*Picture **SHAPE**<sup>®</sup> 21 Content page for 'Management with section field with  
links to Administration

243

244    G: What do you do here?

245

246    If I press on that it will take me to 'Administration'

247

248

+++++

+++ ON-LINE DOCUMENT: S04MJ

+++ Retrieval for this document: 108 units out of 559, = 19%

++ Text units 3-20:

3     \***SHAPE**<sup>®</sup> Session Interview

4

5 G: How would you now rate your understanding of what  
hypermedia/multimedia is?

6

7

8

9 G: How would you now rate your understanding of hyperlinking?

10

11

12

13 G: How would you now rate your understanding of concept maps?

14

15

16 G: How would you now rate your understanding of the use of *SHAPE*®?

17

18

19 *SHAPE*® Session Interview

20

++ Text units 24-27:

24 \*G: Explanation of creating links

25

26

27

++ Text units 164-188:

164 \*Picture *SHAPE*® 11 Enter link name

165

166 G: What do you do here?

167

168 G: What happens next

169

170

171 G; Is that confusing?

172

173

174 G: What would you do now

175

176

177 \*Picture *SHAPE*® 12 Several linked concepts

178

179 G: What do you do here?

180

181 G: What happens next

182

183

184 G; Is that confusing?

185

186

187 G: What would you do now

188

++ Text units 263-293:

263 \*Picture *SHAPE*® 19 Next level with atomic concepts hot.

264 G; Why are these red?

265

266 G: What do you do here?

267

268 G: What happens next

269

270

271 G; Is that confusing?

272

273

274 G: What would you do now

275

276

277 G: Where would these links have come from

278

279

280 \*Picture *SHAPE*® 21 Content page for 'Management with section field with  
links to Administration

281

282 G: What do you do here?  
 283  
 284 G: What happens next  
 285  
 286  
 287 G: Is that confusing?  
 288  
 289  
 290 G: What would you do now  
 291  
 292  
 293  
 ++ Text units 356-359:

356 \*G: Explanation of creating links  
 357  
 358  
 359  
 ++ Text units 473-490:

473 \*Picture TBM 7. Page for Support Staff with Link added to Leisure and  
 Tourism  
 474 G: What do you do here?  
 475  
 476 G: What happens next  
 477  
 478 G; Is that confusing?  
 479  
 480 G: What would you do now  
 481  
 482 G: What has happened at this point  
 483  
 484  
 485 G: How did the text get there?  
 486  
 487  
 488 G: How would you use this link?  
 489  
 490  
 ++ Text units 514-521:

514 \*Oteaching TBM How well do you think ToolBook® would allow you to produce  
 an application for your own teaching?  
 515  
 516 It would, but the(the mechanism) relationships would need to be clearly  
 then both packages would be the same.  
 517

518 \*Difficult TBM Was there anything about ToolBook® that made it difficult  
 or unsatisfactory in producing an application that matched the objectives  
 of the exercise?  
 519  
 520 The content and relationships were a bit confusing but nothing a bit of  
 practice couldn't sort out.  
 521  
 ++++++  
 +++ ON-LINE DOCUMENT: S05MS  
 +++ Retrieval for this document: 118 units out of 412, = 29%  
 ++ Text units 8-11:

8 \*Create Links SHAPE  
 9  
 10 (Mike has trouble labeling the links)  
 11  
 ++ Text units 32-56:

32 \*General SHAPE: What general impressions did you have using SHAPE®?  
 33  
 34 Its good and clunky. its seems straightforward. It would be nice to  
 have an overall \*Picture cos then its easier to visualise it.  
 35 I would want to sit down with a pen and paper beforehand if it was a  
 subject I was happy with I would be quite happy to prototype on here.  
 36  
 37 G: If it was a text document where would you start on the computer or a

38 piece of paper  
 39 On the computer.  
 40  
 41  
 42 G: But with this (SHAPE) you would start on a piece of paper?  
 43  
 44 In this particular application yes because I don't know enough about it  
 45  
 46 G: If you were familiar it, would that make any difference  
 47  
 48 I think so because its quite easy to go and link things or is it easy to  
 go move things around and change things, break links and put new links  
 in, is it easy to prototype on here.  
 49  
 50 G: It will be  
 51  
 52 So if you go down to a quite low level you should be able to repoint  
 links at a higher level.  
 53  
 54 If I was happy with that and happy with the subject I would be happy to  
 prototype on the screen.  
 55  
 56  
 ++ Text units 61-84:  
 61 \*Confusion SHAPE: Was there anything confusing about using *SHAPE*?  
 62  
 63 Its the thing about the types of concepts - you've got hard concepts and  
 hard concepts, navigation map is a soft concept in the sense that its  
 not real, its not tangible whereas a member of staff is a tangible one  
 and creating a link between them - is in three dimensions you can  
 create almost a hierarchy between tangible ones but somewhere behind  
 there is your intangible one  
 64  
 65 G: Are you saying that there is a need to classify concepts and what we  
 are doing here is mixing type of concepts almost like trying to multiple  
 'f' by 'lbs'  
 66  
 67 Yes with the navigation map and the staff there is a link but I don't  
 know quite how to classify what that link might be.  
 68  
 69 G: Would you therefore say that the concept map is deficient in some way  
 70  
 71 Yes you've almost got layers, the navigation map is like a layer over  
 the top over those other concepts How you do that I don't know  
 72  
 73  
 74 G: Maybe you shouldn't be allowed to link these types of concept you can  
 have them on the same screen but there not linkable .  
 75  
 76 Is the navigation map a concept?  
 77  
 78 G: Well this maybe something to do with the fact its so free format  
 79  
 80 That's right you might be making a rod for your own back  
 81  
 82 G: And it could be that although you would need to include something  
 like a navigation map in a particular application it has no place in the  
 concept map.  
 83  
 84  
 ++ Text units 138-144:  
 138 \*Picture *SHAPE* 8 Moved Concepts  
 139  
 140 G: What do you do here?  
 141  
 142 I would decide if there were any links between them and I would  
 CTRL-Click each box and then I would type in the name of the association  
 143  
 144  
 ++ Text units 166-169:  
 166 \*Picture *SHAPE* 11 Enter link name  
 167  
 167 \*Picture *SHAPE* 12 Several linked concepts

168  
169  
++ Text units 187-196:

187 \*Picture *SHAPE*<sup>®</sup> 17 Next level down

188  
189 G: What would you do next  
190  
191 Generate book  
192  
193 What does that do  
194  
195 It creates all the 'horizontal' links  
196  
++ Text units 205-223:

205 \*Picture *SHAPE*<sup>®</sup> 21 Content page for 'Management with section field with links to Administration

206  
207 G: What is this illustrating here now  
208  
209 For this particular element it shows all links from that element to other elements

210  
211 G: Where have they come from  
212  
213 Various levels from your map  
214  
215 G: Why 'management' and 'administration'?  
216  
217 From your map there's a link between 'management' and 'administration'  
218  
219 If up here (higher level) you've got 'school' and down here you've got 'goat' can you link those even though they are on different levels.

220  
221 G: No  
222  
223  
++ Text units 289-289:

289 \*Create Links TBM

++ Text units 298-301:

298 \*Define TBM: Describe to me what TBM does?

299  
300 It basically creates pages within a book for an aid to sectionalise and organise your course and also allow the person to explore linked items.  
301  
++ Text units 318-326:

318 \*Change TBM: Was there anything about TBM?

319  
320 I wouldn't want to see the workings. These don't bare a lot of relationship to structure

321  
322 There's two concepts going on here there's the linear and there's the non-linear and I find it gets confusing

323  
324  
325 G: I'd like you to comment on the follow screens  
326  
++ Text units 353-363:

353 \*Picture 7 TBM. Page for Support Staff with Link added to Leisure and Tourism

354  
355 G: What has happened at this point  
356  
357  
358 G: How did the text get there?  
359  
360  
361 G: How would you use this link?  
362

363  
+++++  
+++ ON-LINE DOCUMENT: S08FB  
+++ Retrieval for this document: 90 units out of 561, = 16%  
++ Text units 9-12:

9     \*G: Explanation of creating links

10  
11  
12  
++ Text units 49-52:

49     \*Confusion **SHAPE**<sup>®</sup> Was there anything confusing about using **SHAPE**<sup>®</sup>?

50  
51     Yes, the name of the links. I'm used to having set name meaning set  
      things for links, looking in the abstract just being able to call (the  
      links) anything.

52  
++ Text units 151-175:

151    \*Picture **SHAPE**<sup>®</sup> 11 Enter link name

152  
153    G: What do you do here?  
154  
155    G: What happens next  
156  
157  
158    G; Is that confusing?  
159  
160  
161    G: What would you do now  
162  
163

164    \*Picture **SHAPE**<sup>®</sup> 12 Several linked concepts

165  
166    G: What do you do here?  
167  
168    G: What happens next  
169  
170  
171    G; Is that confusing?  
172  
173  
174    G: What would you do now  
175  
++ Text units 250-280:

250    \*Picture **SHAPE**<sup>®</sup> 19 Next level with atomic concepts hot.

251    G; Why are these red?  
252  
253    G: What do you do here?  
254  
255    G: What happens next  
256  
257  
258    G; Is that confusing?  
259  
260  
261    G: What would you do now  
262  
263  
264    G: Where would these links have come from  
265  
266

267    \*Picture **SHAPE**<sup>®</sup> 21 Content page for 'Management with section field with  
      links to Administration

268  
269    G: What do you do here?  
270  
271    G: What happens next  
272

273  
 274 G: Is that confusing?  
 275  
 276  
 277 G: What would you do now  
 278  
 279  
 280  
 ++ Text units 349-352:  
 349 \*G: Explanation of creating links  
 350  
 351  
 352  
 ++ Text units 370-373:  
 370 \*Define TBM Describe to me what ToolBook® does?  
 371  
 372 TBM allows you to set up individualpages of information which can be  
 linked to other pages. It can also be set up as a hierarchy so again you  
 can direct students in to a certain path.  
 373  
 ++ Text units 478-495:  
 478 \*Picture TBM 7. Page for Support Staff with Link added to Leisure and  
 Tourism  
 479 G: What do you do here?  
 480  
 481 G: What happens next  
 482  
 483 G; Is that confusing?  
 484  
 485 G: What would you do now  
 486  
 487 G: What has happened at this point  
 488  
 489  
 490 G: How did the text get there?  
 491  
 492  
 493 G: How would you use this link?  
 494  
 495  
 ++++++  
 +++ ON-LINE DOCUMENT: S10PB  
 +++ Retrieval for this document: 144 units out of 416, = 35%  
 ++ Text units 38-62:  
 38 \*Create Links TBM  
 39  
 40 G: What links would to like to add?  
 41  
 42 Facilities for the different courses, theres a links.  
 43  
 44 G: Explanation of navigation/ the final application  
 45  
 46 G: Do you want to add any other pages?  
 47  
 48 I'd leave it there really. What about 'qualifications'I suppose. How  
 about 'placment opportunities'. 'Student union'  
 49  
 50 Is there a spell checker?  
 51  
 52  
 53 I want to go back to facility  
 54  
 55 G; explanation of history navigation.  
 56  
 57 (Phil creates link from 'Facility' to students union  
 58  
 59  
 60 Post ToolBook® Session Interview  
 61  
 62  
 ++ Text units 97-145:  
 97 \*Picture TBM 3

