COGNITIVE MAPPING METHODOLOGIES FOR ENTREPRENEURIAL COGNITION RESEARCH

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ABSTRACT

Cognition is emerging as an important approach in understanding entrepreneurial outcomes (Baron, 2004a, Baron, 2004b, Mitchell et al., 2004, Mitchell et al., 2002a). The growing recognition of the cognitive perspective has led to calls for methodologies that address entrepreneurial cognition. In the entrepreneurial cognition literature, cognitive mapping methodologies are a popular approach for uncovering entrepreneurial cognition. However, these methods vary widely and have significant epistemological and ontological influences. The current paper examines cognitive mapping methodologies in light of the new theoretical developments in the entrepreneurial cognition literature and suggests a framework for matching cognitive mapping methodologies with entrepreneurial cognition research.

INTRODUCTION

Scholars in the field of entrepreneurial cognition agree that analysing entrepreneurs’ distinctive ways of thinking may address many of the issues central to the entrepreneurship phenomena (Mitchell et al., 2007, Baron, 2004b). The past few decades have seen an increasingly scholarly interest in cognitive mapping methods to study entrepreneurial ways of thinking, frequently borrowing and adapting these methodologies from more established disciplines such as management and organisation cognition (MOC) (Hodgkinson and Sparrow, 2002). The field has advanced to a point where it is useful to evaluate the existing cognitive mapping research methodology and examine whether they have kept pace with the development of the entrepreneurial cognition paradigm. This paper presents a theoretically driven framework for evaluating and matching cognitive mapping methodologies in entrepreneurial cognition research.

Cognitive mapping methodology is a family of procedures designed to elicit and systematically represent individual’s knowledge or beliefs. The array of analytical procedures available under the rubric of cognitive mapping are numerous and range in complexity. Reviews of the entrepreneurial cognition area (Mitchell et al., 2004, Forbes, 1999) highlight the importance and popularity of cognitive mapping methodologies as a research tool in the area. The diversity of techniques in cognitive mapping has led to studies that have examined diverse concepts such as schemas in opportunity recognition (Gaglio and Katz, 2001b), and Hill and Levenhagen’s (1995) mental models as metaphors for sense-making and sense-giving. Despite the widespread use of these methods, there is currently no consensus within the literature about the most appropriate ways in which to elicit individuals’ knowledge or beliefs (Hodgkinson et al., 2004). This raises the question on the most appropriate cognitive mapping methodologies for entrepreneurial cognition research and how to align theory, research questions, and research design.

Examining and evaluating the appropriateness of cognitive mapping methods for entrepreneurial cognition is warranted to advance the field through empirical evidence to ground further theoretical development. Robust consideration of cognitive mapping tools will also give more attention to the refinement of core concepts in the entrepreneurial cognition area. The consistent use of research tools to examine core concepts in the field will enable a common vocabulary to be developed. Entrepreneurial cognition has been defined as “knowledge structures that people use to make assessments, judgments or decisions involving opportunity evaluation and venture creation and growth” (Mitchell et al., 2002a). The field has moved beyond utilising concepts from other fields such
as cognitive science and has started to develop its own tools and cognitive agendas (Mitchell et al., 2007). These developments have included perceived connections and alertness (Kaish and Gilad, 1991, Kirzner, 1979), entrepreneurial expertise (Mitchell, 2003, Krueger, 2007), and effectuation (Sarasvathy, 2001). These different conceptualisations of entrepreneurial cognition require different methodological frameworks and approaches.

In an effort to evaluate cognitive mapping methods in light of the developments in the entrepreneurial cognition field, a framework incorporating the epistemological, ontological and methodological rigor of several cognitive mapping methods is described and evaluated. While reviews of cognitive mapping methods exist (Hodgkinson and Sparrow, 2002, Huff, 1990, Jenkins, 1998), these have often only considered methodological issues with regards to their ability to capture cognitions. This paper extends prior reviews of the cognitive mapping literature by examining and drawing links to key constructs in the entrepreneurial cognition literature. This paper integrates current methodological prescriptions in entrepreneurship research (Davidsson and Wiklund, 2001, Hindle, 2004) with the methodological requirements of entrepreneurial cognition. The first part of this paper will explore the current key cognitive concepts and discuss assumptions regarding knowledge and beliefs. The second part of this paper will then describe the major approaches to cognitive mapping methods and the key issues in evaluating them for research. To encourage advancement of useful methodologies for studying entrepreneurial cognitions, cognitive mapping methods are evaluated with regards to their appropriateness for entrepreneurial cognition research.

