

## Association for Information Systems AIS Electronic Library (AISeL)

---

PACIS 1995 Proceedings

Pacific Asia Conference on Information Systems  
(PACIS)

---

December 1995

# Cognitive Mapping - A 'Hot Button' Approach to IT Strategy Development

Norman Smith  
*University of Abertay Dundee*

Fran Ackermann  
*Strathclyde University*

Follow this and additional works at: <http://aisel.aisnet.org/pacis1995>

---

### Recommended Citation

Smith, Norman and Ackermann, Fran, "Cognitive Mapping - A 'Hot Button' Approach to IT Strategy Development" (1995). *PACIS 1995 Proceedings*. 49.  
<http://aisel.aisnet.org/pacis1995/49>

This material is brought to you by the Pacific Asia Conference on Information Systems (PACIS) at AIS Electronic Library (AISeL). It has been accepted for inclusion in PACIS 1995 Proceedings by an authorized administrator of AIS Electronic Library (AISeL). For more information, please contact [elibrary@aisnet.org](mailto:elibrary@aisnet.org).

# COGNITIVE MAPPING - A 'HOT BUTTON' APPROACH TO IT STRATEGY DEVELOPMENT

**Norman M. Smith**  
Department of Mathematical & Computer Science  
University of Abertay Dundee

**Fran Ackermann**  
Department of Management Science  
Strathclyde Business School, Strathclyde University

*This paper describes a live action research project which is investigating the process of developing an IT strategy through the use of group support technology in particular, a cognitive mapping technique. Group support technology is used in this project to capture and analyse qualitative data, so often ignored in organisations' IT strategy development processes. This lack of cognisance of 'soft' issues may be a contributing factor for the failure of many organisational IS / IT strategies.*

*A strategy framework, incorporating a cognitive mapping technique, was developed and tested using a start-up centre as a pilot site. Considering employees views and experience as a valuable asset to an organisation, this framework harnesses these 'softer' issues and uses them to influence the development of an IS / IT strategy.*

*The paper focuses on the qualitative data gathering and analysis stages of the framework. The study itself involved adopting a holistic approach to an organisation's strategy formulation process.*

## Introduction

It is widely recognised that it is important to involve all decision-making staff in the initial stages of strategy determination. The nature of an organisation's multi-disciplinary approach to business necessitates the widening of information ownership. Mintzberg (1987), suggests that "the strategy development is not formal, objective or even 'rational'. Rather, it is a complex incremental process which emerges from the activities of organisational decision-making and is bound up with organisational culture and politics".

If we accept that strategy development is a complex incremental process determined by intangible issues such as culture and politics, why then is there so little attention given to the decision-makers and staff on whom the successful implementation depend. Strategy formulation is all too often, and possibly mistakenly, deemed solely to be within the senior management domain with minimal contribution sought from wider sources. Successful implementation of an organisations' strategy depends on communication of the long-term goals down through the ranks before it can be supported by operational activities. This familiar dichotomy between strategy formulation and its implementation is widely accepted. Disseminating strategic information through an organisation may well lead to distortion and misunderstanding. The effect may well be

a workforce unsure of its direction with little commitment to the strategy's success.

A partial solution to this complex problem may be the encouragement of experienced employees to participate and possibly influence the strategy formulation process. Participation by employees in the strategy formulation may well increase their level of commitment in its implementation and importantly it provides the opportunity for their views, attitudes and individual information requirements to be sought and considered.

The aim of the paper is to explain a method of group involvement within the strategy formulation process and a method of qualitative data gathering and analysis to provide a solution to the complex problem of IT strategy formulation. To date IT strategies have been confined mainly to the application of the hardware and software elements of the system, a possible cause of the inability of information technology to produce tangible benefits. Significant factors contributing to IT noted underperformance were summarised by Eason(1988) as:

- lack of attention to *softer organisational issues, culture & management style*
- lack of *end user participation*
- lack of *end user ownership* of systems
- lack of *guiding organisational & business strategies* (Eason 1988)

Recognising that it was mainly qualitative issues which were not being addressed by IT strategies, research was undertaken to incorporate these issues into the IT strategy formulation process. To support the research, a framework (Table 1) consisting of stages, activities and outcomes has been devised to facilitate partitioning and understanding of the strategy process. In particular, a cognitive mapping technique supported by a computer based Group Support System, Graphics COPE, was used to capture and analyse qualitative data to facilitate the formulation of an IT strategy. It is recognised however that before an IT strategy can be developed it is crucial that clear organisational information requirements should be identified and structured into an Information strategy. An IT strategy therefore emerges from the organisation's Information strategy.