98  
99 That was the first page of the document, a blank one from which you had  
to build from.  
100 \*Picture TBM 5: Page input Box  
101 G: What would you have to do next?  
102  
103  
104 Start making pages up, click on to 'page' and then name the pages  
105  
106 G: ( Correction to right pull down menu)  
107  
108 Oh yea, I would probably have got lost there  
109 \*Picture TBM 6: Page for support staff  
110 G; Once you've created those pages what happens next?  
111  
112 Name the text field for what the module is going to be and even the  
section if we want to then we make the interrelationship between them,  
113 G: How do you make the interrelationship.  
114  
115 We did that by coming down to there, and typed in the name of the page,  
then highlighted it, clicked it.  
116  
117 G: How did you get it to work.  
118  
119 Go to page? I can't remember.  
120  
121 \*  
122  
123  
124 G: (Tries to get Phil to explain F3)  
125 G; Do you recall pressing anything on the keyboard  
126  
127 Oh yes F3  
128  
129 G; What does F3 do?  
130  
131 F3 can do two things First of all it will take these away (Pull down  
menus), it stops the students from altering anything. Those are for  
students and those are for author. And that would make that (link  
field) work  
132  
133 G: How would you go about completing the exercise.  
134  
135 At this moment in time yes but next week if haven't touched it I'd  
forget. A bit more tuition and I'd be alright  
136  
137 G: Why would you forget?  
138  
139 Because I'd not be applying it. It's like any knowledge you gain if you  
don't apply it it goes on the back burner doesn't it  
140  
141  
142 G: Is there any difference between forgetting this and forgetting  
anything else like making an omelette?  
143  
144 Once you've developed a skill the skill will stay with you even though  
the skill will be at a certain level. If you don't practice the skill  
you lose it.  
145 \*  
++ Text units 204-209:  
  
204 \*Create Links **SHAPE**<sup>®</sup> Explanation of creating links  
205  
206 G: What is the connection between schools and courses?  
207  
208 'Names of courses' would that be, 'Course titles'  
209  
++ Text units 254-270:  
  
254 \*Confusion **SHAPE**: Was there anything confusing about using **SHAPE**<sup>®</sup>?  
255  
256 Not confusing but there's so much more to it. A lot more thought  
processes to these different levels.  
257  
258 G: Does that apply to ToolBook<sup>®</sup> as well?



259  
 260 In ToolBook® it was just set 'headings' together With this one there is a  
 lot more thought processes required.  
 261  
 262 G: In what sense?  
 263  
 264 Its in more depth you have to do the relationship between leves as well.  
 265  
 266  
 267 G: Didn't you have to create links in ToolBook® as well?  
 268  
 269 Yes but there are two types of links with this one atomic and composite  
 and getting the differentiation between those two. Its probablty easy but  
 its the first time I've tried to do it.  
 270  
 ++ Text units 286-325:

286 \*Picture **SHAPE**® 5:First screen

287  
 288 G: What do you do here?  
 289  
 290 Click on that and you can do your 'titles' first of what you want and  
 then you say ok and they come up and you split them all around the screen  
 in the **SHAPE**® you want them. Then you decide then whether there is any  
 relationship between them.  
 291  
 292 G: How would you do that?  
 293  
 294 Press this (CTRL) and put the arrow on the bar (concept), press once and  
 then it comes up and you type in what the relationship is and you type ok  
 and a line comes down between the two.  
 295  
 296 G: What do you do next?  
 297  
 298 Don't we go into generate?  
 299  
 300 G; Do we do anything before we generate?  
 301  
 302 Do we move them around to get the **SHAPE**® we want.  
 303  
 304 G: You can do  
 305  
 306 And then we decide then if an atomic or composite, I can't remember  
 whether that is done now. What we've got is that level so we see what  
 we've got to go down to a composite relationship or a an atomic type of  
 relationship. I can't rememebr how to do that.  
 307  
 308 G: Once you've done that what do you do next?  
 309  
 310 Do you go to Generate  
 311  
 312 G; What do we do now?  
 313  
 314 We're looking at composites so we click composites. We only go to book  
 when we're ready to sort it out.  
 315  
 316 G; when we click composites whta happens then?  
 317  
 318 Something goes red, does 'Schools' go red?  
 319  
 320  
 321 G: And what does that mean?  
 322  
 323  
 324 That means you can something else going to the next level you can put  
 your rel ationships down. but the others will just go to the atomic point  
 325  
 ++ Text units 355-361:

355 \*Picture **SHAPE**® 20. Showing the links field

356  
 357 G: What do these (link names)represent?  
 358  
 359 They were composite links from management  
 360  
 361  
 ++++++

+++ ON-LINE DOCUMENT: S11TC

+++ Retrieval for this document: 137 units out of 291, = 47%

++ Text units 5-45:

5     \*G: Explanation of authoring with ToolBook®

6

7     G: What pages would you include?

8

9     (Tom enters pages)

10

11    G: Describe what you have done Was that the whole entire electronic book?

12

13    Yes because I wthink hat using the book metaphor I would expect to see a  
page of contents in a book but I guess that table of contents would be in  
the faculty page.

14

15    G: Explanation of creating links

16    G: What do yoy want to link?

17

18    I want to link 'Staff' to 'School'

19

20    (Tom links the two pages)

21

22    G: Would this be a two way link

23

24    yes

25

26    Tom tries link

27

28    G: could you create some more links, what do you think you want to do  
next?

29

30

31    I think I would start at the top of the hierarchy as I have the mental  
image and that would be the 'faculty'. And I would let to add some  
general information about the faculty put put link links then to schools  
and put in some information about schools, link schools to 'courses', put  
information against courses.

32

33    G: You only have one page for schools, would that be all you need

34    I suppose not, I would like a page for each of the schools

35

36    (Tom creates more pages for each of the schools)

37

38    G: Create to more links, explanation of navigation tool

39

40    (Tom creates another link between 'S of FCS' and 'Faculty')

41

42    G: Explanation of how the book would be created.

43

44    Post session Interview

45

++ Text units 50-57:

50    \*Define TBM Describe what ToolBook® does?

51

52    ToolBook® allows you to you to define pages within a book, conceptual  
pages and to define links bewteen these pages as many links as one might  
like to do I suppose and allows you to enter information on to those  
pages.

53

54    \*General TBM General impressions

55

56    I don't think its a particularly good idea to have type in names of  
other pages because it is entirely dependent on the programmer/author  
typing in the name accurately [for linking pages] I would prefer some  
sort of drag and drop or pull down menu select from other page names and  
not just pages. I could imagine sitting in 'faculty' and to make links  
to other pages so I can imagine pulling down a menu and it has the a  
names of the other pages, ones already linked would be greyed out or  
disabled in some way and I could select other ones. Not individuallly  
but select as many as you wanted. In the same as you can in access when  
creating quieries. It saves time and its when you have to keep going  
back ~I sometimes forget what I've done already I don't find that very  
useful.

57

++ Text units 62-86:

62    \*Confusion TBM   Was there any thing confusing about ToolBook®?  
 63  
 64    It took me a while to work to figure out what I was looking at - the  
      name of the page there , it took me a a little bit to focus on that and  
      realise taht was the page I was looking at and of course this thing here  
      (Link field).  Anothe thing I find confusing, the usually thing, single  
      sclick/double click.  
 65  
 66    (commenting on screens)  
 67  
 68    \*Picture TBM 1 Entry screen for ToolBook®:  
 69  
 70    G; Do you know whta to do here?  
 71  
 72    I think so I would have to create new pages  
 73    \*Picture TBM 4  
 74    G: Where would you go to create new pages?  
 75  
 76    Objects (menu)  
 77    \*Picture TBM 6  
 78    G:  Once you've created the pages would you know how to create links  
 79  
 80  
 81    Yes, I would in author mode dclick on this area here and enter the name  
      of the page to which I wanted to link.  
 82  
 83    G:  How would you get to the other page  
 84  
 85    I would follow the link in reader mode by clciking on it.  
 86  
 ++ Text units 110-124:

110   \*Easy TBM   Was there anything about Tbook that made it easy/satisfactory  
      to achieve the objectives of the exercise.  
 111  
 112   Forming links seemed pretty easy.  
 113  
 114   \*EOL TBM What makes a program easy to learn  
 115  
 116   IF they are able to relate what the user knows  about its capabilities in  
      terms of some mental model to the actions they have to perform with the  
      software  particularly if for example the names of the pulldown menus are  
      intuitive and relate to the task in hand and that the areas on the screen  
      are properly positioned and seem to interelate with the authors mental  
      model of how the sofwatre operates  
 117  
 118  
 119   G:  Where does that mental model come from?  
 120  
 121   It may come from initial description of the sowftare or some ideas of the  
      capability of the sofwtare so for example Tbook, as I undertsand it from  
      what we've seen today allows the user to connect pages of information  
      together using hyperlinks so if its easy to create pages of information,  
      identify them, and to create links between those pages then the sofwatre  
      is easy to use.  
 122  
 123   Tbook could be easy to learn,  I have a better understanding of the need  
      for the names must match in trying to link a nmaed page to another named  
      page  the name must be exactly right  
 124

++ Text units 141-154:

141   \***SHAPE**® Session  
 142  
 143   (Entering concepts)  
 144  
 145   (Create links)  
 146  
 147   \*Define **SHAPE**®  Describe what **SHAPE**® does

148  
149 It allows the user to express concepts at various levels, takes some  
concept and move them down to a lower level and express links between  
those concepts or interrelations which results in the generation of Tbook  
pages which have their links embedded in them due to the definitions which  
have been produced in SHAPE.

150

151 \*General **SHAPE**<sup>®</sup> General impressions

152  
153 As I used it I was thinking about what I had seen before in Tbook and  
realised it was going to produce pages. and **SHAPE**<sup>®</sup> seems to be a more  
intuitive approach because it allows me to express concepts behind and  
map them into pages with links embedded in them and after all that's  
probably the more intuitive way of doing things rather than the having to  
deal with the technology at a lower level. I like the higher level  
approach.

154  
++ Text units 187-194:

187 \*Picture **SHAPE**<sup>®</sup> 7 (Concepts created)

188  
189 Those are the generated concepts overlaying one another I would drag  
them around to separate them. Having done that I would CTRL 'point' and  
point CTRL another one and then I would supply the name of the link.

190

191 \*Picture **SHAPE**<sup>®</sup> 9 (Creating and showing of link)

192  
193 That's the creation of a link and that shows the link graphically.

194  
++ Text units 232-245:

232 \*Picture **SHAPE**<sup>®</sup> 21 (Showing links field of one of the atomic pages)

233  
234 G: What are these

235  
236 Those are the links

237  
238 G: Where have they come from?

239  
240 They have come from the concept links

241  
242 G: How do those (semantic) links distinguish themselves from those (the  
composite concept pages)

243  
244 On the other side they are between levels

245  
++ Text units 250-261:

250 \*Oteaching\* **SHAPE**<sup>®</sup> How well do you think **SHAPE**<sup>®</sup> allowed you to create an  
application for your own teaching?

251  
252 Yes I think pretty well

253  
254 G: How well compared to Tbook

255  
256 This would be my preferred route

257  
258 G: Why would that be?

259  
260 It's easier to cope with it corresponds better to my mental model of the  
structure of some sort of learning package, the way I would break down  
the topic into areas of interest and interrelate them rather than just be  
going straight to pages and trying to define links at that level. This  
is much better - work out the concepts first because I guess if I was  
going to do a Tbooky thing I would actually draw it out on paper and what  
I draw on paper would be rather similar to what I would draw with SHAPE.  
It's much better to cut out paper exercise to do it directly on screen  
itself.

