

**SWP 2/94 A METHODOLOGY FOR CREATING AND COMPARING
STRATEGIC CAUSAL MAPS**

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A METHODOLOGY FOR CREATING AND COMPARING STRATEGIC CAUSAL MAPS

This paper presents a methodology for eliciting the causal structures which managers use to make strategic sense of their world. Whilst such methodologies are established within the strategic management literature (*e.g.* Bougon *et al*, 1990), this approach focuses on the issue of mapping across multiple organisations. In this regard, it contributes to the debate on the application of such maps to strategic management research.

Traditionally strategic management research has focused on the content or the 'what' aspects of strategy and has done so from a rational economic perspective (*e.g.* Porter, 1985). More recently there has been increasing dissatisfaction with such rational, content based approaches. In particular, criticism has focused on a general lack of understanding of the process or the 'how' aspects of strategy and the limitations of assuming that managers are rational beings who all see and act within a defined, objective environment (Mintzberg, 1978; Weick, 1990).

Stubbart (1987) refers to cognitive science as providing the missing link between environmental conditions and strategic action. The cognitive perspective redirects attention away from the objective, 'out there' to the subjective way individuals see the world. Managerial cognition is the broad term applied to research which takes a cognitive approach to understand how individuals and organisations construe their environments. Such research has focused on issues such as selectivity and agenda setting (Kiesler & Sproull, 1982; Dutton *et al*, 1983), cognitive biases in strategy formulation (Schwenk, 1984; Duhaime & Schwenk, 1985; Fletcher & Huff, 1990), information processing (Walsh,

1988; Dutton *et al*, 1989), strategic learning (Argyris & Schon, 1978; Fiol & Lyles, 1985), competitive structure and positioning (Reger, 1988; Porac & Thomas, 1990; Daniels *et al*, 1993) and managerial attribution of performance (Salancik & Meindl, 1984; Huff & Schwenk, 1990; Clapham & Schwenk, 1991). These studies have afforded new insights into strategic processes and have provided empirical evidence supporting many of the 'non-rational' phenomena to which critics of traditional strategic management research have frequently referred.

A general term for the methodologies applied in cognitive studies of strategic management is cognitive mapping. This term has been attributed to the work of Tolman (1948) who proposed an alternative to the stimulus-response models of human behaviour based on the concept of field theory. Field theory asserts that individuals create fields or maps in order to understand and anticipate their environment. These ideas have been developed in the management context through the application of a number of cognitive theories which seek to explain how individuals make sense of their world.

Causal mapping is a subset of cognitive mapping and is concerned with representing cognition as a set of causal interactions. Causal mapping studies have been concerned with illuminating individual decision making (Axelrod, 1976b), exploring the idiosyncratic maps of individuals (Cosette & Audet, 1992), reflecting on organisational change (Narayanan & Fahey, 1990) and providing a mechanism for intervention in organisational issues (Eden, 1988).

This paper will revisit the theoretical basis for causal mapping, review the application of causal mapping in the management literature and critically discuss alternative approaches for creating causal maps. The

specific problems of mapping across multiple organisations will be reviewed and a methodology presented which is designed to overcome many of the problems which are experienced in undertaking this particular type of research.

Causal Mapping as a Basis for Representing Strategy

Huff (1990) suggests five families of maps which cover a variety of potential relationships (Figure 1). As can be seen from Figure 1 causality is represented by the third category, although it is also included in the higher levels of maps such as argument maps or schemata.

HUFF'S FIVE "FAMILIES" OF MAPS

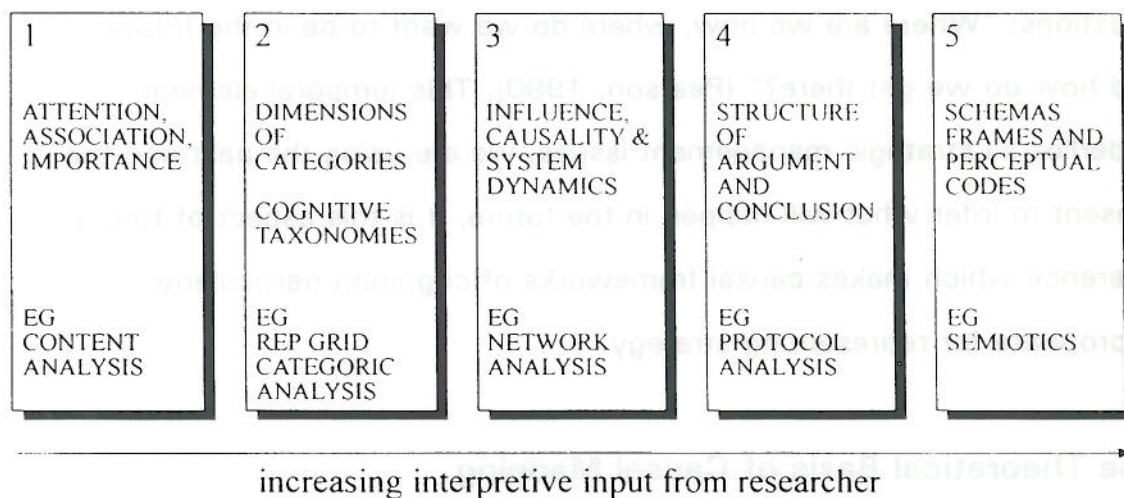


Figure 1: A Classification of Cognitive Maps (Huff, 1990)

Causality is one type of cognitive relationship, but one which has proved popular to those researching strategic management. The reason for this is partly evident from Huff's (1990) five families. In the context

of understanding decision making causality provides a potentially higher level of procedural knowledge (how it works or how to do it) than other sets of relationships, such as association, constructs or categories. In addition the output it creates is relatively robust and parsimonious, this is in contrast to the complex frameworks of argument maps and schemata which rely on high levels of interpretative input from the researcher in order to create the final map.