Aiming to capture the softer organisational issues by means of group activity, several objectives were identified

to support the research project. The objectives of the pilot study were:

- to undertake workshops within an organisation in order to capture qualitative data which will support the Information strategy formulation process
- to develop a transferable framework to support the formulation process
- to increase the group dynamics in terms of improved decision-making
- to increase effectiveness and develop a more positive attitude to group meetings by providing an efficient communication forum

## 1. Problem definition

Although the use of Information Technology(IT) is apparent in almost all organisations today, there is concern that organisations are not using the available technology to its full potential. Several reasons may exist for IT's ineffectiveness in organisations. One reason may be that organisations are not matching the functionality of the technology with their business processes. Brown(1992) suggests that "the lack of an IT strategy within most organisations, or the poor formulation of such strategies, is seen as a very significant contributor to the current malaise".

If we accept that there are existing procedural problems with formulating IT strategies, how can they be identified and overcome. One possible cause for ineffectiveness has been suggested by Symons (1992) who said that "there is currently a gap in culture and language between the business and IT specialists which inhibits communication and understanding" implying that "this gap must be bridged if IT strategy is to be linked effectively with business strategy".

Other literature reinforces the qualitative nature of the problem where it is cited that "it is the 'softer' issues that are more poorly addressed in IT strategies" (Brady 1992) and developing IT strategies and indeed IT systems is essentially a human process rather than a technological one (Holtham, 1992). Having identified possible causes associated with IT strategy formulation, the research uses Group Support Technology and a cognitive mapping technique to address these issues aware that "it is possible to over-emphasise the importance of a strategic document, whilst what is really needed is a strategic planning process that filters through the organisation(Holtham, 1992).

## 2. Group Decision Support Systems

To facilitate this process of IT strategy formulation through group participation a Group Decision Support System(GDSS), based on the cognitive mapping technique, was used. "Experience suggests that clients do not expect to use a GDSS when the problem is well structured and when social relationships surrounding the problem are not important. They do use a GDSS when problems are

intractable" (Eden & Galer, 1990), as in the formulation of an organisations IT strategy.

Many Group Decision Support Systems are designed to work within a complex organisational environment and tackle complex strategic issues and are expected to reflect on the following: the nature of groups; the nature of group decision making as a process; the nature of decision making in organisations and the nature of support and intervention by a facilitator / software tool in relation to a group (Eden, 1992).

## 2.1 Cognitive Mapping - the technique

Cognitive Mapping may be used for a variety of purposes although it is generally a "problem" of some sort that forms the focus of the work. It is a technique used to structure, analyse and make sense of accounts of problems (Ackermann, Eden & Cropper, 1990)

Cognitive Mapping is based upon a specific view of cognition and is strongly influenced by Kelly's theory of personal constructs(1955) which considers people as problem solvers. It is a theory which has resulted in a modelling method which seeks to portray the way in which problem owners make sense of their situations (Eden, 1994).

Cognitive maps are of potential interest to managers because they are a means of graphically displaying their perceptions of the firm's strategic position and because they hold the promise of identifying alternative routes to improving that position (Fiol & Huff, 1992). This view reinforces earlier work on the usefulness of cognitive maps where it was suggested that "maps, with their emphasis on relationships among concepts, also have the potential of capturing the co-ordination of action that is central to definitions of strategy but is very difficult to capture with other methods" Huff(1990).

Cognitive Mapping using COPE software has been used extensively by project teams working with strategic issues (Eden, 1990) and has been used to facilitate more effective management of messy problems by management teams (Ackermann et al, 1991).