261  
+++++  
+++ ON-LINE DOCUMENT: S12PC  
+++ Retrieval for this document: 165 units out of 341, = 48%

++ Text units 1-52:

1  
2     ToolBook® Session Interview  
3  
4     Name: S12  
5  
6     G: How would you now rate your understanding of what  
hypermedia/multimedia is?  
7     G: How would you now rate your understanding of hyperlinking?  
8     G: How would you now rate your understanding of the use of ToolBook®?  
9     G: Explanation of the task  
10    Session Interview  
11  
12    G: Explanation of entering ToolBook®  
13    G: Explanation of entering pages  
14    We have 4 (pages) have we?  
15    G: You can have as many as you like  
16  
17    G: What pages would you include?  
18  
19    Its all about the faculty and the structure of the faculty?  
20    Is it actually a title to each page is that what you want me to add?  
21    Do I have to put capitals or do I just type?  
22    (Phil enters his pages and they are then generated)  
23  
24  
25    G: Explanation of the order of pages and basic navigation  
26    G: Explanation of Title fields  
27    G: Explanation of section field  
28    G: Explanation of creating links  
29    G: Explanation of Reader/Author mode  
30    G: Do you want to add any other pages?  
31    G: Explanation of history - navigation.  
32    G: Explanation of navigation/ the final application  
33  
34    Could you start writting text in and start developing your module and  
when you decided you needed another link you could just create that other  
link?  
35  
36    G: Absolutely  
37  
38    You don't have to do all your linking first?  
39  
40    G: No you can create and add as you go.  
41  
42    Post ToolBook® Session Interview  
43  
44    G: How would you now rate your understanding of the use of ToolBook®?  
45  
46    G: Would you say you knowledge of ToolBook® has increased  
47  
48    \*Define TBM Describe to me what ToolBook® does?  
49  
50    Tbook enables you to put together the whole thing so if your developing a  
course or information brochure of the faculty whatever, then Tbook is the  
mechanism for putting the structure into place, with pages the  
hyperlinks, etc

51

52

++ Text units 61-64:

61    \*Confusion TBM Was there anything confusing about using ToolBook® ?  
62  
63    Yes this bit (Sections field) sections in the book I'm still a bit  
muddled about that but I think I'm getting to grips with setting up the  
pages and the links.  
64

++ Text units 78-103:

78    \*Picture TBM 3 Opening page of ToolBook®  
79  
80    There are four pages  
81

82 G: Can you explain that (page navigation) at the bottom there  
83  
84 Well there are four pages at the moment and the basic structure is  
already set up if you press on the right arrow it takes through each  
blank page  
85  
86 G: What would you have to do next?  
87  
88 Click on 'Page' at the top no is it 'Object'  
89  
90 G: What comes up next?  
91  
92 We go onto 'NewPage' and you get the little grid where you put the titles  
93 G: What comes up next?  
94 We clicked on the Ok button and the pages down the bottom changed, the  
number of pages we then had well we could have started putting in pages  
but we started to create some links.  
95  
96 G: If you want to create a link what would you do?  
97  
98 We doubleclick in that left hand box which put the cursor there and then  
typed in the name of the page we wanted to link with  
99  
100 G: How did you use the link  
101  
102 We have to go into user mode.  
103  
++ Text units 137-180:

137 \*Barrier TBM What would prevent you from using ToolBook® to create an  
application for your own teaching  
138  
139 Time, lack of.  
140  
141 If I got to the stage where the program became too complicated for me and  
I couldn't get backup - tuition my motivation would decrease.  
142  
143  
144 \*SHAPE® Pre Session  
145  
146 G: How would you now rate your understanding of concept maps?  
147  
148  
149 G: How would you now rate your understanding of the use of SHAPE®?  
150  
151  
152 SHAPE® Session Interview  
153  
154 G: Explanation of entering concepts  
155  
156 (Phil enters pages and says) 'They've got to be fairly similar (to those  
created in ToolBook®)  
157  
158  
159 G: Explanation of creating links  
160  
161 G: Explanation of composites/atomic  
162  
163 G: Explanation of Generate composites  
164  
165 \*G: Explanation of moving to next level  
166  
167 There's a link between staff and courses but what's the link.  
168 This is where I am having a problem with this one (SHAPE) is actually  
understanding what the link is and saying what the link is  
169 What's going through my mind now is that I know certain staff teach  
certain courses but actually say what that link is, I'm not sure. The  
link is subject area.  
170  
171 I don't think I started off well I didn't structure it well to start with  
and thats causing problems.  
172  
173 \*G: Explanation of generate book  
174  
175 \*G: Explanation of navigation/ the final application  
176  
177 Post SHAPE® Session Interview

178 How would you now rate your understanding of the use of *SHAPE*<sup>®</sup>?  
 179  
 180  
 ++ Text units 195-198:

195 \*Confusion *SHAPE*<sup>®</sup> Was there anything confusing about using *SHAPE*<sup>®</sup>?  
 196  
 197 Putting in the links between the different concepts that was confusing.  
 198  
 ++ Text units 218-228:

218 \*picture *SHAPE*<sup>®</sup> 5:Opening screen of SHAPE  
 219  
 220 G: Can you describe to me what you see now  
 221  
 222 Well all thats there at the moment in terms of concepts and all there is  
 at the moment is 'The Faculty' and all the various levels and links have  
 to be put in.  
 223  
 224  
 225 G: What do you do here?  
 226  
 227 Dclick on the concept box, which then throws you up a table which you  
 would type in the headings or concepts which you then move around.  
 228  
 ++ Text units 234-251:

234 \*Picture *SHAPE*<sup>®</sup> 12:  
 235  
 236 G: Whats happened next?  
 237  
 238 Forming links that you thought was between these and by holding down the  
 CTRL key clicking on it, colour them up, threw up another little box  
 where you wrote in what your link was and that link appeared with the  
 join line on it.  
 239  
 240 G: And now what would you do?  
 241  
 242 You can now go down to a further level of concepts by clicking sorting of  
 clicking or dclicking on one of these and then throwing up the concept  
 box it either becomes atomic or composite  
 243  
 244 G: And now what would you do?  
 245  
 246 Bring up the concept box and type in the next level  
 247  
 248 G: How do we get to the next level?  
 249  
 250 By Dclicking on the concepts box  
 251  
 ++ Text units 272-277:

272 \*Picture *SHAPE*<sup>®</sup> 20. Showing the links field of Management page  
 273  
 274 G: What do these (link names) represent?  
 275  
 276 They are two links between concepts at the top level.  
 277  
 ++++++ ON-LINE DOCUMENT: S18AJ  
 +++ Retrieval for this document: 98 units out of 387, = 25%  
 ++ Text units 29-53:

29 \*Create Links TBM  
 30  
 31  
 32  
 33 G: Explanation of navigation/ the final application  
 34  
 35  
 36  
 37 G: Do you want to add any other pages?  
 38  
 39

40  
41 G; explanation of history navigation.  
42  
43  
44  
45 Post ToolBook® Session Interview  
46  
47 G: How would you now rate your understanding of the use of ToolBook®?  
48  
49  
50 \*Define TBM: Describe to me what TBM does?  
51  
52 It allows you to set up a framework for something which is analogous to a  
book the frame work would then dictate what was in chapters and pages  
within chapters and allows you to link between pages within a chapter.  
53  
++ Text units 93-101:  
93 \*Picture TBM 5 Page input box  
94  
95 This is setting up the initial set of pages with links between them.  
96  
97  
98 G: Would you be able to continue now?  
99  
100 Probably now, from this point on I could probably create some more work  
it was being faced with a blank page I couldn't remember how to get  
started There wasn't a cursor blinking  
101  
++ Text units 105-119:  
105 \*Picture TBM 7. Page for Support Staff with Link added to Leisure and  
Tourism  
106  
107 G: What has happened at this point  
108  
109 Leisure and Tourism is a page  
110  
111 G: How did the text get there?  
112  
113 You're in author mode.  
114  
115 Is that the link you have set up?  
116 G: How would you use this link?  
117  
118 You would dclick on it to go to that page.  
119  
++ Text units 128-136:  
128 \*Picture TBM 9. Page for Leisure and Tourism  
129  
130  
131 It looks like you've got a link down and a link up, form Leisure and  
Tourism to Support and from Support to Leisure and Tourism.  
132  
133 \*Objectives TBM How well do you think ToolBook® allowed you to achieve the  
objectives of the exercise?  
134  
135 Reasonably well  
136  
++ Text units 176-182:  
176 \*G: Explanation of entering concepts  
177  
178  
179 G: Explanation of creating links  
180  
181  
182  
++ Text units 268-279:  
268 \*Picture *SHAPE*® 8 Moved Concepts  
269



270 G: What do you do here?  
 271  
 272 First of all you want to say whether they are composite or not and you  
 would also want to create links or not between them.  
 273

274 \*Picture **SHAPE**<sup>®</sup> 9 CTRL-Clicked concept

275  
 276 G: What do you do here?  
 277  
 278 Starting a link  
 279  
 ++ Text units 281-285:

281 \*Picture **SHAPE**<sup>®</sup> 11 Enter link name

282  
 283 Now you want the type/name of the link  
 284

285 \*Picture **SHAPE**<sup>®</sup> 12 Several linked concepts

++ Text units 316-331:

316 \*Picture **SHAPE**<sup>®</sup> 20 Content page for 'Management with link field with links  
 to Administration

317  
 318 G: What is happening here?  
 319  
 320 This is just specifying the links from the management page to  
 Administration and schools  
 321  
 322 G: Where would these links have come from  
 323  
 324 You would have done them by when you have the concepts on the screen.  
 Thinking about it I'm not sure whether it is links from the concepts or  
 links from a lower level to an upper level concept.  
 325  
 326 A diagram showing the levels would be useful here  
 327

328 \*Picture **SHAPE**<sup>®</sup> 21 Content page for 'Management with section field with  
 links to Administration

329  
 330  
 331  
 ++++++  
 +++ ON-LINE DOCUMENT: S20RK  
 +++ Retrieval for this document: 110 units out of 583, = 19%  
 ++ Text units 32-34:

32 \*G: Explanation of creating links

33  
 34  
 ++ Text units 76-81:

76 \*Change TBM G: Was there anything about ToolBook<sup>®</sup> you would change?

77  
 78 To be able to structure your pages or being able to show the links or the  
 main frame. The remembering where the page and the history functions was  
 a little bit annoying.  
 79  
 80 G: I'd like you to comment on the follow screens  
 81  
 ++ Text units 160-178:

160 \*Picture TBM 7. Page for Support Staff with Link added to Leisure and  
 Tourism

161  
 162 G: What do you do here?  
 163  
 164 G: What happens next  
 165

166 G; Is that confusing?  
167  
168 G: What would you do now  
169  
170 G: What has happened at this point  
171  
172  
173 G: How did the text get there?  
174  
175  
176 G: How would you use this link?  
177  
178  
++ Text units 235-236:  
  
235 \*G: How would you now rate your understanding of hyperlinking?  
  
236  
++ Text units 247-250:  
  
247 \*G: Explanation of creating links  
  
248  
249  
250  
++ Text units 271-279:  
  
271 \*Define **SHAPE**<sup>®</sup> Describe to me what **SHAPE**<sup>®</sup> does?  
  