The application of causal mapping in the context of strategic management is a reflection on the nature of strategic decisions. Strategic decisions involve the manager with ambiguous, unique and complex issues (Dutton, *et al*, 1989), an implicit aspect of such decisions is their concern with future events. Strategic decisions are those which underpin long term direction, as illustrated through the often cited strategic questions; "Where are we now, where do we want to be in the future and how do we get there?" (Pearson, 1990). This temporal element underlies all strategic management issues, we are using the past and the present to infer what will happen in the future, it is this aspect of future inference which makes causal frameworks of cognition particularly appropriate for representing strategy.

The Theoretical Basis of Causal Mapping

The management literature on causal mapping is fragmentary in terms of identifying clear theoretical grounding for representing cognition as a causal structure. The published work can be divided into two groups. Firstly, that undertaken by Eden and colleagues (Eden *et al*, 1979; Eden, 1992; Eden *et al*, 1992) and work located in the area of consumer cognition (Reynolds & Gutman, 1984) which places Kelly's personal

construct theory (Kelly, 1955) as the underpinning theory. Whilst the work of Kelly provides a comprehensive basis for understanding sensemaking, there is no explicit causal platform within Kelly's theory. This has been provided by Hinkle (1965) who developed Kelly's research to look at the 'slot change' where an individual moves a stimuli along a construct due to changes along another construct *e.g.* to see the future as moving from fixed to uncertain (construct 1) may then change the type of planning horizon from long to short term (construct 2). Hinkle focuses on explaining a change in terms of its effect on the current construct repertory, as opposed to creating new concepts through their causal interaction, *i.e.* the constructs remain the focal aspect of cognition but are inter-linked through causal connections.

The second group is less cohesive and has not recognised one specific theory but a collection of related work. In the strategic management literature it is exemplified by citations from the work of Axelrod (1976a), for example; Bougon, *et al* (1977); Stubbart & Ramaprasad (1988); Cosette & Audet (1992). Axelrod's collection of work in the study of political elites (Axelrod, 1976a) is seminal in that it provides an unprecedented collection of research applying causal mapping concepts to study individual and group decision making.

However, Axelrod's work is largely applied rather than theoretical and draws on a number of sources for the theoretical basis of the methodology. The work of Maruyama (1963) is presented as a theoretical basis for much of the mapping undertaken by Axelrod and his colleagues. This work having been extended using directed graph theory (Harary *et al*, 1978) to allow complex computations to be made on the elicited maps. A concern with such an approach is that, whilst it offers analytical

credibility (Axelrod emphasises the added rigour of a mathematical system), it appears atheoretical in that these are theories of *analysis* rather than theories of *sensemaking*. Maruyama's (1963) research focused on causal maps related to population systems in order to explain population movement rather than individual sensemaking at a cognitive level. This is in marked contrast to the comprehensive underpinning, at an individual level, of personal construct theory (Kelly, 1955).

There is, however, a body of theory in cognitive psychology which does provide a more direct foundation for the causal mapping approaches which are currently being applied. Attribution theory has developed in the area of social psychology as a way of understanding interpersonal interactions and the interpretation of actions and events (see Fiske & Taylor [1984: 20-71] for an overview of the area). The work of Heider (1944, 1958) bares many similarities to that of Kelly (1955), in that he proposes a theory to explain how individuals interpret and predict their world, Heider uses the term 'common-sense psychology' where individuals relate their own actions through attribution and inference as to what their causes and effects may be. This 'naive analysis of action' provides a basis for representing sensemaking as a series of causal links between concepts. Heider's work has been developed by many social psychologists, but has lacked the complementary methodology which Kelly (1955) provided through his repertory grid. More recently researchers have applied Heider's theories and developed research frameworks for their implementation. Kelley (1983) provides some valuable observations on the possible nature of such causal structures including their temporal direction or emphasis, their extent, and their structure, a number of these concepts are already being applied in the analysis of causal maps (e.g. Eden, *et al*, 1992).

In a theoretical sense it is therefore posited, for the purposes of this discussion, that causal mapping has a body of theory, broadly termed attribution theory, which provides a basis for maps which focus on the causal linkages between concepts.

The Focus of Causal Mapping Studies

Causal maps are created to serve a wide variety of research questions and focus at many different levels of analysis. One approach to differentiating between studies using causal mapping approaches is the focus of their analysis. Causal mapping studies can be categorised as focusing on the internal dynamics of the maps, on changes in the maps over time or context, or on making comparisons across the maps of individuals or organisations.

Firstly, causal maps which are constructed for the purpose of examining their own internal dynamics (e.g. Maruyama, 1963; Roberts, 1976; Bougon & Komocar, 1990; Cosette & Audet, 1992). Such studies are often conducted for the purpose of explaining and developing the methodology and often involve quite elaborate levels of analysis to establish relationships within the maps. For example, Bougon *et al* (1977) found a significant relationship between the level of influence an individual felt they had over a concept and the number of causal inputs a concept received from other concepts within the map. This relationship has subsequently been supported by other studies (Porac, 1981 & Komocar, 1985).

The second type of study is concerned with changes in the causal maps over time or in differing contexts. Such studies are often

undertaken to establish the predictive qualities of causal maps. Narayanan & Fahey (1990) used documentary evidence to examine the decline of an organisation during the sixties and seventies. Huff & Schwenk (1990) looked at how maps varied between good times and bad for particular organisations. A focus on explaining the antecedents to particular events is evident in Axelrod's (1976a) collection of causal mapping research projects (*e.g.* Bonham & Shapiro, 1976; Axelrod, 1976b). In the case of one particular study (Bonham & Shapiro, 1976) the researchers actually found themselves in an unexpected situation where the predictive qualities of a map could be assessed. The map of a government adviser had been constructed from a simulated crisis, this was then followed by an actual crisis, whilst their original map was not able to completely anticipate the adviser's response, a number of important aspects would have been predicted by the earlier map.