CURRENT DEVELOPMENTS IN ENTREPRENEURIAL COGNITION

Within the last decade, entrepreneurial cognition has become an important perspective in understanding entrepreneurs’ decision making and behaviours. Existing theories of entrepreneurship (Kirzner, 1979, Knight, 1921, Schumpeter, 1934, Shane and Venkatraman, 2000) suggests that the ways in which entrepreneurs perceive and interpret the environment is critical (Forbes, 1999). Baron (2004) highlight the importance of the cognitive perspective in helping address vital entrepreneurship issues such as why some people become entrepreneurs, why some people recognise opportunities but not others, and why some entrepreneurs are more successful than others? Mitchell et al (2007) further extend the focus of attention to the central research question of “how do entrepreneurs think?” (pp. 3). They argue that this central question allows advancement in the field by channelling “the research innovation energies” towards broader diffusion among the research community. By paying attention to the conceptual foundations and “focused thinking questions”, borrowed from the boundaries and exchange logic of contributing fields (Busenitz et al., 2003, Mitchell et al., 2007), successful theory and research about cognition and cognitive processes need to take into account the tenets of human agency (Mitchell et al., 2007). Approaches such as heuristics based logic (Tversky and Kahneman, 1982, Busenitz and Barney, 1997), perceptual processes/entrepreneurial alertness (Gaglio and Katz, 2001b, Krueger, 1993, McGrath and MacMillan, 1992), entrepreneurial information processing based expertise (Mitchell et al., 2000), and effectuation (Sarasvathy, 2001) remain to be explored in detail and perhaps extended in future studies. These conceptual approaches represent a movement towards consolidating the entrepreneurial cognition area and a move beyond the (entrepreneurship) field boundaries to the larger research community. By discussing the methodological appropriateness of cognitive mapping methods with the central research questions in entrepreneurial cognition, it is hoped the field can be advanced methodologically as well as conceptually.

Approaches in Entrepreneurial Cognition

We begin our discussion by reviewing briefly the current concepts in entrepreneurial cognition. This will then be mapped to the science and epistemology of cognitive mapping methods. The theoretical models that have arisen in the entrepreneurial cognition area point to a diversity of approaches examining the role of cognition in entrepreneurship (Baron, 2004a, Forbes, 1999, Mitchell et al., 2007, Mitchell et al., 2004). However the dominant (and prescribed) approaches are anchored in examining an entrepreneur’s perceptual and thinking processes around the context of the entrepreneur’s purpose of problem (Mitchell et al., 2007). Krueger (2007) specifically suggests that the deep seated beliefs and knowledge structures which guide the entrepreneur ultimately anchor entrepreneurial thinking and may be the key to their development as professional experts as entrepreneurs. Put simply, the move towards a more expert entrepreneurial mindset is through the cognitive development of deep belief structures inherent in individual agency. This central idea lends a harmonious match to cognitive mapping methods, primarily because cognitive mapping methods are...
rooted in uncovering the belief or knowledge structures of individuals and groups.

Early reviews of the entrepreneurial cognition area signify the boundaries for examination (Baron, 2004b, Forbes, 1999). Forbes (1999) suggests that cognition studies can be grouped under economic outcomes and the creation of the venture. The majority of research that Forbes (1999) reviews is concerned with the cognitive antecedents of organisation building and new venture creation. His review organises the literature according to an information processing perspective around entrepreneurial activities such as the stages of venture development (e.g., pre-founding, founding and post-founding stages). Much of the work in describing entrepreneurial cognition focuses on examining how entrepreneurs view the world or process information in the venture creation process (Baron, 2004a). This perspective underscores the importance of knowledge structures or mental models in organisation building. Baron (2004a) believes that cognitive research such as “prototype models of object or pattern recognition” and “schemas” may inform key concepts in the entrepreneurial literature such as opportunity recognition and alertness to opportunity. At the theoretical level, most studies have examined the role of these blueprints, beliefs and models in the creation of new ventures under conditions of high uncertainty and ambiguity (Stone and Brush, 1996, Knight, 1921, Busenitz and Barney, 1997), or focusing on the entrepreneurs decision making and thinking (Gartner, 1988, Gartner et al., 1994). For example, Busenitz and Barney (1996) posit that cognitions often precede entrepreneurial intent and that entrepreneurs have unique schemas regarding venture creation. Entrepreneurs make greater use of biases and heuristics, which allow for quicker information processing; cultural values, socio-economic factors and personal variables influence these cognitions. These heuristics and biases are based on schemas that emphasise opportunity and controllability. Shane (2000), in his study of technology-oriented new ventures, found that individuals prior knowledge about a market influences his or her choice of markets in which to exploit new technologies. Hill and Levenhagen (1995) focused on the use of metaphors and mental models by entrepreneurs. They argued that metaphors and models are often an effective way for entrepreneurs to capture those elements of the environment that they do not understand and to retain the flexibility to interpret those that they do know. It seems that the use of these metaphors and mental models speaks for the engagement of sense making and sense giving.