272  
273 Creates concept maps, - it looks as if it sits on top of TBM and so you  
can diagrammatically show the various links between the sections and  
hierachy of each page.  
274  
275 G: Why  
276  
277 To make TBM more userfriendly.  
278 Its what you would use TBM for - for creating online interactive book -  
or pages.  
279  
++ Text units 294-300:  
  
294 \*Change **SHAPE**<sup>®</sup> Was there anything about **SHAPE**<sup>®</sup> you would change?  
  
295  
296 Linking between pages of the same level. Information boxes saying what  
is going on. It wasn't as bad as TBM where 'bang' its just a white peice  
of paper - Are you going to develop a tutorial?  
297  
298 G: I'd like you to comment on the follow screens  
299  
300  
++ Text units 393-417:  
  
393 \*Picture **SHAPE**<sup>®</sup> 11 Enter link name  
  
394  
395 G: What do you do here?  
396  
397 G: What happens next  
398  
399  
400 G; Is that confusing?  
401  
402  
403 G: What would you do now  
404  
405  
  
406 \*Picture **SHAPE**<sup>®</sup> 12 Several linked concepts  
  
407  
408 G: What do you do here?  
409  
410 G: What happens next  
411  
412  
413 G; Is that confusing?  
414  
415

416 G: What would you do now

417

++ Text units 493-523:

493 \*Picture **SHAPE**® 19 Next level with atomic concepts hot.

494 G: Why are these red?

495

496 G: What do you do here?

497

498 G: What happens next

499

500

501 G: Is that confusing?

502

503

504 G: What would you do now

505

506

507 G: Where would these links have come from

508

509

510 \*Picture **SHAPE**® 21 Content page for 'Management with section field with links to Administration

511

512 G: What do you do here?

513

514 G: What happens next

515

516

517 G: Is that confusing?

518

519

520 G: What would you do now

521

522

523

++ Text units 539-542:

539 \*Difficult **SHAPE**® Was there anything about **SHAPE**® that made it difficult or unsatisfactory in producing an application that matched the objectives of the exercise?

540

541 Not being able to link concepts at the same level.

542

+++++

+++ ON-LINE DOCUMENT: S25AR

+++ Retrieval for this document: 110 units out of 391, = 28%

++ Text units 5-12:

5 \*Define SHAPE: Describe to me what **SHAPE**® does?

6

7 **SHAPE**® will create a piece of work that is built up of different concepts. the top concepts can then be broken down into subsidiary levels and the links between those subsidiary levels can all be hyperlinked together. Ant there for it is possible once the thing is created to jump from one to the other where ever direct links made and you can also move to separate pages.

8

9 G: And what would the final result be

10

11 The final result would be a concept document that can be linked

12

++ Text units 83-95:

83 \*Picture **SHAPE**® 8 Moved Concepts

84

85 G: What do you do here?

86

87 G: What would you do now

88

89 If I want to show there is a direct link between these I would then I would click on there and it would turn yellow.

90

91 G: No  
 92  
 93 Oh click on that one and a little box will come up saying 'Escape' and  
 then - if I saw it I would remember.  
 94  
 95  
 ++ Text units 111-154:

111 \*Picture *SHAPE*<sup>®</sup> 11 Enter link name  
 112  
 113 G: What happens next  
 114  
 115 A line linking the two.  
 116

117 \*Picture *SHAPE*<sup>®</sup> 12 Several linked concepts  
 118  
 119 G: What happens next  
 120  
 121 Now you need to explain a little more about these three - create a  
 separate page, breaking down the different parts of the management  
 structure.  
 122  
 123 G: How would you do that?  
 124  
 125  
 126 Click on it? Press the control?  
 127  
 128 G: Dclicking the concept  
 129  
 130 Oh yes, and a little box comes up saying 'Is this the end of the line'  
 or is it concept  
 131  
 132 G: Did you have a problem with the idea of composite concepts  
 133  
 134 I was being a little vague about it first I don't there is anything wrong  
 with the way you've written it there no I understand the idea that  
 composite means 'builds on'. What does the atom bit mean?  
 135  
 136  
 137 G: What happens next  
 138  
 139 We reached that stage so we want to create a new page/screen  
 140  
 141 G: So how do we get to the schools page  
 142  
 143 Generate composite  
 144  
 145 G: What does that do?  
 146  
 147 It creates the new page  
 148  
 149 G: How do we get to that new page  
 150  
 151 Do we press concept or pressing that?  
 152  
 153  
 154  
 ++ Text units 175-181:

175 \*Picture *SHAPE*<sup>®</sup> 17 Next level down  
 176  
 177 G: What do we do next  
 178  
 179 Decide whether there are any links between these concepts and whether  
 there any of these screens are linked to another one again.  
 180  
 181  
 ++ Text units 196-201:

196 \*Picture *SHAPE*<sup>®</sup> 21 Content page for 'Management with section field with  
 links to Administration  
 197  
 198 G: Describe this page  
 199  
 200 This tells you what this page is linked to.

201  
 ++ Text units 233-240:

233    \*Define   TBM: Describe to me what TBM does?

234  
 235    Tbook creates links in a directory in the same way that the other program  
       did. I think it will achieve all the same objectives as the program we  
       used before but in a slightly different manner. In what appears to me to  
       be a slightly more complicated manner

236  
 237    G: Can you describe how it does it

238  
 239    Probably not that well. I know that it creates a series of separate  
       pages and then its up to me then to decide what I want written on these  
       pages. It uses the same format of box for the different concepts and it  
       does give me the opportunity to link with the other sections the ones at  
       the top and to go on and link composites, the other ways.

240  
 ++ Text units 312-335:

312    \*Picture TBM 6: Page for Support Staff

313  
 314    G: What has happened at this point

315  
 316    It has now broken down the pages

317  
 318    G: What has happened at this point if say we wanted to create a link

319  
 320  
 321    Would I have to click on that (Andy doesn't know)

322  
 323  
 324

325    \*Picture TBM 7. Page for Support Staff with Link added to Leisure and  
       Tourism

326  
 327    G: What has happened at this point/ how do we get this to work

328  
 329    Something about having to go from author to history

330  
 331  
 332    G: How would you use this link?

333  
 334    I can't remember

335  
 +++++  
 +++ ON-LINE DOCUMENT: S26TS  
 +++ Retrieval for this document: 122 units out of 561, = 22%  
 ++ Text units 3-20:

3        \***SHAPE**® Session Interview

4  
 5        G: How would you now rate your understanding of what  
       hypermedia/multimedia is?

6  
 7  
 8  
 9        G: How would you now rate your understanding of hyperlinking?

10  
 11  
 12  
 13        G: How would you now rate your understanding of concept maps?

14  
 15  
 16        G: How would you now rate your understanding of the use of **SHAPE**®?

17  
 18  
 19        **SHAPE**® Session Interview

20  
 ++ Text units 24-27:

24        \*G: Explanation of creating links

25  
 26

27  
++ Text units 57-61:

57 \*General **SHAPE**<sup>®</sup> What general impressions did you have using **SHAPE**<sup>®</sup>?  
58  
59 It was easy/straightforward - show the relationships once you know the  
basic moves - how to create the links its very straightforward - it gives  
you an instant result and its easy enough to change things.  
60  
61  
++ Text units 95-102:

95 \*Picture **SHAPE**<sup>®</sup> 5: Opening screen of SHAPE  
96  
97 G: What do you do here?  
98  
99 That enables you to go off and genrate your links fom that opening that  
describe the faculty whatever and we did that by dclicking the cmap box  
100  
101 G: What happens next  
102  
++ Text units 168-192:

168 \*Picture **SHAPE**<sup>®</sup> 11 Enter link name  
169  
170 G: What do you do here?  
171  
172 G: What happens next  
173  
174  
175 G; Is that confusing?  
176  
177  
178 G: What would you do now  
179  
180

181 \*Picture **SHAPE**<sup>®</sup> 12 Several linked concepts  
182  
183 G: What do you do here?  
184  
185 G: What happens next  
186  
187  
188 G; Is that confusing?  
189  
190  
191 G: What would you do now  
192  
++ Text units 267-297:

267 \*Picture **SHAPE**<sup>®</sup> 19 Next level with atomic concepts hot.  
268 G; Why are these red?  
269  
270 G: What do you do here?  
271  
272 G: What happens next  
273  
274  
275 G; Is that confusing?  
276  
277  
278 G: What would you do now  
279  
280  
281 G: Where would these links have come from  
282  
283

284 \*Picture **SHAPE**<sup>®</sup> 21 Content page for 'Management with section field with  
links to Administration  
285  
286 G: What do you do here?

287  
288 G: What happens next  
289  
290  
291 G: Is that confusing?  
292  
293  
294 G: What would you do now  
295  
296  
297  
++ Text units 359-362:  
  
359 \*G: Explanation of creating links  
  
360  
361  
362  
++ Text units 391-395:  
  
391 \*Ideas TBM How easy did you find the ideas behind ToolBook® to grasp?  
392  
393 Same as before but a slightly different way of presenting the info I  
think think the general understanding of achievement of where you wanted  
to get to is there but a slightly differnt method of achieving it, rather  
than seeing the links physically your having to know more precisingly  
where you want to go after when you're in a praticular level. In other  
words you have to have the whole thing mapped out at the start  
394  
395  
++ Text units 480-497:  
  
480 \*Picture TBM 7. Page for Support Staff with Link added to Leisure and  
Tourism  
481 G: What do you do here?  
482  
483 G: What happens next  
484  
485 G; Is that confusing?  
486  
487 G: What would you do now  
488  
489 G: What has happened at this point  
490  
491  
492 G: How did the text get there?  
493  
494  
495 G: How would you use this link?  
496  
497  
++ Text units 530-533:  
  
530 \*Easy TBM Was there anything about ToolBook® that made it easy in  
producing an application that matched the objectives of the exercise?  
531  
532 If had done something on a bit of paper before you knew where you were  
going to go and what links were going to happen there's some preparatory  
work required  
533  
+++++  
+++ ON-LINE DOCUMENT: S28DS  
+++ Retrieval for this document: 119 units out of 572, = 21%  
++ Text units 3-20:  
  
3 \*SHAPE® Session Interview  
4  
5 G: How would you now rate your understanding of what  
hypermedia/multimedia is?  
6  
7  
8  
9 G: How would you now rate your understanding of hyperlinking?  
10  
11  
12

13 G: How would you now rate your understanding of concept maps?  
14  
15  
16 G: How would you now rate your understanding of the use of **SHAPE**?  
17  
18  
19 **SHAPE** Session Interview  
20  
++ Text units 24-27:  
24 \*G: Explanation of creating links  
25  
26  
27  
++ Text units 60-66:  
60 \*General **SHAPE** What general impressions did you have using **SHAPE**?  
61  
62 I think if you want to do it properly you really need to sit down and  
think it through and the links between different things. I think I would  
feel more confident doing it on paper first. But I can see its value in  
relation to education and lecturing  
63  
64 Its quite user friendly and it allows you to go through it in a logical  
way.  
65  
66  
++ Text units 174-198:  
174 \*Picture **SHAPE** 11 Enter link name  
175  
176 G: What do you do here?  
177  
178 G: What happens next  
179  
180  
181 G; Is that confusing?  
182  
183  
184 G: What would you do now  
185  
186  
187 \*Picture **SHAPE** 12 Several linked concepts  
188  
189 G: What do you do here?  
190  
191 G: What happens next  
192  
193  
194 G; Is that confusing?  
195  
196  
197 G: What would you do now  
198  
++ Text units 273-303:  
273 \*Picture **SHAPE** 19 Next level with atomic concepts hot.  
274 G; Why are these red?  
275  
276 G: What do you do here?  
277  
278 G: What happens next  
279  
280  
281 G; Is that confusing?  
282  
283  
284 G: What would you do now  
285  
286  
287 G: Where would these links have come from  
288  
289



290 \*Picture **SHAPE**<sup>®</sup> 21 Content page for 'Management with section field with  
links to Administration

291  
292 G: What do you do here?  
293  
294 G: What happens next  
295  
296  
297 G: Is that confusing?  
298  
299  
300 G: What would you do now  
301  
302  
303  
++ Text units 308-319:

308 \*Oteaching **SHAPE**<sup>®</sup> How well do you think **SHAPE**<sup>®</sup> would allow you to produce  
an application for your own teaching?