In a less exact sense, Eden and colleagues have also considered the change in maps over time (Eden, 1988), in this case it is the improving utility of the maps in a consultancy situation. As the causal maps evolve they provide increasing explanation of complex problems and become increasingly adopted and utilised by the respondent group (Eden & Jones, 1980; Jones & Eden, 1981).

The third classification concerns studies which have attempted to make direct comparisons between differing causal maps at the individual, group or organisational level. Stubbart & Ramaprasad (1988) compared the maps of two executives within the US steel industry and found these to be highly idiosyncratic but with some overlapping concepts.

Researchers have also focused on managerial attribution of success and failure in order to make comparisons across industries (Bettman & Weitz,

1983) and between organisations with stable and erratic performance (Salancik & Meindl, 1984; Clapham & Schwenk, 1991). Langfield-Smith (1992) looked across a number of maps within an organisation and then attempted to define common concepts which represent the values of the organisation. Hart (1976; 1977) undertook two differing studies to compare the maps of policy makers. Ware (1978) undertook a comparison of the maps between two groups of students, identified as academically successful and unsuccessful, the purpose being to establish whether the causal maps could help explain the differences between these two groups.

Of the above categories, the third grouping, studies which directly compare maps appears to have found less widespread support than the other categories. In a review of twenty eight contemporary research studies only eight were concerned with the direct comparison of maps across individuals or organisations. This is perhaps surprising as much of the mainstream research on strategic management concerns making comparisons across organisations in order to determine the issues which may explain differences in strategic behaviour (*e.g.* Porter, 1985; Miles & Snow, 1978). It is suggested that a possible reason for this lack of application is the difficulty in finding methodologies which are able to both capture the true nature of causal cognition and permit an effective basis for comparative analysis. If research in managerial cognition, as represented through causal mapping, is to develop further in offering a new perspective on strategy, then the ability to effectively compare and contrast such maps is central to this development.

Established Causal Map Methodologies

The current published research applying causal map methodologies utilise a number of distinct methodologies. Four established approaches are reviewed, all of which focus on using primary data which is gathered either through an interview or a group discussion.

A number of causal mapping studies have been based on documentary, as opposed to interview, data. There are good practical reasons for this, such as the need for data spanning many years, recorded as it occurred, rather than as it was subsequently post rationalised (Schwenk, 1985). This discussion is concerned with techniques which use primary, as opposed to secondary data. Primary data collection offers greater flexibility in matching the data to the research question in that it is not reliant on the availability of a particular type of data, such as letters to shareholders (Huff & Schwenk, 1990). Primary data sources therefore provide a potentially more extensive research tool for strategy research (Eden *et al*, 1993).

These four approaches have been selected as they represent the dominant frameworks proposed for applying causal mapping methodologies. Whilst there are others (*e.g.* Langfield-Smith & Wirth, 1992; Markoczy & Goldberg, 1993), the following represent the more widely developed approaches. They are listed as follows: The Self-Q technique (Bougon, 1983); The Means-End Chain Method (Reynolds & Gutman, 1984); COPE based Cause Map (Eden *et al*, 1992) and Comparative Cause Mapping (Laukkanen, 1992).

The Self-Q technique (Bougon, 1983) is an interviewing process based on self-questioning by the respondent. It is a methodology which focuses on the elicitation, rather than the analysis side of the mapping activity. Originally Bougon's technique utilised four interviewing stages (Bougon, 1983) later to be reduced to three with the respondent completing some elements of the process away from the interviewer (Bougon *et al*, 1990). The stages involved the collection of the concepts (1), the verification of these concepts (2), the identification of the causal links between the concepts (3) and the verification of the map by feeding this back to the respondent (4). The advantages of such an approach are that, whilst it allows the respondent to elicit his or her idiosyncratic concepts in a relatively unstructured way, it does then impose structure through a ranking exercise to focus the respondent on the issues which are most relevant to the particular research question. The self questioning approach is said to minimise the possible bias which can be introduced by the interviewer, thereby optimising its reliability. It does however restrict the respondent in the third stage where causal connections are only made between the concepts which have been elicited in stages one and two, rather than allowing the causal inferences to generate new concepts. In the most recent form of this approach (Bougon *et al*, 1990) respondents use multi-coloured forms to complete the process, whilst there is little detail on the likely duration of the interview programme it is probable that this will run to at least three or four hours in total.

The Means-End Chain Method has been developed for eliciting and analysing consumer as opposed to managerial cognition. However this approach has been applied in a managerial context (Jolly *et al*, 1988) and introduces a number of new perspectives to the creation of causal maps. In common with Eden's work (1988) the means-end chain approach is

grounded in the work of Kelly (1955) as developed by Hinkle (1965). The triadic sort technique is applied to elicit data from the respondent. This is an approach which minimises interviewer influence over the respondent, however it can be time consuming and monotonous for the respondent depending on the number of elements being used. The triadic sort elicits constructs which are then ladderred (Reynolds & Gutman, 1988), a technique involving the interviewer establishing why the respondent prefers a particular pole of the construct. This data is then constructed into a matrix of all the constructs elicited which are then aggregated across respondents to produce an aggregate Hierarchical Value Map (Jolly *et al*, 1988).

The advantage of this approach is that it is relatively efficient in terms of the time commitment needed from the respondents. In the case of the management based study (Jolly *et al*, 1988) the mapping exercise lasted between 45 minutes and one hour. An area of concern is the approach to aggregation which involves constructing a map from all the individual connections made between concepts by all the respondents. In terms of cognitive theory the overall map may therefore be atheoretical in that it fails to represent any one individual's causal framework but is created by the aggregation of all the connections. For example, an aggregate map which shows A causing B which in turn causes C may be derived from half the respondents believing A causes B and half that B causes C but no single individual holds that resultant cognition that A causes B which then causes C.