As definitions of entrepreneurship evolved, researchers turned to investigate more directly entrepreneur’s mental representations of complex entrepreneurship processes and agency in order to explore their nature and impact on a variety of entrepreneurial outcomes. Given the scope and nature of cognition, employing a research methodology for studying cognition in entrepreneurs is complicated and far from straightforward. Hodgkinson and Sparrow (2002) observed that given the cross-disciplinary nature of cognition, there is a problem of simplifying and agreeing upon a common language and definitions. Correspondingly, Meindl, Stubbart, & Porac (1994) noticed that over a short time period, the cognitive literature (and in particular, the MOC literature) employed a rich diversity of complex terms, each highly similar on the surface but which actually may have very different connotations within the respective fields from which they have ultimately originated (see Hodgkinson and Sparrow (2002) for a detailed discussion of the diverse conceptualisations and definitions used).

Despite this, the majority of terms used in the cognitive literature can be categorised under the designation of “knowledge structures”. As Walsh (1995) points out, “knowledge structures” found its way into modern psychology from clinical neurology (Oldfield and Zangwill, 1942, Woodworth, 1938, Head, 1920). At its heart, the study of cognitions developed out of a need to understand how human beings think and how this in turn affects all aspects of the human endeavour. Thus far, there have been significant advances in the development of key cognitive concepts for entrepreneurship which has helped to delineate the field. Within the field, approaches have centred on a social psychology perspective of person-situation-cognition -motivation gestalt-based configuration (Fiske and Taylor, 1984). However, this major approach to understanding entrepreneurial cognition specifies the importance of human agency in entrepreneurial endeavours in limited information context (Mitchell et al., 2007). With regards to this, several approaches in the mainstream literature specify the conditions through which cognitions become importance.

Some of the most promising entrepreneurial concepts include heuristics based logic (Busenitz and Barney, 1997), perceived connections and alertness (Kaish and Gilad, 1991), entrepreneurial expertise (Mitchell et al., 2000), effectuation (Sarasvathy, 2001), and entrepreneurial schemas and mental models (Hill and Levenhagen, 1995). These entrepreneurial cognition concepts and theories are by no means the only approaches, however, given the large scope of the entrepreneurial cognition
area, these represent the more common or popular approaches to examining entrepreneurial cognitions. While a detailed review of these approaches are beyond the scope of this paper (readers are directed to Baron (2004a); Mitchell et al (2004); and Mitchell et al, (2007) for a brief review of some of the major approaches to the entrepreneurial cognition array), a brief description of these approaches and their underlying assumptions for cognitive mapping will be discussed (see Table 1 for a brief overview of the major arguments).

Cognitive implications for cognitive mapping

Table 1 describes some of the major approaches to studying entrepreneurial cognitions. In this table a brief description of the concepts or theories are described and their cognitive assumptions are highlighted. This allows us to examine the suitability of cognitive mapping methods in examining these constructs. Five major requirements for cognitive mapping are linked to cognitive assumptions of these theories and concepts. These include the nature and structure of knowledge, levels of processing, planned control of behaviour, memory, and saliency.

The nature of knowledge highlight knowledge structures which are used to guide entrepreneurial behaviour. The nature of knowledge, while complicated and diverse in conceptualisation, is a central feature of human cognition and agency. Knowledge for example, can be conceptualised into procedural (“knowing how”) versus declarative knowledge (“knowing what”– (Anderson, 1985). This represents an important implication for cognitive mapping because cognitive mapping is elicitation of knowledge structures. Knowing how to do something (procedural knowledge) is seen as automatic and unconscious and may not be surfaced with cognitive mapping where elicitation of cognition is tied into the participants’ conscious (although sometimes incognisant) articulations or expressions. Entrepreneurial biases and heuristics, for example, are seen as cognitive shortcuts and thus, may be limited to the participants’ conscious articulations and rationales.

A related issue is the process of cognition. Levels of processing are an important aspect of interpreting and understanding an entrepreneur’s complex and dynamic environments. Processing in skill development can be applied as a cognitive analogy to entrepreneurial cognition concepts and theories. Fitts and Posner (1967) described three stages to the cognitive acquisition of skills. There is the cognitive phase (where the learner has to attend consciously to cues from the environment), the associative phase (where old skills are configured into new patterns of use) and the autonomous stage (where component parts of the skill become automatic). In the same way, these processes are related to the automatic versus controlled cognitive processing that occurs (Cohen et al., 1990, Shiffrin and Schneider, 1977). Controlled processes are limited in capacity and require conscious attention, while automatic processing is freer from capacity limitations and the need for attention. These levels of processing express the boundaries for capturing cognition through cognitive mapping. Cognitive biases and heuristics for example, may rely on automatic processes that would not be captured by cognitive mapping methods.