309  
310 RTC, T and Env, can you do slides?  
311  
312 It would be good but but I still thik students need the opportunity to  
discuss the issues.  
313 In relation to the factual knowledge it would be useful.  
314

315 \*Difficult **SHAPE**<sup>®</sup> Was there anything about **SHAPE**<sup>®</sup> that made it difficult or  
unsatisfactory in producing an application that matched the objectives of  
the exercise?

316  
317 My own understanding and having time to think these (The concepts and  
relations) through.  
318  
319  
++ Text units 366-369:

366 \*G: Explanation of creating links

367  
368  
369  
++ Text units 486-503:

486 \*Picture TBM 7. Page for Support Staff with Link added to Leisure and  
Tourism

487 G: What do you do here?  
488  
489 G: What happens next  
490  
491 G; Is that confusing?  
492  
493 G: What would you do now  
494  
495 G: What has happened at this point  
496  
497  
498 G: How did the text get there?  
499  
500  
501 G: How would you use this link?  
502  
503  
+++++  
+++ ON-LINE DOCUMENT: S35DB  
+++ Retrieval for this document: 99 units out of 528, = 19%  
++ Text units 3-12:

3 \***SHAPE**<sup>®</sup> Session Interview

4  
5 G: How would you now rate your understanding of what  
hypermedia/multimedia is?  
6 G: How would you now rate your understanding of hyperlinking?  
7 G: How would you now rate your understanding of concept maps?

8 G: How would you now rate your understanding of the use of **SHAPE**®?  
9  
10  
11 **SHAPE**® Session Interview  
12  
++ Text units 14-14:  
14 \*G: Explanation of creating links  
++ Text units 23-28:  
23 \*Define **SHAPE**® Describe to me what **SHAPE**® does?  
24  
25 It offers a vehicle of sequential ordering of info and converts some  
thoughts about important concepts that relate to a subject and puts them  
into a kind of hierarchical structure that offers the opportunity to  
connect one level to another level. and then within levels it also offers  
the opportunity to show how different subconcepts link together.  
26  
27 To translate a curriculum into some multimedia application.  
28  
++ Text units 143-167:  
143 \*Picture **SHAPE**® 11 Enter link name  
144  
145 G: What do you do here?  
146  
147 G: What happens next  
148  
149  
150 G; Is that confusing?  
151  
152  
153 G: What would you do now  
154  
155  
156 \*Picture **SHAPE**® 12 Several linked concepts  
157  
158 G: What do you do here?  
159  
160 G: What happens next  
161  
162  
163 G; Is that confusing?  
164  
165  
166 G: What would you do now  
167  
++ Text units 242-272:  
242 \*Picture **SHAPE**® 19 Next level with atomic concepts hot.  
243 G; Why are these red?  
244  
245 G: What do you do here?  
246  
247 G: What happens next  
248  
249  
250 G; Is that confusing?  
251  
252  
253 G: What would you do now  
254  
255  
256 G: Where would these links have come from  
257  
258  
259 \*Picture **SHAPE**® 21 Content page for 'Management with section field with  
links to Administration  
260  
261 G: What do you do here?

262  
 263 G: What happens next  
 264  
 265  
 266 G: Is that confusing?  
 267  
 268  
 269 G: What would you do now  
 270  
 271  
 272  
 ++ Text units 337-340:  
  
 337 \*G: Explanation of creating links  
  
 338  
 339  
 340  
 ++ Text units 357-360:  
  
 357 \*Define TBM Describe to me what ToolBook® does?  
  
 358  
 359 It enables you to create pages of a book and then to decide whether there  
 are any direct links between  
 360  
 ++ Text units 449-466:  
  
 449 \*Picture TBM 7. Page for Support Staff with Link added to Leisure and  
 Tourism  
  
 450 G: What do you do here?  
 451  
 452 G: What happens next  
 453  
 454 G; Is that confusing?  
 455  
 456 G: What would you do now  
 457  
 458 G: What has happened at this point  
 459  
 460  
 461 G: How did the text get there?  
 462  
 463  
 464 G: How would you use this link?  
 465  
 466  
 ++++++ ON-LINE DOCUMENT: S36KT  
 +++ Retrieval for this document: 103 units out of 578, = 18%  
 ++ Text units 31-33:  
  
 31 \*G: Explanation of creating links  
  
 32  
 33  
 ++ Text units 150-167:  
  
 150 \*Picture TBM 7. Page for Support Staff with Link added to Leisure and  
 Tourism  
  
 151 G: What do you do here?  
 152  
 153 G: What happens next  
 154  
 155 G; Is that confusing?  
 156  
 157 G: What would you do now  
 158  
 159 G: What has happened at this point  
 160  
 161  
 162 G: How did the text get there?  
 163  
 164  
 165 G: How would you use this link?  
 166  
 167  
 ++ Text units 219-222:

219 \*Motivation TBM How motivated are you to continue to use ToolBook® to  
develop an application for your own teaching?

220

221 If I had seen something in relation to my own module I might have seen  
some of the benefits. I am having difficulty translating something from  
boring old UWIC to something more specific for students. I don't want to  
just join the crowd because it's glamorous to do so I want to the  
benefits it gives students over and above the traditional methods that's  
where I can't see it yet.

222

++ Text units 231-233:

231 \*G: How would you now rate your understanding of hyperlinking?

232

233

++ Text units 244-247:

244 \*G: Explanation of creating links

245

246

247

++ Text units 268-275:

268 \*Define **SHAPE**® Describe to me what **SHAPE**® does?

269

270 It basically allows in an IT version of concept mapping it allows links  
to be made between concepts or 'bungs' of relevant information

271

272 G: What is the purpose of it?

273

274 I assume its like an index if you look up something it tells you what is  
linked to it.

275

++ Text units 297-303:

297 \*Change **SHAPE**® Was there anything about **SHAPE**® you would change?

298

299 Maybe multilinking - if you're linking 15/20 concepts it will take you a  
long time. We are not teaching cul des sacs (Defined links) we're not  
teaching Cul De Sacs we're teaching links. Everything should be linked  
anyway.

300

301 G: I'd like you to comment on the follow screens

302

303

++ Text units 395-419:

395 \*Picture **SHAPE**® 11 Enter link name

396

397 G: What do you do here?

398

399 G: What happens next

400

401

402 G: Is that confusing?

403

404

405 G: What would you do now

406

407

408 \*Picture **SHAPE**® 12 Several linked concepts

409

410 G: What do you do here?

411

412 G: What happens next

413

414

415 G: Is that confusing?

416

417

418 G: What would you do now

419  
 ++ Text units 494-524:

494 \*Picture **SHAPE**® 19 Next level with atomic concepts hot;  
 495 G: Why are these red?  
 496  
 497 G: What do you do here?  
 498  
 499 G: What happens next  
 500  
 501  
 502 G: Is that confusing?  
 503  
 504  
 505 G: What would you do now  
 506  
 507  
 508 G: Where would these links have come from  
 509  
 510

511 \*Picture **SHAPE**® 21 Content page for 'Management with section field with  
 links to Administration

512  
 513 G: What do you do here?  
 514  
 515 G: What happens next  
 516  
 517  
 518 G: Is that confusing?  
 519  
 520  
 521 G: What would you do now  
 522  
 523  
 524

\*\*\*\*\*  
 +++ ON-LINE DOCUMENT: S37HJ  
 +++ Retrieval for this document: 106 units out of 549, = 19%  
 ++ Text units 3-20:

3 \***SHAPE**® Session Interview

4  
 5 G: How would you now rate your understanding of what  
 hypermedia/multimedia is?  
 6  
 7  
 8  
 9 G: How would you now rate your understanding of hyperlinking?  
 10  
 11  
 12  
 13 G: How would you now rate your understanding of concept maps?  
 14  
 15  
 16 G: How would you now rate your understanding of the use of **SHAPE**®?  
 17  
 18

19 **SHAPE**® Session Interview  
 20  
 ++ Text units 24-27:

24 \*G: Explanation of creating links

25  
 26  
 27  
 ++ Text units 167-191:

167 \*Picture **SHAPE**® 11 Enter link name

168  
 169 G: What do you do here?  
 170  
 171 G: What happens next  
 172

173  
174 G; Is that confusing?  
175  
176  
177 G: What would you do now  
178  
179

180 \*Picture **SHAPE**<sup>®</sup> 12 Several linked concepts

181  
182 G: What do you do here?  
183  
184 G: What happens next  
185  
186  
187 G; Is that confusing?  
188  
189  
190 G: What would you do now  
191

++ Text units 266-294:

266 \*Picture **SHAPE**<sup>®</sup> 19 Next level with atomic concepts hot.

267 G; Why are these red?  
268  
269 G: What do you do here?  
270  
271 G: What happens next  
272  
273  
274 G; Is that confusing?  
275  
276  
277 G: What would you do now  
278  
279  
280 G: Where would these links have come from  
281  
282

283 \*Picture **SHAPE**<sup>®</sup> 21 Content page for 'Management with section field with links to Administration

284  
285 G: What do you do here?  
286  
287 G: What happens next  
288  
289  
290 G: Is that confusing?  
291  
292  
293 G: What would you do now  
294

++ Text units 348-351:

348 \*G: Explanation of creating links

349  
350  
351

++ Text units 368-375:

368 \*Define TBM Describe to me what ToolBook<sup>®</sup> does?

369  
370 TBM allows you as an author to produce pages that you can move ideas from one to another and provide links with.