In contrast to the alternatives discussed here the mapping approach put forward by Eden (1988) is designed to be used as an interactive tool assisting in clarifying problems and facilitating group solutions to complex

issues. The approach is grounded in personal construct theory as developed through Hinkle's implication grid (1965). In this particular context an important contribution is the highly accessible and analytically flexible, Graphics COPE. This analysis package allows the visual display and analysis of causal maps in a way which permits multiple analysis and assessment. Unlike the Self-Q technique the process for eliciting maps involves a relatively unstructured elicitation process thereby allowing concepts to be developed from causal links, as opposed to linking defined groups of concepts, *i.e.* the causal connections, as opposed to the constructs, become the focus of the mapping exercise.

Laukkanen's approach to causal mapping (Laukkanen, 1990 & 1992) is of particular interest in this context as it has been developed specifically for making comparisons across causal maps. In this regard it might be expected to offer a more focused and less time consuming elicitation procedure. However, this process involves a programme of three interviews with respondents each estimated to take three hours (*i.e.* nine hours per respondent). This is longer than many of the idiosyncratic studies applying techniques such as the Self-Q methodology (Bougon, *et al*, 1990). In addition Laukkanen's methodology does not appear to consider the possibilities of systematic bias, the researcher conducts the interviews and codes all the data which is incorporated in the subsequent maps. The process involves an unstructured interview (based around a pre-established protocol) which seeks to uncover the causal patterns the respondent uses to make sense of a situation. In this sense, the method has high content validity as the data is recorded in the form presented by the respondent who is relatively free to introduce the concepts which he or she feel are salient. The data reduction is then carried out *post hoc* by reducing the maps to a '*standardised natural language*' in order to allow

for subsequent analysis. The concern with such an approach is that at this vital stage there appears to be no attempt to ensure that the data is being transformed in a reliable way, as would be the case if this involved the content analysis of a document (Berelson, 1954). A further issue is that the focus of analysis is at the level of concepts and their links, *i.e.* the concept of profit can be effectively analysed across a group of respondents to evaluate its position in a cause and effect structure, rather than the focus of analysis being the maps of the respondents as individuals.

Having raised these issues it is important to acknowledge that Laukkanen's CMAP2 analysis (Laukkanen, 1992) provides an important contribution in addressing the complex issues of comparing such maps and introduces the notion that maps designed for the purpose of direct comparison will be significantly different from those designed for idiosyncratic reflection.

All of these approaches bring particular strengths and weaknesses to the researcher's dilemma of how to elicit and analyse causal maps for the purposes of comparison. The Means-End Framework (Reynolds & Gutman, 1984) offers a particularly focused interview protocol reducing the time needed to have access to the respondent. The Self-Q approach (Bougon, *et al*, 1990) provides a particularly rigorous and structured basis for ensuring that the maps are covering the key issues as reliably as possible. The COPE framework (Eden *et al*, 1992) offers a well founded methodology with a highly usable analysis package which allows for the detailed analysis of individual maps and the opportunity for fast interactive mapping. Laukkanen's comparative mapping (Laukkanen, 1992) provides a framework designed specifically for the comparison of

causal maps with an analysis packaging for examining concepts across a population of respondents.

Issues in Comparative Causal Mapping

In order to establish the optimal aspects of a particular causal mapping methodology for the purposes of comparative analysis a conceptual framework is proposed and outlined in Figure 2.

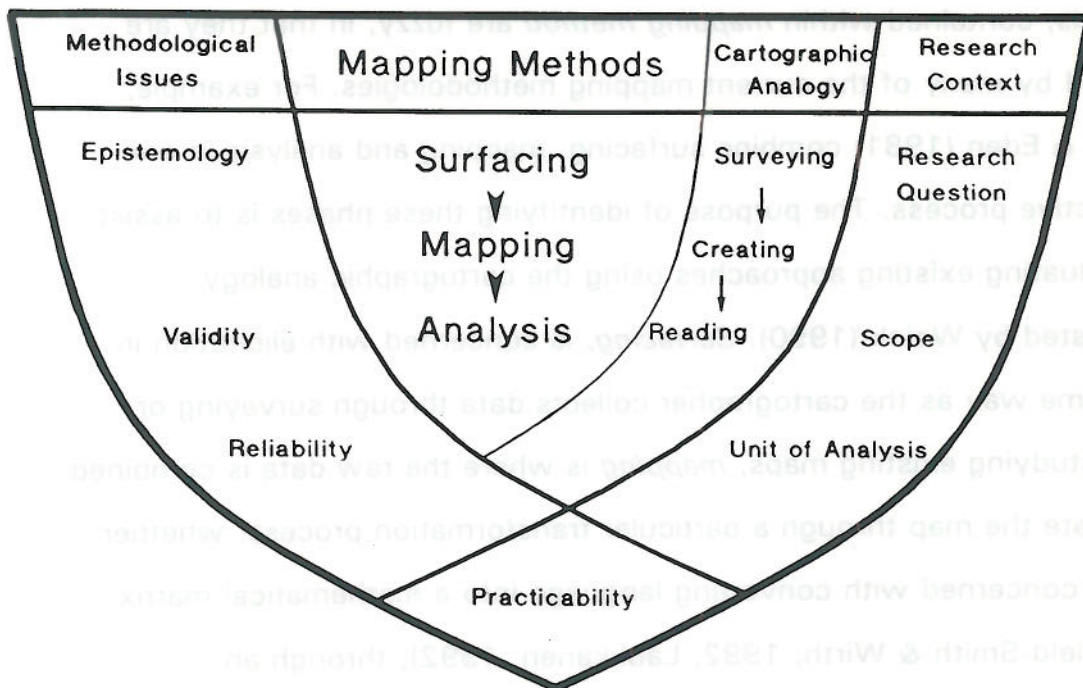


Figure 2: Conceptual Framework of Mapping Methodologies

The framework shown in Figure 2 is placed within the context of a methodology (causal mapping), the mapping method is nested between two key dimensions, *methodological issues* which are concerned with the soundness of the approach based on accepted research practice and theory, and the *research context* which considers the specific nature of the research study in question. These two dimensions overlap through

the concept of practicability which mediates either dimension's influence on the final selection of the mapping method, *i.e.* an optimal methodological solution may be too time consuming and complex for the research context and, similarly, the most appropriate approach for the context, such as a questionnaire which can be quickly completed by a number of managers, may be inadequate from a methodological perspective.