The aims of cognitive mapping are to provide:

- an instrument to help negotiation towards best solution
- a way of 'hearing several people at once' by setting the views of one person in the context of the ideas of others
- a method which is designed to suggest action to resolve issues
- a designed environment for ensuring effective decision making(Eden, 1988)

## 2.2 Graphics COPE - the tool

Graphics COPE is an ideas management software tool specially developed for manipulating qualitative data. It provides help with structuring problems or situations whether they be complex (requiring analysis to manage their complexity) or simple ideas(requiring further exploration and scrutiny) (Ackermann, Cropper & Eden, 1992).

Graphics COPE is a computer program which helps with the building and analysis of cognitive maps. A cognitive map is a method of modelling ideas by providing an easily understood representation. A Graphics COPE model is a collection of ideas and relationships connected in the form of a cognitive map, as illustrated in Fig 1. Ideas are expressed by short phrases and relationships are described by linking them in a causal manner. Causal links are interpreted as representing 'may lead to' or 'is explained by'. Thus, where the concept 'provide further training' is linked to 'increase knowledge of disability' it would be read as 'provide further training may lead to increase knowledge of disability'. Graphics COPE provides the facilitator / consultant with an array of analysis features providing the opportunity for exploring any emergent issues or organisational barriers identified in the maps.

### 3. Pilot Study Framework

A framework partitioning the phases of the strategy formulation was considered necessary both to aid understanding of the process and as a means of replicating the activities in a controlled sequence. The framework, illustrated in Table 1, identifies expected outcomes for each activity stage. To apply and test the appropriateness of the framework, a pilot site was required.

#### 3.1 Selection of a pilot site

The pilot site, is a new Centre in the process of developing an operational strategy. There were no pre-

existing staff relationships, or history. The challenge facing management at the selected site was that of developing an Information / IT strategy from scratch, to support its operational aims.

The diverse nature of backgrounds of staff made it essential that an information strategy was formulated, namely, to establish and maintain the team building process.

#### 3.2 Pilot site - The White Top Centre, Dundee

The White Top Centre is an innovative new centre providing day service and respite care for adults with profound and multiple disabilities.

The result of a unique collaboration, it aims to provide an integrated and holistic approach to service provision. An additional important aspect of the Centre is the research activity based within the Centre. The research link is maintained by close contact with the associated White Top Research Unit within the University of Dundee.

Resources for the Centre are excellent. Equipment is 'state of the art' including an in-house video recording and editing suite and a local area network. More like a North American University Affiliated Facility(UAF) than the usual adult resource centre, the WTC is breaking new ground in service provision for this client group. Contemporary methods of gathering qualitative data were sought to contribute to the overall formulation of strategy.

STAGE	ACTIVITY	OUTCOMES
Pre-workshop consultation	Senior Management Team	<ul style="list-style-type: none"> <li>Organisational Topics for consideration within workshops</li> </ul>
Qualitative data gathering workshops	Exploration of issues with participants at strategy workshops - Dominos	<ul style="list-style-type: none"> <li>Identification of key issues.</li> <li>Identification of key data requirements.</li> </ul>
Generation of Cognitive Maps	Identify staff groups 'hot buttons' Graphics COPE - mirroring of data gathered during domino sessions	<ul style="list-style-type: none"> <li>Identification of barriers to information flow</li> <li>Computer-based Map</li> </ul>
Globalisation of Cognitive Maps	Integrate, Compare, Merge & Filter contents of Cognitive maps	<ul style="list-style-type: none"> <li>Organisational Map</li> </ul>
Critical Analysis	Evaluation of issues and information	<ul style="list-style-type: none"> <li>Consensus regarding information represented by analysis of maps</li> <li>Ensure issues are not only operational but strategic</li> </ul>
Technology Gap Analysis	Current IT capability	<ul style="list-style-type: none"> <li>Shortfall between Information Requirements &amp; Technology</li> </ul>
Technology & Process Specification	IT requirements specification Procurement Tenders	<ul style="list-style-type: none"> <li>Prioritise</li> <li>Cost Analysis</li> <li>Training</li> <li>Communications</li> <li>Hardware / Software etc.</li> </ul>
Implementation	Tender selection	Matching Information Requirements with appropriate technology or processes
Evaluation	Review of Information Requirements	Confirmation of organisational progress

Table 1. Pilot Study Framework

## 4. Process of Knowledge Exploration & Elicitation

### 4.1 Pre-Workshop Consultation

Pre-workshop consultation involved discussions with the Centre Manager and Director concentrating on the selection of the topics of the forthcoming workshops. Consultation at this stage was vital as a means of identifying the clients' expectations of the process.