371  
372 G; For what purpose  
373  
374 To take general ideas and formulate and expand them.  
375

++ Text units 468-485:

468 \*Picture TBM 7. Page for Support Staff with Link added to Leisure and Tourism

469 G: What do you do here?  
470  
471 G: What happens next  
472  
473 G: Is that confusing?  
474  
475 G: What would you do now  
476  
477 G: What has happened at this point  
478  
479  
480 G: How did the text get there?  
481  
482  
483 G: How would you use this link?  
484  
485  
+++++  
+++ Total number of text units retrieved = 1832  
+++ Retrievals in 16 out of 27 documents, = 59%.  
+++ The documents with retrievals have a total of 7256 text units,  
so text units retrieved in these documents = 25%.  
+++ All documents have a total of 9235 text units,  
so text units found in these documents = 20%.  
+++++

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# Appendix P

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## Appendix P Notions Derived from Focus Group Analysis

<p><b><i>Learnability</i></b></p> <ul style="list-style-type: none"> <li>• Long learn time is undesirable (A)</li> <li>• Motivation to learn driven by accomplishment/utility - computer skill dependent (A)</li> <li>• Content can affect learnability (S)</li> <li>• Iteration helps learnability (S)</li> </ul>	<p>Key to origin of notion/idea:</p> <p>(A) Authorware®  (S) <b>SHAPE</b>®  (W) Webmapper  (T) ToolBook®  (F) FrontPage®  (GD) From interview with Greg Dainty on his experiences of developing an application with FrontPage® and <b>SHAPE</b>®  (D) Discussion following demonstration of HAPs</p>
<p><b><i>Complexity</i></b></p> <ul style="list-style-type: none"> <li>• Required wider knowledge increases cognitive overhead (F)</li> <li>• Associating with prior ideas can mislead and cause misconceptions (F)</li> <li>• Inadequacy of representational scheme to model what is required (S)</li> <li>• The need for a complexity gradient for learners (T)</li> </ul>	<p><b><i>Usability</i></b></p> <ul style="list-style-type: none"> <li>• Usability versus functional power (A)</li> <li>• Affected by prior knowledge (F)</li> <li>• Eliminate activities that don't contribute to the end result - Transparency of purpose (W)</li> <li>• Finding a handle - looking for an equivalent idea to understand the new HAP - Mental model match. ( in reference to hypermedia generally)</li> <li>• Various Prompt types helps the user to proceed (S)</li> <li>• Speed of result improves transparency of purpose (S)</li> <li>• The need for Memorability (S)</li> </ul>
<p><b><i>Linking</i></b></p> <ul style="list-style-type: none"> <li>• Semantic links are useful but are not the only way to create hyperlinks (S)</li> <li>• Intuitiveness of hyperlinking is dependent on prior knowledge (F)</li> <li>• Intuitiveness of linking is dependent on the domain (S)</li> <li>• The importance of naming semantic links is not necessarily important to creating hypermedia. (GD)</li> <li>• Things can be linked with 'frames' instead of 'lines' ie embracing similar things (S)</li> <li>• What is the purpose of linking visually? (W)</li> </ul>	<p><b><i>Knowledge</i></b></p> <ul style="list-style-type: none"> <li>• How explicit can you make the knowledge? (A)</li> <li>• How much of the knowledge should be visible? (general comment)</li> <li>• The need for clarity of representation (S)</li> <li>• What constitutes a representation of knowledge? (F)</li> <li>• Knowledge needs to be visible to increase functionality (GD)</li> <li>• How to represent procedural knowledge? (S)</li> <li>• The need for zoom in and out of knowledge representation (W)</li> </ul>

<p style="text-align: center;"><b><i>Transparency of Operation</i></b></p> <ul style="list-style-type: none"> <li>• The need to see the whole 'structure' (D)</li> <li>• Separating the phases increases Transparency of Operation (D)</li> <li>• It is difficult to make complex applications transparent (D)</li> <li>• The need for prior knowledge (F)</li> <li>• The danger of hidden information (F)</li> <li>• The need to avoid misconceptions (F)</li> <li>• The need to separate the phases of authoring (F)</li> <li>• Prior knowledge can lead to misconceptions or transparency (F)</li> <li>• The concept maps are intuitive not the program (S)</li> <li>• Extent of use of the metaphor or prior knowledge (T)</li> <li>• Logical consistency of the HAP may not correspond to the user's sense of logic (W)</li> </ul>	<p style="text-align: center;"><b><i>Mental Model Match</i></b></p> <ul style="list-style-type: none"> <li>• Users seek for a 'handle' to understand (A)</li> <li>• HAPs must respond to a wide range of prior knowledge (D)</li> <li>• Prior knowledge can lead to misconceptions (F)</li> <li>• Hidden conditions (F)</li> <li>• The need to provide a handle (F)</li> <li>• Some people will always need some instruction (S)</li> <li>• Preconditioning dictates usage (W)</li> </ul>
<p style="text-align: center;"><b><i>Task Match</i></b></p> <ul style="list-style-type: none"> <li>• Identity of HAP with final product is important (A)</li> <li>• Proficiency precedes an appreciation of task match (A)</li> <li>• Concept maps don't match entirely to the task (D)</li> <li>• Hidden limitations reduces task match but only after discovery (F)</li> <li>• Usefulness of design metaphor to end product (T)</li> <li>• Variety of final products expected of HAP. (GD)</li> </ul>	<p style="text-align: center;"><b><i>Operational Momentum</i></b></p> <ul style="list-style-type: none"> <li>• Some programs do have a sense of momentum (A)</li> <li>• Complexity reduces momentum (A)</li> <li>• Providing cues increases momentum (D)</li> <li>• Feeling that one is on a trip is synonymous with operational momentum (D)</li> <li>• Making decisions for the learner can increase operational momentum (S)</li> <li>• Functional power can increase operational momentum (W)</li> </ul>
<p style="text-align: center;"><b><i>Utility</i></b></p> <ul style="list-style-type: none"> <li>• Proficiency precedes perceived usefulness (A)</li> <li>• Visual representations increase utility (D)</li> <li>• Separate phases can increase utility (D)</li> <li>• Accomplishment and utility are not necessarily related (D)</li> <li>• The speed of visibility of result is important (D)</li> <li>• Functional power versus usability (D)</li> <li>• Connectedness to other tools (D)</li> </ul>	<p style="text-align: center;"><b><i>Transparency of Purpose</i></b></p> <ul style="list-style-type: none"> <li>• Utility is a component of transparency of purpose (D)</li> <li>• Concurrent visibility of final product when authoring (F)</li> <li>• Any activities must be reflected in the final product (W)</li> </ul>

<i>Accomplishment</i>	<i>Accommodation</i>
<ul style="list-style-type: none"><li>• Motivation and accomplishment are interrelated (A)</li><li>• Accomplishment derives from accommodation and is a property of the user</li></ul>	<ul style="list-style-type: none"><li>• HAPs must induce confidence (D)</li><li>• Confidence partially dependent on familiarity (D)</li><li>• The need to reduce cognitive overhead (F)</li><li>• Accessibility of design metaphor (F)</li></ul>

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# Appendix Q

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## Appendix Q Evidential Data Bits Indexed on Learnability from Focus Group

Q.S.R. NUD.IST Power version, revision 3.0.4 GUI.  
Licensee: geoff.