The distinctions between the three phases of surfacing, mapping and analysis, contained within *mapping method* are fuzzy, in that they are bridged by many of the current mapping methodologies. For example, Jones & Eden (1981) combine surfacing, mapping and analysis in one interactive process. The purpose of identifying these phases is to assist in evaluating existing approaches using the cartographic analogy suggested by Weick (1990). *Surfacing*, is concerned with elicitation in the same way as the cartographer collects data through surveying or from studying existing maps, *mapping* is where the raw data is combined to create the map through a particular transformation process, whether this is concerned with converting language into a mathematical matrix (Langfield-Smith & Wirth, 1992; Laukkanen, 1992), through an assessment by the respondent (Bougon *et al*, 1990) or through a structured coding process (Clapham & Schwenk, 1991). The final stage of *analysis* is where the map is actually read or interpreted, whether this be to provide further insights into the thoughts of an individual or group (Axelrod, 1976b; Cosette & Audet, 1992), to establish predictive qualities (Narayanan & Fahey, 1990) or to make comparative judgements between maps (Stubbart & Ramaprasad, 1988; Ware, 1978).

In order to develop methodologies which can enhance the process of comparing causal maps it is necessary to review some of the current methods in the context of the conceptual framework. Many of the elements within the framework have already been discussed, such as the epistemological status of causal mapping and the specific requirements of differing research contexts. This section will focus on three aspects of the framework which relate to concerns surfaced in the earlier review of mapping studies and methodologies. The methodological issues of validity, reliability and practicability are of particular relevance to studies which aim to compare across multiple causal maps.

Issues in Comparative Causal Mapping: Validity

The concept of validity is often expressed as a question: "*Are we measuring what we think we are measuring?*" Kerlinger (1973: 457). In the context of causal, or any other form of cognitive mapping this question is impossible to answer. Individual cognition is, at the present time, unknowable and such maps can only be an attempt to capture part of this structure through concepts and links. Kerlinger's question can be regarded as a positivistic view of validity, it assumes that there is a reality which can be established and measured in some way. Easterby-Smith *et al* define the phenomenological perspective of validity as follows; "*Has the researcher gained full access to the knowledge and meaning of informants?*" (1991: 41). This approach to validity is more appropriate to the causal mapping context and leads us to the question, have we allowed the respondent to respond in a way which is salient and meaningful to him or her? In reviewing the existing studies which have made comparisons between individual maps there are a number of concerns highlighted by this question:

Saliency versus Comparability: Many studies have noted that the comparative analysis of causal maps is problematic and essentially requires some level of trade off between saliency, capturing the variables and relationships which accurately reflect the cognition of the individual and comparability, ensuring that there is sufficient commonality between the maps to make meaningful comparisons. A common approach to this problem has been to use *a priori* variables where all the variables in the map are presented to the respondent who is then required to make the necessary causal links. This has been used in a number of studies (Bougon, *et al.* 1977; Roberts, 1977; Ware, 1978; Porac, 1981; Ford & Hegarty, 1984; Komocar, 1985) using various numbers of variables from a total of 5 (Porac, 1981) through 14 (Bougon *et al.*, 1977) to 25 (Komocar, 1985). The advantage of this approach is that the researchers can identify the total number of possible connections and are therefore working with a pre-defined matrix across all the maps.

Whilst there are obvious benefits in terms of analysis and reliability, the validity question is whether using these *a priori* variables captures individual views of the world or whether they force the respondent to work within a set of variables which are not central to their individual cognitions of a situation. Ford & Hegarty (1984), who used a fixed set of variables to compare MBA's with practising managers, consider that one of the reasons as to why their maps were relatively simple (in terms of lack of causal connections), was a lack of saliency for the respondents with the eight researcher defined variables. The danger with such an approach is that it potentially removes a key strength of mapping research; the ability to reflect the divergence of respondents reasoning which can detect new aspects of managerial thought not yet considered in the established literature (*e.g.* Reger, 1988).

Atomistic versus Holistic: A further characteristic of the *a priori* mapping studies is that they have tended to use paired comparisons for eliciting data from the respondents. This approach requires the respondent to make single causal links between the presented variables (A causes B, A does not cause C etc.). The concern is that when the respondents are providing data in this fashion, it can lead to a highly atomistic approach to constructing a cognitive map. Whilst this has a practical benefit, in ensuring that all possible permutations have been considered, it is inconsistent with Tolman's (1948) original concept of the cognitive map which describes pathways and landscapes as forming the map structure, *i.e.* the map is a gestalt or holistic set of connections which make up a coherent whole. The application of paired comparisons may potentially create maps which are atomistic and do not reflect the holistic view. In some studies this issue has been addressed by feeding back the structure to the respondent and asking them to amend the map to provide a more coherent representation of their views (*e.g.* Stubbart & Ramaprasad, 1988).

The issues raised in discussing the validity of comparative mapping methods all relate to the question, what are we actually comparing? Cognitive mapping is essentially a qualitative research approach, it is a way of eliciting meaning and promotes the understanding of how an individual makes sense of a situation. The notion of validity as capturing individual sensemaking is therefore pre-eminent in the design and undertaking of mapping research.

Issues in Comparative Causal Mapping: Reliability

As with the concept of validity, reliability can also be viewed from a number of perspectives. Many qualitative research perspectives consider that the concept of reliability is inappropriate to this paradigm (Taylor & Bogdan, 1984). However the general view is that reliability is concerned with replicability (Gummesson, 1991; Easterby-Smith *et al*, 1991), *i.e.* if the study is undertaken by another researcher using the same methodology with the same respondents, the results would be the same. Kerlinger (1973) provides a further dimension to this view concerning the distribution of error. In this definition the concept of reliability is concerned with ensuring that the distribution of error is as even as possible, *i.e.* that there is no systematic bias caused by individual preconceptions held by the interviewers, coders or other individuals which may effect the data.