A final feature of levels of processing includes the notion of the depth of processing in encoding memory (Craik and Tulving, 1975). Craik and Tulving (1975) argued that memory is influenced by the depth of processing involved. The deeper the processing around the memory, the better that memory is preserved and encoded. The levels of processing include levels of conscious process, automaticity, and depth of processing.

The cognitions of entrepreneurs may be dependent on types of memory; cognitive constructs which are based on short or long term memory, or even implicit or explicit memory (Baddeley, 1990). One major implication regarding entrepreneurial cognition concepts and theories will be in its relationship to memory. Obviously, with regards to some cognitive mapping, participants rely on memory to articulate their cognitions retrospectively. This impacts on the extent to which cognitive mapping may be able to elicit the cognitive constructs under investigation.

The ability of entrepreneurs to plan and control their behaviours is influenced by their ability to think through or interpret their environments; in other words, their planned control of behaviour (Ajzen, 1991). Notions of planned control of behaviour involve anticipating and navigating through complex environments. The ability to plan and control actions is a central conceptualization in the cognition literature (Miller et al., 1960). The planned behaviour of individuals are either influenced by the environment in a straightforward manner or dependent on how the environment is represented by
the individual (Hampson and Morris, 1996). For entrepreneurial cognition concepts such as effectuation, our notions of the ability of individuals to mediate or plan their behaviour is an important consideration in assessing the suitability of cognitive mapping.

One last factor in examining the cognitive underpinnings of entrepreneurial cognition is saliency. This concerns the nature of cognition and is related to our understanding of cognitions and its epistemologies. Are the conceptions of cognitions as articulated by entrepreneurial cognitions concepts and theories salient (noticeable) to entrepreneurs (and of interest) to researchers? This is tied into issues of temporality and the context of the entrepreneurial cognition phenomena. Entrepreneurial cognition approaches such as effectuation express the role of the environment in affecting “effectuative thinking”. It is this embeddedness of cognitions into the contingent process of entrepreneurship and the environment that may hinder the ability of cognitive mapping methods to capture the phenomena of interest. Entrepreneurial cognition concepts such as entrepreneurial expertise signify iterative and internal processes that may be more conducive to cognitive mapping methods. The cognitive assumptions of entrepreneurial cognition concepts and theories may make them more or less suitable for cognitive mapping. However, in order to match the appropriate cognitive mapping methods, a complementary discussion of cognitive mapping is presented (with integration to the requisites presented above).

COGNITIVE MAPPING METHODOLOGIES FOR ASSESSING ENTREPRENEURIAL COGNITION

While the idea of knowledge structures (albeit in different forms and definitions) permeates most discussion of cognition in organisations, it also represents a subject of considerable debate for methodology (Spender, 1998, Eden and Ackermann, 1998, Huff, 1990). While causal mapping was initially used to access the belief systems of managers, within the last decade, the notion that individuals’ cognition and how these are shared in an organisation to guide their behaviours has gained wide acceptance between managers and researchers of management (Walsh, 1995, Eden, 1992). Forbes (1999), in an early review of the entrepreneurial cognition area, describes it as having a “critical mass” that establishes its significance and feasibility. He draws distinction between studies that have examined content of knowledge structures and cognitive process. This is a useful organisation of the empirical studies in the literature as it draws attention to the methods utilised. Cognitive mapping was found to be a significant methodological tool in the entrepreneurial cognition arsenal. However, while the use of cognitive mapping methodologies was common in the first two decades (in the 80s and 90s) of entrepreneurial cognition research, in recent years, their popularity to examine cognition in entrepreneurship research has decreased. This can be attributed to the variety of methods available (Baron and Ward, 2004, Hindle, 2004), but also to the establishment of and focus on the “boundaries and exchanges” of theory development (Mitchell et al., 2007, Busenitz et al., 2003).