PROJECT: INTRVWS, User Geoff Elliott, 4:34 pm, 17 Aug, 1998.

```
*****
(3 8 6) /Focus Group/Analysis/learnability
*** No Definition
*****
+++ ON-LINE DOCUMENT: AUTH-INT
+++ Retrieval for this document: 18 units out of 152, = 12%
++ Text units 23-33:
23 Can you see the structure of the knowledge?
24
25 m sort of, you can see the structure of the presentation
26 g what I have found that by attempting to use it to create hypermedia to
end up creating a structure ie a frame within frame within a frame
27 gr you can see the structure but its very rigid it says go that way or
that way whereas in a hypermedia you can go anyway.
28 m it's horses for courses I wouldn't use this for concept mapping
29 g well its not designed for concept mapping
30 m exactly I'd use it for presentations.
31 L again the structure is fragmented into frames so that you can't see the
whole thing.
32 g yes you're creating a hierarchy whether you like it or not.
33 m I think when you're proficient it would be extremely useful
++ Text units 141-147:
141 How easily does this program create a product that matches the task for
the learner
142
143 gr this question is probably the most important of all and this program
isn't very easy at all.
144 gr for a learner it would be very difficult. It would take quite a long
time to get enough skill at it to know how to visualise how youre going
to do it and then actually construct and make a vision appear on the
screen. You said yourself that it took a long time to get used to it and
your computer literate. Compared to SHAPE® where you can get on and use
it with this even to create a concept map(knowledge representation) would
probably take quite a long time.
145 m From my point of view as a learner I would be very motivated by this
because of the quality of the final product
146 g that;s from the point of view of a very IT literate sort of person what
about the learner like X
147 m he wouldn't go near it.
*****
+++ ON-LINE DOCUMENT: SHAPEINT
+++ Retrieval for this document: 11 units out of 272, = 4.0%
++ Text units 135-145:
135 e I think it as intuitive as it is, depending on the underlying knowledge
and that might be very or not very depending upon what you're talking
about.
136 it doesn't take a lot a instructions to link but for first time users
there are a lot of issues in terms of how they would approach this. I
think they would well want to come back and create addition links once
they knew where they were going. and I think they could very quickly go
in there do something , come out, reflect on it and go back in and do it
like they really want to.
137
138 M sort of prototyping.
139
140 gr but you couldn't do that without any instructions.
141 e no its not intuitive in that sense.
142
143 L After doing it once it is very easy to do but that once is dependent
upon training
144
145 g well that's an interesting question about any program when you're
confronted with a program for the first time
*****
+++ Total number of text units retrieved = 29
+++ Retrievals in 2 out of 27 documents, = 7.4%.
+++ The documents with retrievals have a total of 424 text units,
so text units retrieved in these documents = 6.8%.
+++ All documents have a total of 9235 text units,
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so text units found in these documents = 0.31%.

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# Appendix R

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## Appendix R Summary of Research Findings

### Quantitative Results

1. Ease of Learning and Ease of Use were positively correlated.
2. *SHAPE*® significantly easier to understand than TBM.
3. *SHAPE*® produced richer hypermedia than TBM.
4. *SHAPE*® had a higher utility than TBM.
5. The ease of use of *SHAPE*® was largely independent on computer skill.
6. The ease of use of TBM was highly dependent on computer skill.
7. The order of use of each HAP was significant in a number of ways but did not detract from the main findings.
8. Spatial relations ability was significantly correlated to the number of links and concepts created in *SHAPE*®.
9. Spatial relations ability was not significantly correlated to the number of links and concepts created in TBM.
10. Subjects were more motivated to continue with *SHAPE*® than TBM.
11. There was no significant correlation between subjects' intrinsic and extrinsic motivation and their motivation-to-continue with either *SHAPE*® or TBM.
12. Principle components analysis suggested that the ease of learning and ease of use comprised of three main factors called *Transparency*, *Accommodation* and *Accomplishment*.

### Qualitative Results

#### *Analysis of the one-to-one training sessions*

1. Evidence was found to support the existence of the three factors discovered in the PCA.
2. Transparency can be subdivided into *Transparency of Operation* and *Transparency of Purpose*.
3. The existence of a number of subfactors was discovered:
  - *Operational Momentum*
  - *Logic of Operation*
  - *Noise/Economy of dialogue*
  - *Mental Model match*
  - *External Consistency*
  - *Internal consistency*
4. Subjects with lower computing skills gave more precise descriptions of *SHAPE*® than of TBM supporting the finding above that users found *SHAPE*® easy to understand.
5. Subjects found *SHAPE*® more enjoyable than TBM.