In comparative mapping studies two differing approaches to the issue of reliability have emerged. The first is to present the respondent with a set of variables which they will then link with causal connections. This process of using *a priori* variables has been designed to alleviate reliability and analysis problems as the respondents make the connections explicitly themselves and thereby contain any bias within their own maps. The second approach is found in studies which are concerned with the use of documentary data. In this situation there is a need for *post hoc* coding which is approached with differing degrees of rigour in the published studies: Several widely cited studies noted the use of multiple coders but made no mention of levels of agreement or how disagreements were resolved (Stubbart & Ramaprasad, 1988; Bonham & Shapiro, 1976; Levi & Tetlock, 1980; Hart, 1977). Others made no

mention of any coding process, or what other steps may have been taken to ensure reliability (Roos & Hall, 1980; Hall, 1984; Cosette & Audet, 1992). In contrast, many did provide clear accounts of the coding strategy and how disagreements were handled (Huff & Schwenk, 1990; Narayanan & Fahey, 1990; Axelrod, 1976b; Bettman & Weitz, 1983) with one study going as far as separating out the outputs of two coders as they were not happy with their levels of agreement (Clapham & Schwenk, 1991).

In overall terms there is a lack of consistency as to how coding issues are dealt with and reported. This is of particular concern in the context of studies which are making comparisons across multiple individuals and or organisations. In these situations any form of systematic bias, distributed non-randomly, would have a profound effect on the output of the mapping process. This is likely to be situations where the surfacing and mapping process involves high levels of interviewer input in terms of the latitude available within the protocol, *i.e.* whether the interviews are highly structured or unstructured. Methodologies which allow latitude but do not address how the issue of reliability will be resolved must raise concerns as to how the cognitions of the researcher are separated from those of the respondent.

Issues in Comparative Causal Mapping: Practicability

Whilst all management researchers strive for maximising the validity and reliability of their research they are ultimately governed by the nature of the management context and the disposition of their respondents: "*...feasible research questions may be determined more by access possibilities than by theoretical considerations.*" (Easterby-Smith *et al*,

1991: 6). For mapping approaches to become more widely applied and therefore providing a mainstream of strategic management research, it is imperative that they are appropriate to the situation of the respondent.

Whilst many successful studies have used documentary evidence, with its attendant strengths and weaknesses, this can ultimately only provide a limited insight into organisational strategy due to the potentially wide range of research questions which need to be explored. The discussion on practicability focuses on the issues of getting and sustaining the co-operation of the respondents appropriate to a particular research question. Methodologies which allow the respondent to reflect their own views, in their own language, are likely to be more acceptable and therefore more successful in their application to management research.

Brown (1992) discusses the problems of rigorous methodologies which cause irritation and avoidance behaviour in the respondent. It is unacceptable in today's lean times for managers to spend up to nine hours with a researcher (as required by Laukkanen, 1992) unless there are very clear direct benefits from this use of time. Whilst such benefits and interest levels may exist in many research programmes, particularly those which involve in-depth studies, they are less likely to be evident in comparative studies which involve the elicitation of multiple maps to be compared across many organisations.

There appears to be a view that rigorous research needs to involve the respondent in lengthy interviews to capture the requisite richness of the cognitive map. However this is not necessarily so, for example, Daniels *et al* (1993) developed a card sort technique which produces

results which converge with the repertory grid technique but in a fraction of the time. It is perhaps surprising that, as this type of practicability is central to the success of management research, the issue of how acceptable methodologies are to managers themselves has not been more widely discussed in the management research literature. In a managerial context the most rigorous methodology in the world is meaningless if you cannot get managers to take part in the research.

This review has elicited a number of concerns over methodologies which have been applied to make comparisons across multiple causal maps. The methods currently available undoubtedly possess many strengths in terms of validity, reliability and practicability, the problem is that, dependent on the research context, these approaches do not always offer the optimal solution. The purpose of this paper is to suggest that a re-configuration of these particular methods may provide a framework which enhances access, maximises the validity of the respondent's data and which ensures that the maps created can be reliably compared and analysed on the basis of comparing individual or organisational maps.

Proposed Research Method for Creating and Comparing Strategic Causal Maps

The proposed methodology will be discussed using an example of a study undertaken by the author. The method will be described within the conceptual framework outlined in Figure 2.

Research Context

A research context is used which places particular demands on the practicability of the methodology. The *research question* is concerned with representing the growth strategies of small independent retailers as a strategic causal map in order to compare those who have an established growth record with those who have not. The *scope* of the research is limited to a local population of retailers with their outlets only existing within the Bedfordshire and Buckinghamshire Yellow Pages Area of the UK. The *unit of analysis* is a key individual, either the owner or dominant partner in the business.

Mapping Methods

This section will be discussed in conjunction with the methodological issues outlined in Figure 2.

Surfacing: The current approaches which are applied for eliciting primary data from the respondent are described by Eden *et al* (1992) as either structured (*e.g.* Bougon, 1983) or unstructured (*e.g.* Eden *et al*, 1992; Laukkanen, 1992).

Structured approaches involve providing the respondents with a list of variables which have been derived from the existing literature (Porac, 1981; Ford & Hegarty, 1984) or from a previous interview with the respondent (Bougon *et al*, 1990). In the case of these structured approaches these variables become the entire population of variables within the map, the quality of this elicitation is therefore central to the quality of the map. The nature of this process, and the variables, are

dependent on the nature of research context, if the concepts are likely to be more concrete and clearly discrete this would involve a more straightforward and less ambiguous process, *e.g.* in the case of research which has involved the mapping of competitors (Reger, 1988; Porac & Thomas, 1990), if the variables are less easily defined such as strategic issues or actions *e.g.* threats and opportunities (Jackson & Dutton, 1988) then the process of elicitation and delineation becomes more complex and problematic.