At this early stage of development, identification of staff beliefs and values was seen as desirable thereby highlighting to staff their common organisational goals. Of greater importance was the potential of the mapping technique to highlight where barriers to effective information transference may manifest. The desire to 'get it right' at an early stage was viewed as vital by Centre management. Topics for the workshops were discussed to elicit the relevant information needed to support the implementation of the IT and operational strategies. During these initial discussions it was emphasised that the process about to be undertaken would be of more than a single consultation, but rather a transference of knowledge to facilitate any strategy development. Thereby implying that the process of IT strategy development within the White Top Centre would be iterative.

To maintain the holistic approach encouraged by Centre management, as many staff as possible would be involved in the strategy development process. This involved approximately twenty staff representing their multi-disciplinary backgrounds.

### 4.2 - The Workshops - Qualitative Data Gathering

It was decided to run two separate workshops. The number of participants in each workshop were the same and both genders were equally represented. The constituents of each group represented staff from different functional areas within the Centre. This was essential as an integrated approach to service provision was one of the founding tenets of the new Centre.

### 4.3 Workshop layout

Workshop participants were seated in a horseshoe arrangement, facing and having access to a large white board. Each participant was provided with a black marker pen and a number of 'dominos' (Ackermann, 1991). Dominos are paper ellipses which are used by the participants to write down their views and opinions. The shape has been selected to allow overlapping and clustering. Using black marker pens by all participants ensures anonymity of the proponent of the idea. The dominos were large enough for 8-10 words thereby limiting participants to the expression of one idea at a time.

### 4.4 Workshop activity

The 'domino' process enables users to generate and capture a large number of views from group members in a relatively short period of time and unlike standard brainstorming techniques it facilitates the organisation of the data into a structured format thus providing added value to the group (Ackermann 1991). Each workshop commenced with a short introduction of its aims and an explanation of the significance of the 'dominos' and seating arrangement. The process of knowledge and information elicitation was explained, stressing that it was their opportunity to influence and inform the decision making process of the White Top Centre. Also emphasised was the anonymity of the data gathering process. This was considered necessary to encourage the elicitation of as many beliefs, opinions and values as possible, thereby encouraging high levels of participation.

The workshop sessions started with a question to the participants to elicit their views on the main aims of the Centre. The initial question which triggered the information gathering workshops was 'What are the objectives of the White Top Centre?'. It is important to initiate the workshops with a broadly focused question which is non-threatening and thus encourage participation in the process. When participants feel comfortable with this means of expression the workshop facilitator can then probe and question further in order to gain more in-depth and comprehensive information. The concept of 'hot buttons' was used during the idea generation workshops. 'Hot buttons' is a concept widely used in negotiation skills programmes and communication processes and is used as an information probing stratagem. The concept attempts to appeal to the participants interests, values etc. Used in selling, it attempts through communicative exploration to hit upon what is important to that individual to trigger interest and commitment and thereby further participation.

The completed dominos, each containing a phrase, were handed to the facilitator for sticking on the white board. During the workshop the facilitator continually encouraged exploration of the emerging issues and concepts. Throughout the workshop the dominos were structured into a hierarchical order. Structuring encouraged the strategic goals to be placed at the top with long term issues supporting the goals with several potential options feeding into these strategic issues.

The groups were also encouraged to cluster the concepts and then label them. Labelling of the clusters provided visual feedback to the group, thereby identifying common areas of importance. Approximately 80 dominos were attached to the wall with several clusters emerging but with several dominos remaining isolated. Further exploration of the isolated dominos would be required to determine if they were related to the others or indeed merely a spurious idea.