6. When asked to comment on what factors contribute to ease of use, subjects suggested simplicity after using TBM and playable/enjoyment after using *SHAPE*®.
7. Comments on linking with *SHAPE*® focused on the semantics and with TBM they focused on the mechanics of linking.
8. Subjects were quick to point out that they required expert support when learning the HAPs.
9. There was evidence to suggest how these factors interacted as shown in figure 6.4 chapter six.
10. More evidence was found to support the finding above that ease of learning and ease of use are closely related.
11. The content analysis of the subjects' output from the two HAPs showed that they corresponded well with the standard model although the output from *SHAPE*® was more complete.
12. There were interesting idiosyncrasies present in the output from *SHAPE*® in terms of the labels of the links even though they were valid links.
13. Some subjects came up against limitations in the ability of concepts to represent what they wanted.



14. Subjects perceived *SHAPE* to be more of an 'ideas developer' and TBM as an information constructor.

#### ***Desk-based analysis of HAPs***

1. The desk-based analysis indicated that HAPs should allow the user to:
  - Switch between views.
  - Zoom in and out of detail.
  - Represent different knowledge types.
  - Create hyperlinks in a number of ways.
  - Allow the definition of different knowledge types

#### ***Analysis of focus group and experiences of constructing a real application***

1. Further evidence was found to support the existence of the factors discovered in previous activities.
  2. Evidence was found to support the existence of other factors,
    - *Utility*
    - *Hidden structure*
    - *Complexity*
    - *Motivation*
  3. Suggestions on how to improve the characteristics of HAPs were made.
  4. Some issues related to knowledge construction and representation were made, namely:
    - Inadequacy of the HAPs to represent what is required
    - Facility to zoom in and out
    - visual representations are generally a good thing
    - How necessary is it to 'see' knowledge
  5. The separation of the authoring process into two phases, the knowledge definition and the functional definition phase.
- The interaction of factors model was modified to include *Utility*, *Hidden Structure*, *Complexity* and *Motivation*

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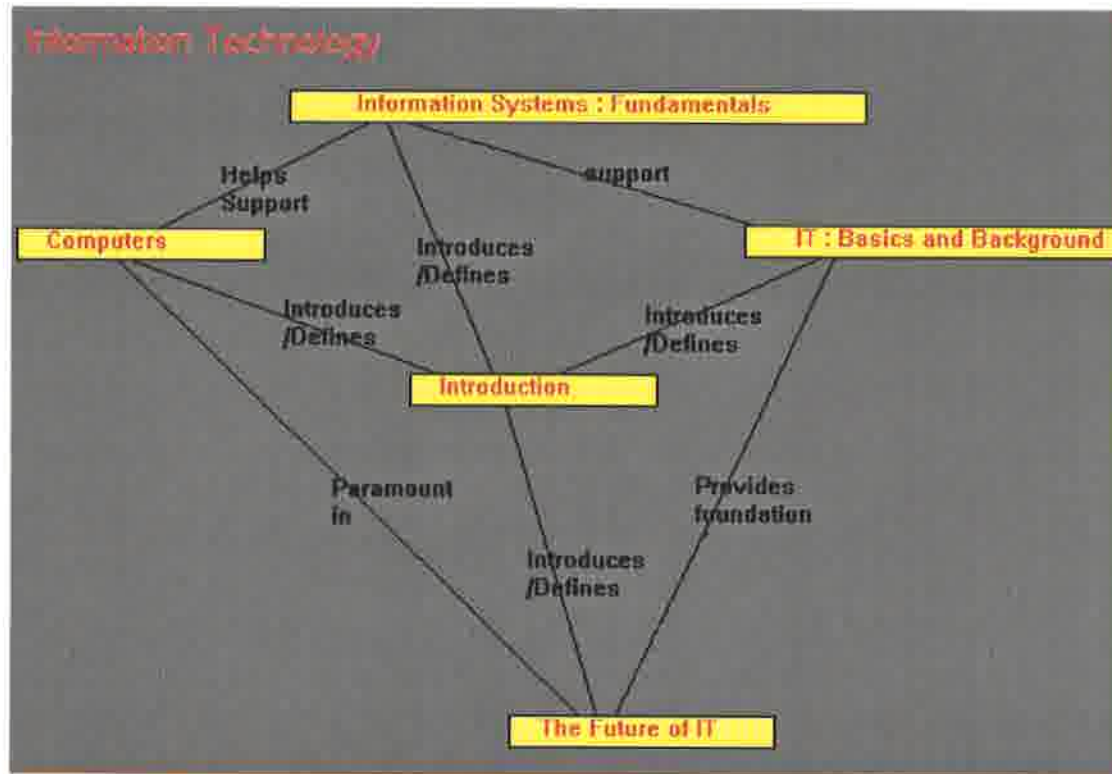
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# Appendix S

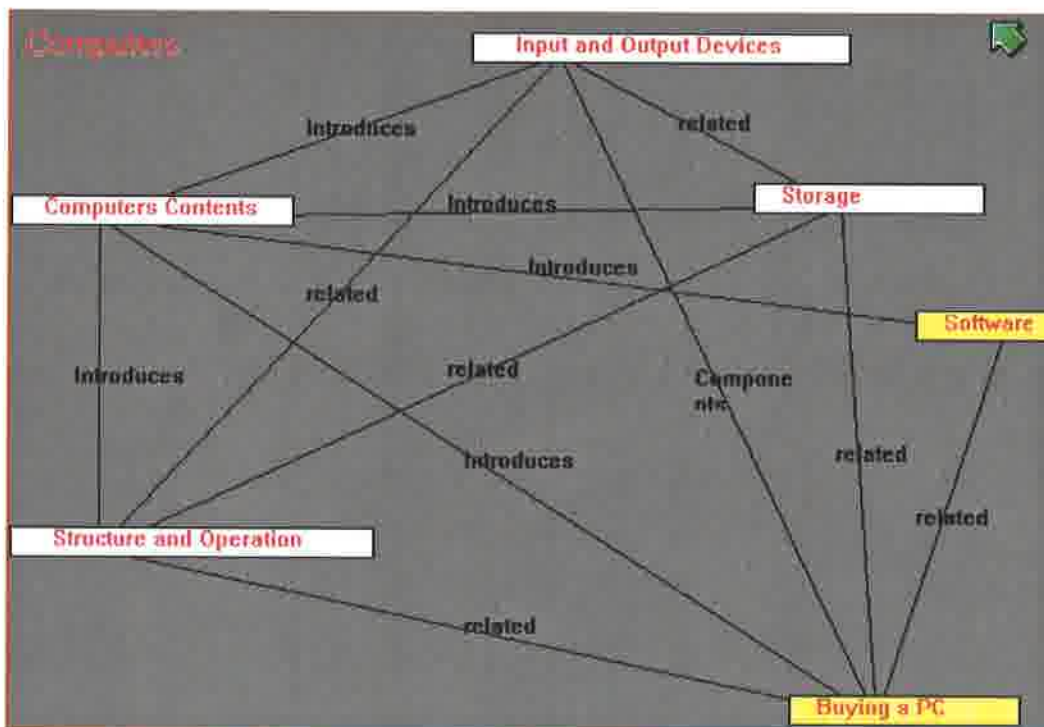
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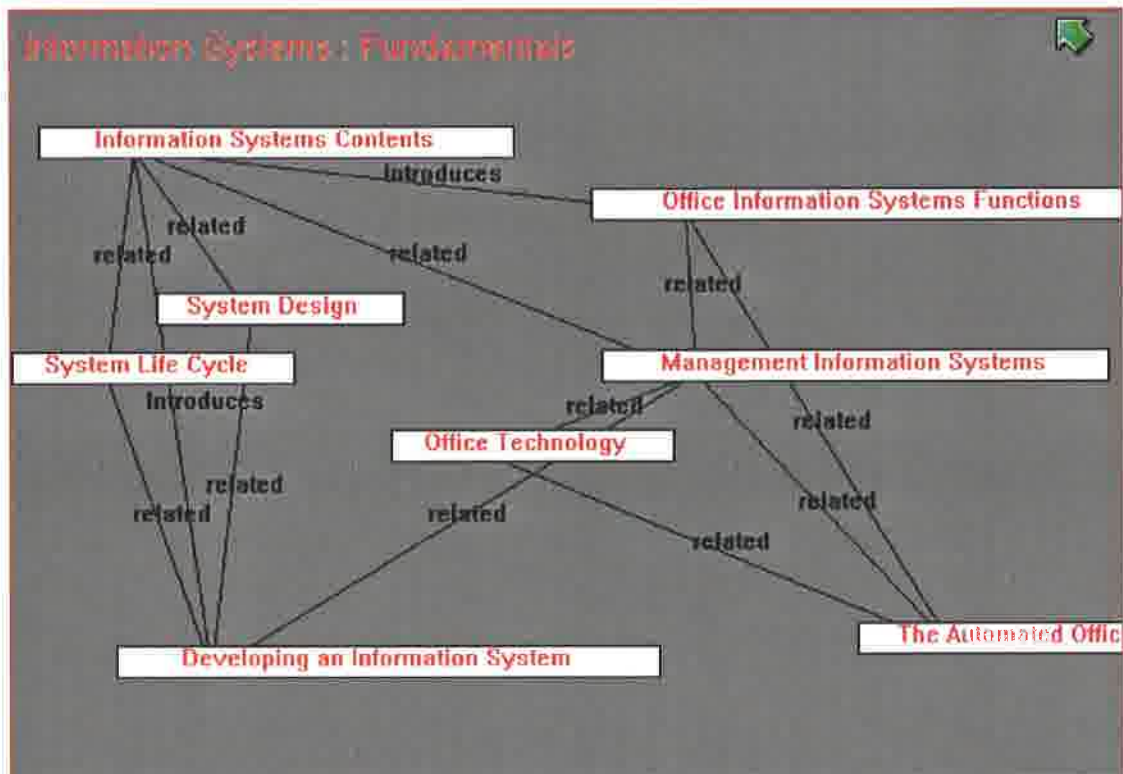
## Appendix S Concept maps of CLICK-IT®



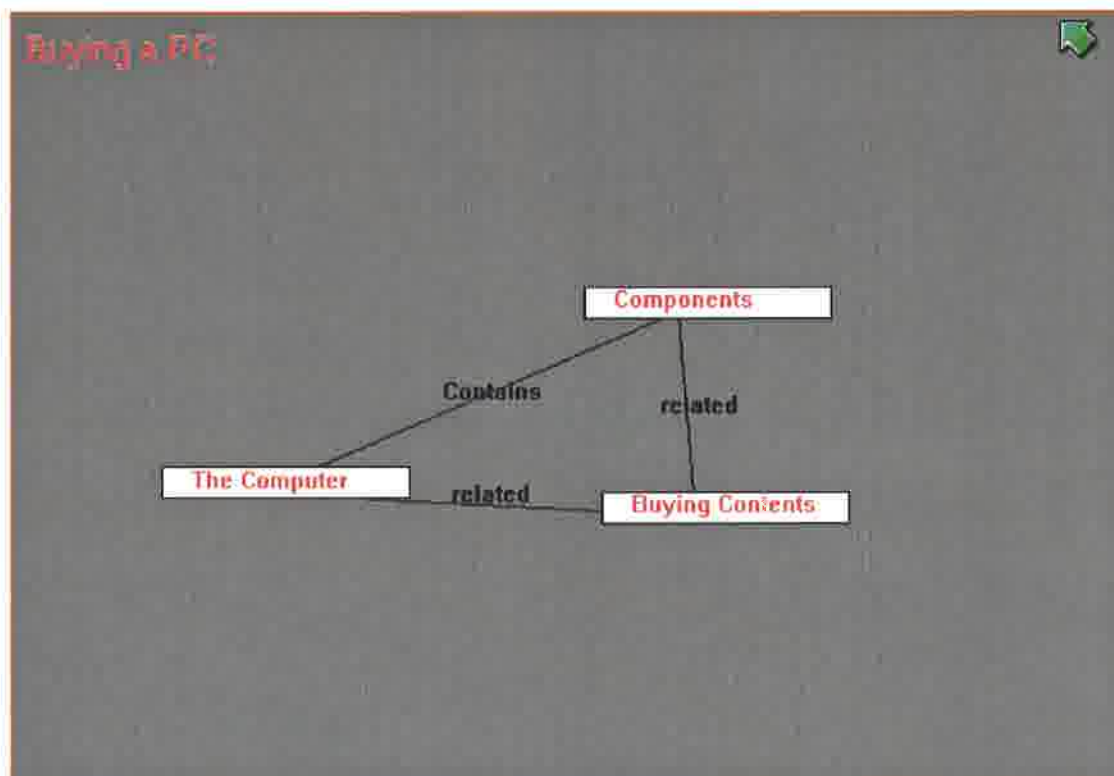
## Top level concept map of CLICK-IT®



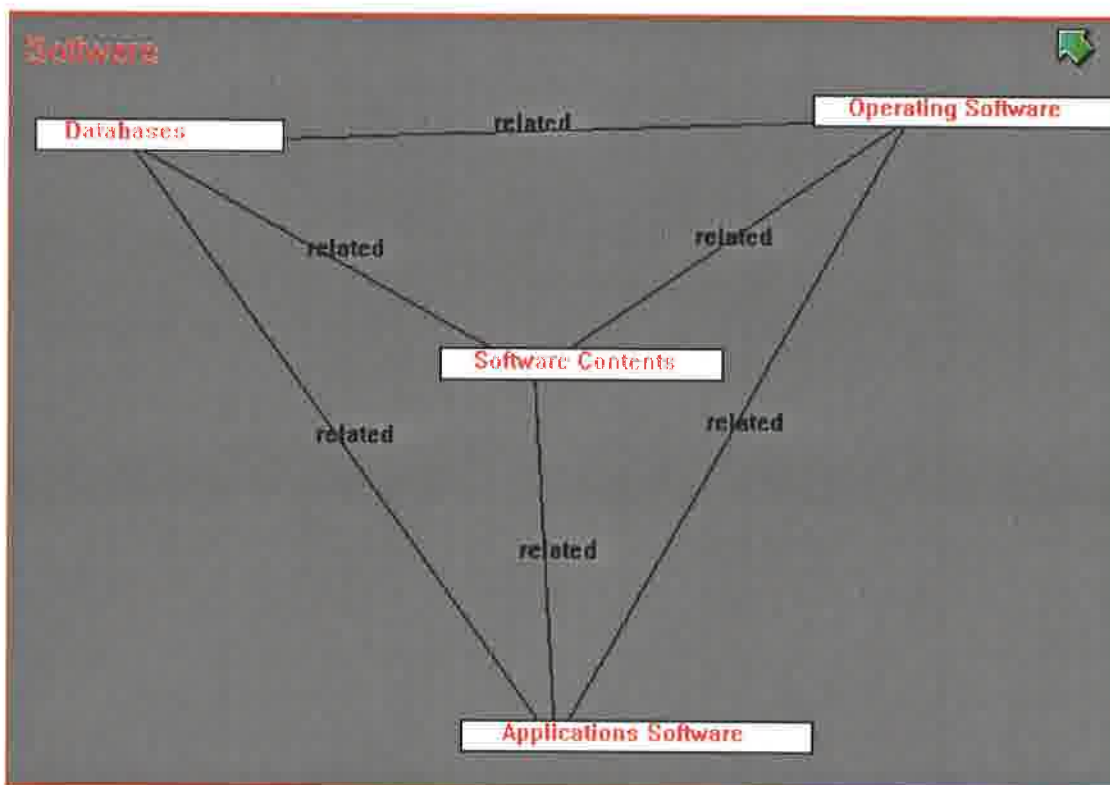
## Second Level Concept Map of CLICK-IT®



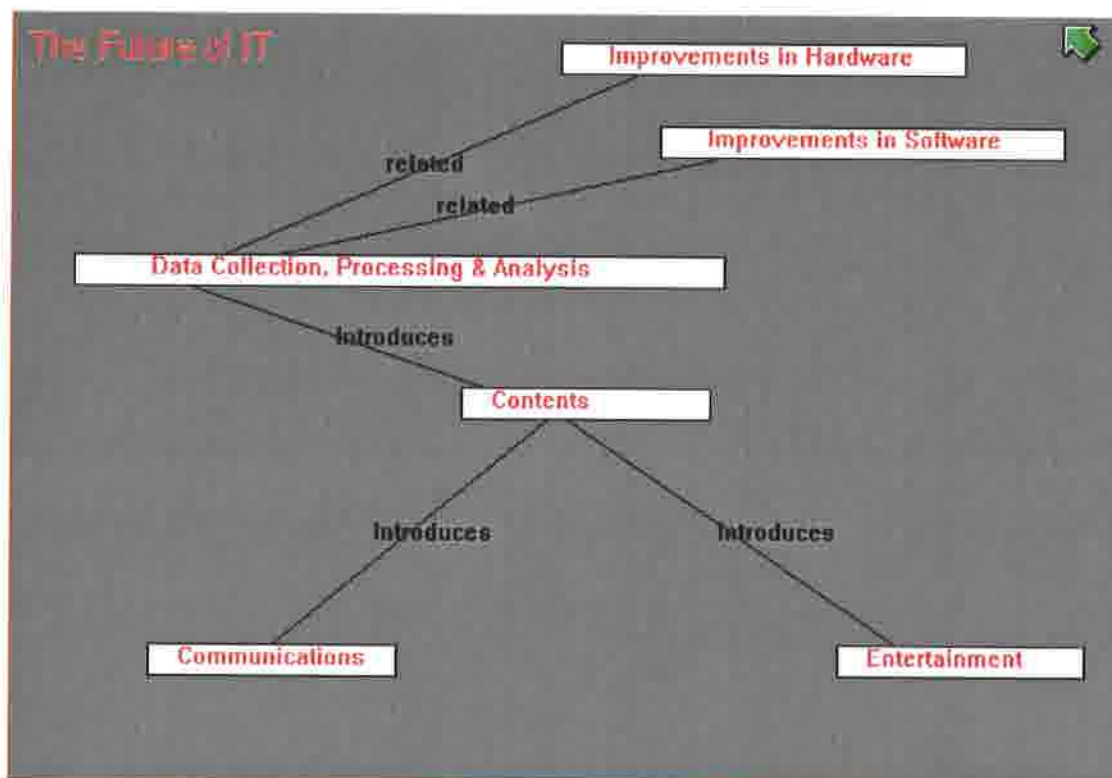
Second Level Concept Map of CLICK-IT® Information System Fundamentals



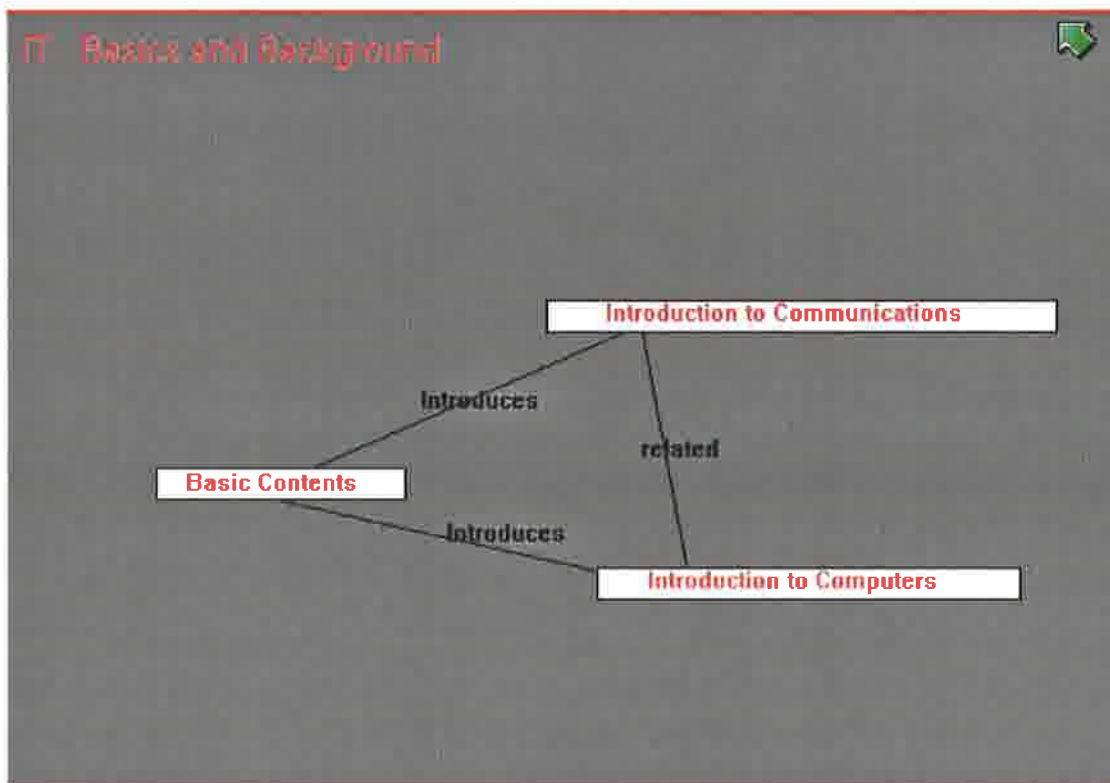
Third Level Concept Map of CLICK-IT® Buying a PC



Third Level Concept Map of CLICK-IT® Software



Second Level Concept Map of CLICK-IT® The Future of IT.



**Second Level Concept Map of CLICK-IT® Basics and Background**

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# Glossary

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**Glossary of Terms**

<b>Term</b>	<b>Meaning</b>
CSI	Abbreviation of Computer Skills Inventory, part of the Computer Skills Metric. (See appendix A for paper on CSI).
CSM	Abbreviation of Computer Skills Metric, a measure of Microsoft Windows 3.1 skill. (See appendix A for paper on CSM).
Discrete hypermedia	Hypermedia that is self contained and embodies all that is pertinent to a particular domain (like the history of church architecture) and purpose (like an encyclopedia) Applications that are distributed via CD are most likely examples of discrete hypermedia (like electronic books and encyclopedia).
Design metaphor	Design metaphor is the mechanism by which a HAP enables hypermedia to be produced. Typical metaphors include, music score, book, control flow diagram.
HAP	A Hypermedia Authoring Programs is a program designed to enable hypermedia to be produced. HAPs vary in how they enable hypermedia to be authored and the functionality that they can imbue in the resultant product.
HE	Abbreviation of Higher Education.
One-to-one Training Sessions	These are the individual sessions in which each subject has the task of learning and using the two HAPs.
Open hypermedia	Open hypermedia is an extended continuum of links and documents that have links to other extended hypermedia documents. The World Wide Web is an example of extended hypermedia in which links to material anywhere on the Web is permissible.
QDA	Abbreviation of Qualitative Data Analysis.



Second Generation Hypermedia	Hypermedia with significantly enhanced functionality. Basic hypermedia has simple hyperlinks second generation hypermedia can have computed links, searches and dynamically produced documents. Intelligence is another way of increasing functionality where some knowledge of the user is generated and acted upon.
Tools, Programs Packages	These terms are interchangeable in the context of this study. For authoring hypermedia the term Hypemedia Authoring Program is used. See HAP.