Unstructured approaches are, by definition, less easy to outline, but involve a number of elements. Laukkanen (1992) talks of establishing the atmospherics of the interview and picking out key themes which become the anchor for further interviews. Eden *et al* (1992) use an open discussion approach which involves either the derivation of the map as part of the discussion (*e.g.* Eden & Jones, 1980) or the subsequent coding of an open discussion (Ackermann *et al*, 1990). Whilst there are undoubted benefits with an entirely unstructured approach, particularly with regard to the saliency of the final map, they require consistency and skill on the part of the interviewer. The interviewer is required to develop the discussion without leading the respondent in a way which would bias the mapping process. This issue may not be of the same relevance in idiosyncratic or interactive mapping exercises, but its effects in the context of comparing different individuals maps must be of concern.

In order to overcome these difficulties a semi-structured approach is proposed which presents the respondent with a set of concepts designed to stimulate the discussion. These concepts have been elicited through a series of preliminary interviews with subjects holding the same characteristics as the respondent group, in the case of the example these

are local independent retailers. The benefits of this approach are that it provides the researcher with a framework for beginning the interview which is consistent across all the maps. In addition the researcher has obtained a set of concepts which are relevant and meaningful to the respondents without having to conduct preliminary interviews with them all.

In the example study the preliminary interviews found that subjects would talk of issues involved with growth as either actions (things they would do) or dimensions (ways of measuring and defining growth), the preliminary interviews elicited a list of twenty two actions and fourteen dimensions. The surfacing process would involve the respondent selecting those actions and dimensions which they considered relevant to their business situation (there is no limit as to how many could be selected).

Having selected their concepts these would be ranked in terms of importance and the laddering technique applied to explore the causal linkages from the concepts. The laddering technique is outlined in a number of studies (Reynolds & Gutman, 1984; 1988; Eden, 1988) and involves the interviewer asking the question *"why is this important to you"* the response providing an explanation as to the effect a particular concept has. For example; *"Opening new outlets (concept 1) is important because it means I spread my overheads more thinly (concept 2)"*. This process is continued until no further responses are forthcoming, the significance of this exercise is that as the ladder progresses the concepts will become more abstract and more value oriented (Gutman, 1982). The laddering is repeated until all the concepts selected by the respondent have been discussed.

The purpose of the structuring is to keep interviewer input and judgement, and thereby potential bias, to a minimum. It does however, retain the benefits of unstructured surfacing, the respondents are creating new concepts based on causal relationships starting from the supplied concepts, they are not limited to a set of concepts supplied by the researcher's interpretation of what is important to them, or from a review of the literature. It is however important to note that the interviewer should avoid a highly mechanistic approach to the laddering process and allow the respondent to discuss issues freely, returning, where appropriate to the laddering exercise. The danger is that if the interviewer applies too rigid an interpretation the discourse will become more like a structured questionnaire with the respondent providing single responses to the "why" question. In the context of mapping, a discussion which allows the respondent to express his or her view of the world must ultimately take precedence over a series of completed ladders.

This process is particularly time efficient and easy for the respondent to complete. In the example study the average interview was around forty minutes (as opposed to several hours in other methods) there is only one interview which makes it a realistic task to undertake a large number of maps for comparative purposes, in the example study thirty maps were surfaced through the work of one interviewer.

Mapping: The process of mapping involves the transformation of the surfaced data into the subsequent map. The methodological issues are that the map captures as much of the data which represents the individual's view as is possible (content validity) and does not introduce systematic error in doing this (reliability). It is the potential complexity and potential difficulties of this stage which cause many researchers to

use a more restricted approach in the surfacing phase, such as limiting the respondent to *a priori* variables. It is the author's view that causal mapping is concerned with capturing the richness and idiosyncrasies which other research approaches often attempt to remove. The price of this view is that the mapping stage is potentially time consuming and labour intensive, this is preferable to much of this activity being forced into the interview process with a subsequent effect on respondent access and motivation.

In the example study the data is in the form of interview transcripts, in order to transform these into comparable causal maps a coding process is undertaken based on the framework outlined by Wrightson (1976) as modified by Huff *et al* (1990). The basis of the coding protocol is that the transcript is transformed into a set of concepts which are interlinked by causal connections, it is important to note that the coding process mirrors the interview protocol in identifying holistic strings of concepts rather than single connections.

In the case of the example, a team of five coders were used to ensure that each transcript was coded three times. Whilst this approach introduces a stage which should not be under-estimated in terms of its demands on the research resources. It is a process which provides a realistic compromise between validity, which is maximised through the unstructured interview process and ensuring that the final maps reliably represent the individual respondent's cognitions and not those of the researcher.

A cut off point of majority agreement was taken for both concepts and causal links, *i.e.* at least two out of the three coders had to identify

the concept or the link for these to be included in the map. This process produced an overall level of agreement of 88% for the concepts included in the finalised maps. The issue remains as to what entails an acceptable level of inter-coder reliability? The freedom given to the coders (in order to avoid imposing a potentially biased framework) makes comparison problematic as other studies may have used finite categories and concepts to guide the coding process (e.g. Reger, 1988). Berelson (1954) found that inter-coder reliability levels ranged between 66% & 96% across thirty published content analysed studies with a mode around 90%. He noted that these studies tended to use simplistic approaches such as sorting a defined list of symbols into predefined categories and that reliability levels would vary significantly on the basis of research context:

"Reliability is higher under these conditions: the simpler the categories and the units, the more experienced and better trained the coders, and the more precise and complete the set of rules."