Definitions and Conceptualisation: An Integration of Theoretical and Methodical Requisites

A wide range of theoretical frameworks, methodologies and analytical techniques have been labelled cognitive maps (Huff, 1990). Within the field of MOC the terms “mental map”, “cognitive map” and “cause map” are used. The distinctions between these terms are not always clear very much reflecting the different terminologies used in describing knowledge structures (Huff, 1990, Langfield-Smith and Wirth, 1992, Markoczy and Goldberg, 1993). While all refer to some form of knowledge structure, most have been used interchangeably. The cognitive map can be defined broadly as a device that may contain all possible types of relations occurring in patterns of concepts (Fiol and Huff, 1992, Bougon, 1983). The key distinction between a cognitive map and a cause map is what Huff (1990) describes as a cause map being somewhere in the middle between maps that deal with manifest content and maps that specify underlying cognitive structures. While a cognitive map is a broader generic concept that may contain graphical representations regarding information (Fiol and Huff, 1992, Bougon, 1983), the cause map is usually limited to causality relations whereby manifest content and the underlying cognitive structures are important (Huff, 1990, Laukkanen, 1990). Causal mapping is a subset of cognitive mapping and is concerned with representing cognition as a set of causal interactions.
<table>
<thead>
<tr>
<th>Entrepreneurial Concepts/Theories</th>
<th>Description</th>
<th>Nature of Knowledge</th>
<th>Levels of Processing</th>
<th>Planned Control of Behaviour</th>
<th>Memory</th>
<th>Saliency</th>
<th>Match with Cognitive Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heuristics based logic (Busenitz and Barney, 1997, Busenitz and Lau, 1996, Simon and Houghton, 2002)</td>
<td>Simplifying strategies that individuals use to make decisions. Decision shortcuts are used by different individuals and in differing situations</td>
<td>Procedural</td>
<td>Automatic</td>
<td>Environment/Perception</td>
<td>Implicit</td>
<td>Unnoticeable</td>
<td>Weak</td>
</tr>
<tr>
<td>Entrepreneurial expertise (Mitchell et al., 2000, Gustavsson, 2004, Mitchell et al., 2002b)</td>
<td>Entrepreneurs use expert information processing to make decisions. Entrepreneurs possess or develop unique knowledge structures and process information differently from non-entrepreneurs</td>
<td>Procedural/Declarative</td>
<td>Controlled</td>
<td>Perception</td>
<td>Explicit</td>
<td>Noticeable</td>
<td>Strong</td>
</tr>
<tr>
<td>Effectuation (Sarasvathy, 2001, Read and Sarasvathy, 2005, Sarasvathy, 2004)</td>
<td>Focus of entrepreneurs on selecting among the possible effects that can be created with an entrepreneurs' set of means and tools. Effectuation represents a special case of expertise that is embodied by the way they think and make sense of the entrepreneurial process</td>
<td>Procedural/Declarative</td>
<td>Controlled</td>
<td>Environment/Perception</td>
<td>Implicit/Explicit</td>
<td>Noticeable</td>
<td>Medium</td>
</tr>
<tr>
<td>Entrepreneurial Schemas and mental models (Ozgen and Baron, 2007, Krueger, 2007, Zahra et al., 2005, Hill and Levenhagen, 1995)</td>
<td>Entrepreneurs have mental models or schemas regarding aspects of the entrepreneurial process. Knowledge structures and causal links of the entrepreneurship process</td>
<td>Procedural/Declarative</td>
<td>Controlled</td>
<td>Perception</td>
<td>Explicit</td>
<td>Noticeable</td>
<td>Strong</td>
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</table>
A useful categorisation for cognitive mapping methods is described by Huff (1990) who suggests that cognitive maps cover a variety of relationships that can be categorised into five families. These are: maps that assess attention, association and importance of concepts, maps that show dimensions of categories and cognitive taxonomies, maps that show influence, causality and system dynamics, maps that show the structure of argument and conclusion, and maps that specify schemas, frames and perceptual codes. Maps that assess attention, association, and importance of concepts are typically general cognitive maps that emphasise emphasis and placement. These kinds of maps display frequency of the concepts and their relationships or differences. Maps that show dimensions of categories and cognitive taxonomies investigate complex relationships among concepts. These maps draw on dichotomised concepts and show hierarchical relationships among broad concepts and more specific categories. Maps that show influence, causality and system dynamics highlight relationships among cognitive elements. Cause maps allow investigators to focus on action. Maps that show the structure of argument and conclusion are increasingly complex in terms of its aims. These maps attempt to show the structure of the logic behind conclusions and decisions to act. Maps that specify schemas, frames, and perceptual codes examine the underlying mental framework or structure that affects all action and behaviour. This is a useful taxonomy for highlighting the theoretical basis for cognitive mapping methods. Dominant cognitive mapping techniques such as Decision Explorer (Eden, 1992), comparative cause mapping (Laukkanen, 1990), and repertory grid technique (Kelly, 1955, Fransella and Bannister, 1977) possess subtle yet important epistemological and ontological differences, with significant implications for the representation of cognition. This is underscored by Huff’s (1990) taxonomy of cognitive maps. Maps that assess attention, association and importance of concepts, have far reaching implications for the nature and types of knowledge represented than maps that show influence, causality and system dynamics. These epistemological concerns highlight the different theoretical basis for the methods that are used.