Throughout the exploration and elicitation process participants were encouraged to include imperatives in the phrasing on their dominos, to make the concepts more action orientated e.g. *provide training* rather than *training*.

It was vital to the process that the participants own vocabulary was retained on the dominos to ensure continuing data ownership. This workshop process was repeated for the second staff group.

### 5. Generation of Cognitive Models and Maps

The next stage of the process was undertaken off-site and consisted of mirroring the contents of the dominos from each workshop into a separate Graphics COPE model. At this point the COPE models did not represent a map but merely represented a collection of issues from two workshops. The separate COPE models were then joined removing repeated issues in the process, whilst retaining 'end user ownership' of the issues.

At this point neither the hand written dominos nor the Graphics COPE models represented a cognitive map. They merely represented a collection of accounts; values, beliefs and concepts from two groups. Multiple copies of the models were made available to the original participants.

The groups were sub-divided into two's or three's, and invited to identify and draw links between accounts. They were encouraged to establish and draw links between their own model and the other main group's model. Links established cause and effect of accounts. The paper-based annotated models were then used to update the Graphics COPE models. The models representing the views, beliefs and values of the White Top Centre staff had been formed into organisational causal maps, illustrated in Fig.1. During the workshops the maps had been organised into a hierarchical structure consisting of organisational aims leading down to potential actions.

### 6. Position Statement

Analysis of the cognitive maps was presented to the White Top Centre for discussion one week after the workshops had taken place. The purpose of the meeting was to provide group feedback - considered an important part of the strategy process. At this point the cognitive maps provided a vehicle for discussion. In fact they represented the agenda for the meetings. Discussion held with the workshop participants at this stage were used to identify the goals and long-term issues. The result of the meetings produced these outline organisational goals and strategic issues as perceived by the participants of the workshops:

#### 6.1 Goals identified included:

- Influence service provision both within and outwith the Centre
- Add to existing research knowledge in the field
- Enable clients to gain full potential - Improve quality of life
- Provide a model for other services

#### 6.2 Strategic Issues for further exploration and discussion were highlighted:

- Problems in team working due to too little or too much information
- Not believing some information received
- Information in the wrong format
- Information not readably accessible
- How to act as an information resource to other centres
- Provision of further training

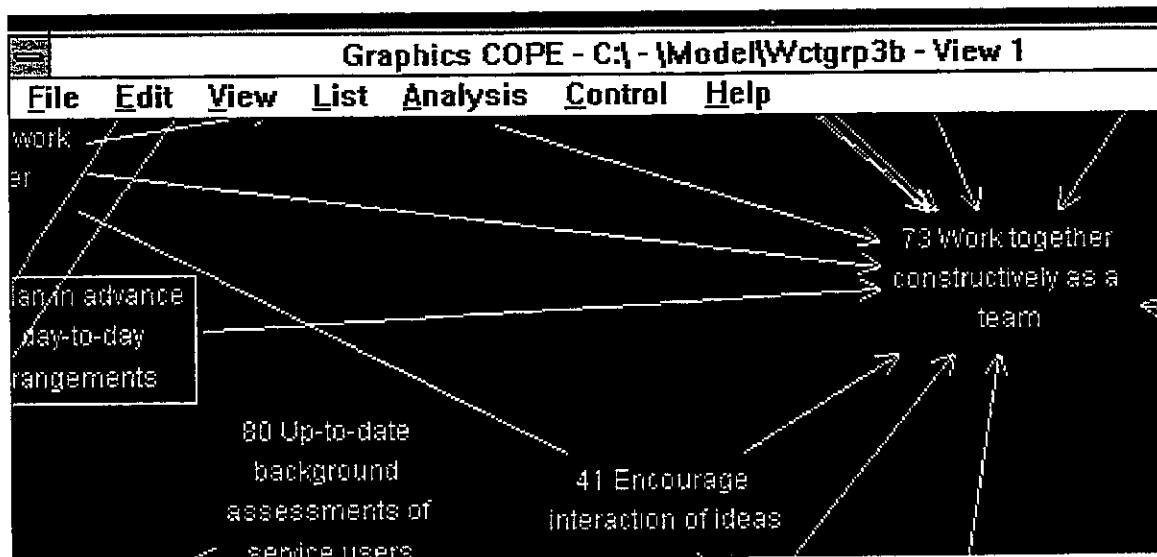


Fig.1 - Example of a Graphics COPE Map

Identification of predictable common goals emerged from the groups. This perhaps was not surprising as staff had all been recently recruited and the staff induction programme laying out the organisational aims / goals of the Centre had been repeated at regular intervals. The staff goals generated through the workshops converged accurately with the goals of the operational strategy. The strategic issues regarding information exchange within the Centre was of more significance to management.