Berelson (1954: 514)

On the basis of these observations, this research involved open or free coding with relatively inexperienced coders, in addition the analysis was made on verbatim transcripts rather than the written text of many of the studies Berelson examined, these issues combined make a lower level of reliability more likely. An overall level of 88% is therefore highly acceptable on the basis that it is in line with the more simplistic studies reviewed by Berelson (1954).

The diagram illustrates the relationships between 15 variables, organized into two main sections separated by a vertical dashed line.

Left Section Variables:

- 13005 Refrigerate lorries and shops ...
- 13006 Extra expense too great ...
- 13012 Turnover ...
- 13013 Profit ...
- 13014 Can afford to refit premises ...
- 13015 Keep up to date ...

Right Section Variables:

- 13001 Family business ...
- 13002 Guarantee of Quality ...
- 13003 Know all the staff ...
- 13009 Know the customers ...
- 13010 Social role of the business ...
- 13011 Makes me happy ...
- 13016 Owner does the buying ...
- 13017 Increase number of outlets ...
- 13018 Control of the business ...

Relationships (Arrows):

- 13005 points to 13006.
- 13012 points to 13013.
- 13013 points to 13014.
- 13014 points to 13015.
- 13015 points to 13006.
- 13016 points to 13002.
- 13002 points to 13003.
- 13001 points to 13003.
- 13001 points to 13009.
- 13009 points to 13010.
- 13010 points to 13011.
- 13011 points to 13018.
- 13018 points to 13017.
- 13017 points to 13010.
- 13016 points to 13011.

As a first stage in the analysis, the elicited maps were analysed on the basis of their structural attributes. This approach is consistent with the view put forward by Weick & Bougon (1986) that maps should only be analysed on a structural basis as the descriptors themselves are only codes for underlying cognition, not the cognitions themselves. Whilst such a purist view is not shared by most researchers, this does indicate the potential robustness of structural analysis in comparing causal maps. Such analysis has recently been facilitated by the development of suitable software such as Graphics COPE (Ackermann, 1992). Eden *et al* (1992) provided a detailed review of how the structure of such maps can

be analysed, this would include the connectivity of the maps (number of nodes to causal links) and number of clusters, the example shown in Figure 3 contains two clusters as illustrated by the broken line. The shape of the map is also determined through the relationship between heads, or end points as shown in Figure 3 (e.g. 13011), tails or start points (e.g. 13001) and the length of the ladders in the map (e.g. 13001-13003-13011).

Unfortunately COPE does not permit the same level of cross analysis as is built in to Laukkanen's CMAP2 (Laukkanen, 1992), but transposing the Graphics COPE output to an analysis package such as SPSS PC+ allows for a relatively straightforward analysis to be undertaken.

In the second phase the analysis becomes content specific, firstly on the basis of grouping the concepts into categories. In the case of the example study the concepts were grouped into three classifications based on their role within the ladder. Gutman (1982) defines these as attributes, consequences and values. For example in Figure 3 concept 13017 "*Increase number of outlets*" is coded as an attribute or action; 13018 "*Control of the business*" is coded as a negative consequence of this action (i.e. if the respondent increases the number of outlets he/she would see this as losing control) and 13011 "*Makes me happy*" is coded as a value arising from this consequence. Other classifications which have been used are goals, key issues and options (Ackermann, 1992). This classification stage allows for a further perspective in the analysis and is naturally dependent on the research issues which are being explored.

The third analysis phase involves a more detailed assessment of the maps. In this instance by grouping the concepts in a more precise manner. In the case of the example study it involved grouping the concepts to explore hypotheses based on the relationship between concepts such as control and growth and the role of the customer. It should be emphasised that this was carried out keeping the idiosyncratic data of the maps intact. This was felt important to retain the focus of analysis on the respondent and to ensure that any assumptions on grouping were made explicitly rather than hidden behind a merging of terms to allow for easy comparison (e.g. Laukkanen, 1990). In the example presented in Figure 3 concept 13009 "*Know the customers*" was coded as a customer based concept and concepts 13002 & 13018 "*Guarantee of Quality*" and "*Control of the Business*" were coded as control based concepts.

Review and Discussion

This study has reviewed the existing causal mapping methodologies from the position of developing methods to compare maps across organisations and individuals. A number of concerns have been surfaced in terms of their suitability to become more widely applied in strategic management research. These are most notably concerns over validity, do they really capture the issues which are important to the respondents? Reliability, are they free from systematic bias imposed by the researcher or other individuals? Finally, practicability do they allow management researchers to build the sort of relationships they need with the management community through methodologies which are efficient and challenging rather than time consuming and irritating?

A methodological framework is suggested for the purpose of comparative strategic causal mapping, creating maps which will allow effective comparison across individuals or groups. This method uses a focused personal interview introducing concepts collected from preliminary interviews with other players in the same industry. The interview protocol is straightforward, requiring the minimum of interviewer input but with the emphasis on capturing the respondent's concepts in their own language. The interviews are comparatively short (40 minutes versus several hours) but capture the breadth of data necessary for effective comparative mapping.

The mapping process involves the use of multiple coders, whilst this is a significant requirement for any research study it means that the researcher can be far more confident about the reliability of the resulting maps. This is particularly relevant when the purpose of the method is to compare across different maps. The analysis of such maps is already well described by others (Eden *et al*, 1992) but it is important to recognise that this method results in simpler maps which can still be analysed in the same way as idiosyncratic maps but across individual maps. In the example study the average map contained 20 nodes as opposed to larger maps identified by Eden *et al* (1992) which can contain anywhere up to 2000 nodes.

As is clearly shown in the framework in Figure 2 all methodologies can only be judged by their relevance to the research question. This approach is therefore not being proposed to supersede the existing methods, all of which are highly appropriate in particular research contexts. The purpose, and ultimate test for this approach, is to make causal mapping more accessible and palatable in the context of

researching managers and to encourage its application as a way of comparing strategies across organisations or individuals. It is this wider application of causal mapping as a means of capturing and comparing strategic thought which will provide an indication of its real utility to the study of strategic management.

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