Bood (1998) argued that comparing cognitive mapping techniques can be systematic and useful for theoretical and methodological rationalisation. He argues for the inclusion of theoretical and methodical bases in comparing the utility of various cognitive mapping methods. Bood’s (1998) framework for comparing cognitive and causal mapping is useful in its ability to identify the advantages and disadvantages of each method including the nature and requirements of the cognitive or causal mapping. He organises the various comparative cognitive mapping techniques into aspects such as the data required, nature of the cognitive map, format of the cognitive map, nature of the comparisons of the cognitive maps, the captured type of knowledge, advantages and disadvantages of each methodology. This framework can be extended for the purpose of integrating the theoretical requisites of entrepreneurial cognition and the theoretical basis for methods.

Figure 1. The relationship between Theoretical and Methodical Requisites for Cognitive Mapping
Of the various elements that he advances, three elements are relevant for matching entrepreneurial concepts and theories to cognitive mapping methods. These methodical requisites are: the required data, nature of the cognitive map and the captured type of knowledge (Bood, 1998). The integration of theory and methods requisites can be seen in Figure 1. Required data represents the kinds of data required for the mapping of cognitions. This can be the required data to show cause and effect relations such as causal mapping methods (Hodgkinson et al., 2004), dissimilarity data such as repertory grid technique (Fransella and Bannister, 1977), or lines of argumentation (Ferguson and Hegarty, 1994). The nature of cognitive maps represents the uses for maps highlighted in the taxonomy presented by Huff (1990) such as concepts and relationships or the underlying dimensions of cognition such as categories and cognitive taxonomies. The last methodical requisite is the captured type of knowledge represents the nature of knowledge that is captured by the methods used. These could be concepts, the relationship between concepts, and the dimensions underlying cognition. The nature of cognitive maps highlight the different families of cognitive maps and the increasing need for interpretation from the researcher (and complexity of the maps) as cognitive mapping move from methods that elicit the objective to the abstract (Huff, 1990).

The theoretical bases for representing cognition (methodical requisites) can then be matched to the cognitive requisites for theory (theoretical requisites). The five requisites which highlight the cognitive implications such as the nature of knowledge, levels of processing, planned control of behaviour, memory and saliency all have implications for the theoretical basis of cognitive mapping. The nature of knowledge for example, impacts on the theoretical basis for cognitive mapping such as required data used, the nature of the maps and the captured type of knowledge, levels of processing will impact on the required data for mapping and the nature of the map, planned control of behaviour impacts on the nature of map, while memory will impact on the required data, and finally, saliency will impact on the required data and captured knowledge.

Utilisation of Integrated Framework

With respect to the above framework, the appropriate methodological approaches require an examination of a variety of factors in order to determine methodological fit. In order to determine the appropriate cognitive methods used to highlight the role of entrepreneurial cognition, a framework for comparing the utilities of the different cognitive mapping methodologies can be integrated into the matching of theoretical and methodical requisites. A variety of different cognitive and cause maps have been proposed in the literature to which cognitive mapping methods can be compared as to their utility and relevance (Hodgkinson et al., 2004, Eden et al., 1992).

Table 2 compares four popular cognitive mapping techniques in the literature and contrasts these with the methodical requisites and practical aspects for entrepreneurial cognition mapping. These include the comparative causal mapping by Laukannen (1990, 1992, 1998), Repertory Grid Methods (Reynolds and Gutman, 1984, Simpson and Wilson, 1999), Self-Q Method (Bougon, 1983) and the technique suggested by Eden (1998) and associated software, Decision Explorer.