Only after further exploration of the cognitive maps will the potential options be considered. Since the potential options are used to support the strategic issues and in turn the organisational goals it was deemed appropriate to pursue agreement on the top level of the hierarchy structure.

## 7. Reflections

The nature of this action research project is concerned with strategy formulation and implementation therefore a period of reflection is required to understand the emergent issues identified through the use of the GDSS intervention. Further exploration and refinement of the concepts is required to ensure that the client organisation obtain a *working* and actionable IT strategy, driven by their participatively gathered ideas, knowledge and experiences.

Throughout the project attention has been given to the softer issues concerning the pilot site. End user participation has remained high and through using 'dominos', cognitive mapping and an associated software tool; Graphics COPE, end user ownership of the information, concepts and accounts has been maintained.

The intention is to continue with the project by running further workshops to refine the cognitive maps and develop a working IT strategy.

### For further information contact,

Norman Smith  
 Department of Mathematical & Computer Sciences  
 University of Abertay Dundee  
 Bell Street, Dundee, DD1 1HG  
 Scotland, UK  
 Tel: UK 01382 308600, Fax: UK 01382 308607  
 E-mail: N.SMITH@ABERTAY-DUNDEE.AC.UK

## References

- Ackermann, F. 1991. Using Dominos-for Problem Solving, Department of Management Science, Strathclyde Business School
- Ackermann, F., Eden, C. & Cropper, S. 1990, 'Cognitive Mapping: A users guide', Working Paper 90/2, Department of Management Science, Strathclyde Business School
- Ackermann F., Cropper, S. & Eden, C. 1992. 'Graphics COPE Users Guide', Department of Management Science, University of Strathclyde
- Brady, T. et al. 1992. Strategic IT issues: the views of some major IT investors, *Journal of Strategic Information Systems*, Vol. 1 No 4 (Sept)
- Brown, A. 1992. *Creating a Business-based IT Strategy*, Chapman & Hall: London
- Eason K.D. 1988. Information Technology and Organisational Change, Taylor Francis, London
- Eden, C. 1988. Using Cognitive Mapping for Strategic Options Development and Analysis, in J.Rosenhead(Ed), *Participatory Methods for Handling Complexity*, Wiley, London
- Eden, C. 1992. On evaluating the performance of "Wide-Band" GDSS's, Working Paper 92/14, Strathclyde Business School
- Eden, C. 1994. Cognitive Mapping & Problem Structuring for Systems Dynamics Model Building, Working Paper, Department of Management Science, Strathclyde Business School
- Eden, C. 1990. Strategic Thinking with Computers, *Long Range Planning*, Vol. 23 No 6, pp 35-43, Pergamon Press
- Eden, C. and Galer, G. 1990. A Client Perspective, *Long Range Planning*, 23, 42-43
- Fiol, C.M. and Huff, A.S. (1992), Map for Managers: Where do we go from here?, *Journal of Management Studies*, Vol. 29 No 3 (May), 267-285
- Holtham, C. 1992. Creating & developing a practical IT strategy in *Creating a Business-based IT Strategy* (Ed) A. Brown, Chapman & Hall, London, 199-215
- Huff, A.S. 1992. Cognitive Mapping & Strategic Thought in *Mapping Strategic Thought*, John Wiley & Sons, Chichester
- Kelly, G.A. 1955. *The Psychology of Personal Constructs: a theory of personality*, Norton, New York
- Mintzberg, H. 1987. Crafting Strategy, *Harvard Business Review*, 65(4), 66-75