Cognitive mapping as a research method has been described as a way of describing and understanding representations of models in which people navigate a system or some real domain. While it is often a description of unobservable human cognitive content and system, it nevertheless attempts to model the cognitions of people and the underlying mechanisms and structures that represent their thinking (Laukkanen, 1998). Cognitive maps such as the comparative causal mapping approach are thus describing the elements and patterns in which social actors like entrepreneurs think about some issue or phenomena. The underlying assumption here is that individual’s (or groups as may be the case in group cognitive mapping or comparative cognitive mapping) cognitions can be elicited and represented graphically.
<table>
<thead>
<tr>
<th>Methodical Requisites</th>
<th>Comparative Cause mapping with CMAP2</th>
<th>Repertory Grid Technique</th>
<th>Self-Q Method</th>
<th>Cognitive Mapping using Decision Explorer</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Required data</strong></td>
<td>Cause and effect relations, lines of argumentation</td>
<td>Dissimilarity data</td>
<td>Ranking data, cause and effect, lines of argumentation</td>
<td>Cause and effect relations, lines of argumentation</td>
</tr>
<tr>
<td><strong>Nature of cognitive map</strong></td>
<td>Concepts and relationships</td>
<td>Underlying dimensions</td>
<td>Concepts and relationships</td>
<td>Concepts and relationships</td>
</tr>
<tr>
<td><strong>Captured type of knowledge</strong></td>
<td>Dictionary, directory and recipe, Chang in linkages</td>
<td>Dictionary, Axiomatic, Different dimensions, Statistical difference</td>
<td>Dictionary, directory, recipe, Chang in concepts, Change in linkage</td>
<td>Dictionary, directory, and recipe, Chang in concepts, Change in linkage, Chang in centrality</td>
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</tbody>
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<tr>
<th>Practical Aspects</th>
<th>Advantage</th>
<th>Disadvantage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Advantage</strong></td>
<td>Comparison of content of maps</td>
<td>Comparison requires fixed pool of constructs</td>
</tr>
<tr>
<td><strong>Disadvantage</strong></td>
<td>Influence researcher on construction of map</td>
<td>Non-generation of new concepts after first generation of concepts</td>
</tr>
<tr>
<td></td>
<td>Systematic analysis and comparison</td>
<td>Systematic analysis and comparison, interactive construction of maps</td>
</tr>
<tr>
<td></td>
<td>Systematic analysis and comparison, interactive construction of maps</td>
<td>Interactive construction of cognitive map</td>
</tr>
<tr>
<td></td>
<td>Interactive construction of cognitive map</td>
<td>Comparison of content difficult</td>
</tr>
</tbody>
</table>
Laukannen (1990) for example has proposed a methodology for eliciting cause maps in combination with software to analyse systematically data gathered from interviews. Over several sessions (in general about three), interviews are conducted to obtain general and behavioural information regarding the domain of interest. The initial interview is then followed up in the next few to elicit concepts and causal beliefs around the anchor themes. Concepts and cause-effect relations between concepts are fed into the computer software (CMAP2) in order to obtain these cause maps. The various concepts used by the respondents and the causal assertions that relate to these concepts can be examined in detail as well as comparing other cognitive maps. The basis for comparisons of maps is the standardised concepts and the links between these concepts. The main advantages with this form of causal mapping are that it provides a comparability database for respondents on the main concepts and their linkages. A major disadvantage is the influence of the researcher on the construction of the cognitive maps.

Repertory Grid Methodology developed from personal construct psychology (Kelly, 1955). This method requires generation of elements, either by the respondents or by the researcher based on theoretical considerations. These elements are then subjected to the respondents classifying, ranking and comparing them pairwise. There is a huge repertoire of methods for comparing elements (Fransella and Bannister, 1977). Comparison of respondents on these elements have also been developed (Simpson and Wilson, 1999, Reynolds and Gutman, 1984). The method allows the use of quantitative statistical methods for analyses including multidimensional scaling (Bood, 1998). The advantages of this method are its ability to systematically analyse and compare responses on the pool of constructs generated to highlight their underlying features. The main disadvantage of this method is that comparisons and analysis of constructs are on the initially generated pool of constructs and does not allow new constructs to be compared or generated.

The Self-Q method developed by Bougon (1983) sets out a structured approach to interviewing research subject that and eliciting concepts in a systematic and organised way. This technique allows respondents to collect and verify concepts and examine their causal linkages. This self-questioning approach is designed to minimise biases from the interviewer and allow verification of the maps produced. This technique is an interviewing process that utilises a three stage approach in elicitation. The technique has been described as focusing on the elicitation rather than the analysis side of the mapping activity (Jenkins, 1998). The main advantage of this method is its ability to compare and analyse the mapping of constructs and elements with interaction from the respondents. The main disadvantage is its limited focus on an initial pool of constructs.

These four approaches to cognitive mapping and the methodological outlines highlight appropriate methods for different research contexts. However, as will be discussed, the most appropriate methods for entrepreneurial cognition will require a careful consideration of the theoretical requisites, research context, and methodological issues. Other cognitive mapping techniques can be evaluated with this framework (Langfield-Smith and Wirth, 1992, Markoczy and Goldberg, 1993, Eden and Ackermann, 1998). However, it is good to bear in mind that the taking into account the theoretical and methodical requisites will highlight the appropriateness of these methods for entrepreneurial cognition as some methods that are suitable for one area of cognition may be unsuitable for other areas (Eden and Ackermann, 1998).

By comparing the four cognitive mapping approaches on its methodical requisites and keeping in mind the ways in which the theoretical requisites impact on them, a picture can emerge about the appropriateness of these methods for the research context in studying entrepreneurial cognition. For example, the analysis of cognitive maps may require that researchers be aware of the contextual variables that dominate the methods for eliciting these maps. In particular, words, language, jargon and “shorthand” vocabulary of the interviewees may represent situated understandings. Other methodological criteria that emerge from this are that current measures of similarities and differences in cognitive maps that depend upon statistical analyses (such as comparative cause mapping or quantitative analyses of repertory grid techniques) may assume agreement about syntactical equivalence. The methodical requisites of a cognitive map in which meaning is derived will include interpretation of words that may be judged as synonymous with other words or phrases, or more significantly the context of the construct within the map. These methodical requisites derived from the theoretical requisites provides context to a construct and their meaning is derived from mapping these constructs and processes. The problems of comparing maps thus require a need for researchers to be clear about the status of the data they are using (Eden and Ackermann,
This is an important aspect for choosing a methodology that would incorporate suitable elements for unearthing entrepreneurial cognition.

By considering the required data, nature of cognitive map and captured knowledge, a researcher can also weigh up the impact of subjective researcher judgement (Barr et al., 1992), or the amount of information which can limit the true scope of entrepreneur’s thinking (Ford and Hegarty, 1984). The difficulties of subjective researcher judgment is perhaps more evident in the repertory grid technique when the choice of constructs may be supplied by researchers a priori rather than by the subjects. In addition, the elicitation process may not be designed to add to the number of constructs generated initially. Other methods such as comparative cause mapping approach the subject of researcher judgement by limiting the a priori judgments allowing several iterations of analysis of rich data that comes out from semi-structured interviews. This becomes an important consideration for the appropriateness of such cognitive mapping methods for entrepreneurial cognitions and is tied into the saliency of entrepreneurial cognition. However, in addition to considering this, issues of epistemology, reliability, validity and practicality need to be taken into account (Jenkins, 1998). This aspect of choosing cognitive mapping methods is better developed in the literature and will not be discussed here (Eden and Ackermann, 1998, Hodgkinson et al., 2004, Jenkins, 1998, Huff, 1990). Suffice to say, the integration of theoretical and methodical requisites of cognitive mapping methods allows a rationale to be developed about the right and appropriate cognitive mapping method to use. When combined with methodological rationales around epistemology, reliability, validity and practical issues in entrepreneurial cognition (Baron and Ward, 2004, Hindle, 2004), a robust framework for mapping entrepreneurial cognitions can be utilised.

CONCLUSION

In a special topic forum on the interplay between theory and method, Van Maanen and colleagues (2007) lament that despite the practical separation of theory and method for teaching purposes, theory and methods should be highly interrelated in practice. Though the relationship between theory and method is complicated and may cause critical arguments and debates, “theories without methodological implications are likely to be little more than idle speculation with minimal empirical import. And methods without theoretical substance can be sterile, representing technical sophistication in isolation” (pp. 1146). This balancing of the researchers’ ability to simultaneously be true to the power and elegance of ideas and demands of empirical reality remain a constant challenge to most fields. However, with regards to the entrepreneurial cognition field, specific development and theoretical consideration for cognitive mapping methods for the concepts and theories of the field will help move the field forward.

This paper extends the entrepreneurial cognition literature by creation of a rigorous and robust framework for using cognitive mapping methods in entrepreneurial cognition, supporting better methodological choices and robust knowledge diffusion. Cognitive mapping methods can be a powerful way to research cognitions in organizational and entrepreneurial settings. Cognitive mapping make it easy to study cognition in organizations and in individuals. Because the entrepreneurial process can be a very personal (and complicated) one, cognitive mapping can be a particularly useful research tool for cognition researchers. Cognitive mapping is flexible (it can examine individual or group levels, it can use quantitative or qualitative or a mixture of both data), and the variety of methods available allows fruitful investigation of many but not all entrepreneurial cognition phenomena.

Because cognitive mapping as a family of research tools is wide in its theoretical and practical advantages, it can be useful in developing theory and guiding empirical work. It not only can offer an insight into entrepreneurial cognitions but also allows exploration of their behaviours and agency. This is not only important for entrepreneurial cognition as a field of promise for entrepreneurship research but this allows further methodological advancements for cognitive mapping techniques which take into account motivation, emotion and affect, and other forces that impact on the entrepreneurial process (Mitchell et al., 2007).
REFERENCES


