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A Cognitive Mapping Approach to Business Models: Representing Causal Structures and Mechanisms

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Abstract

Research has highlighted the cognitive nature of the business model intended as a cognitive representation describing a business' value creation and value capture activities. Whereas the content of the business model has been extensively investigated from this perspective, less attention has been paid to the business model's causal structure – i.e. the pattern of cause-effect relations that, in top managers' or entrepreneurs' understandings, link value creation and value capture activities. Building on the strategic cognition literature, this paper argues that conceptualizing and analyzing business models as cognitive maps can shed light on four important properties of a business model's causal structure: the levels of complexity, focus, and clustering that characterize the causal structure; and the mechanisms underlying the causal links featured in that structure. I use examples of business models drawn from the literature as illustrations to describe these four properties. Finally, I discuss the value of a cognitive mapping approach for augmenting extant theories and practices of business model design.

Keywords: Business model; strategic cognition; cognitive map; causal reasoning.

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Introduction

> Strange to recall, Kodak was the Google of its day. Founded in 1880, it was known for its pioneering technology and innovative *marketing…By 1976 Kodak accounted* for 90% of film and 85% of camera sales in America. Until the 1990s it was regularly *rated one of world's five most valuable brands (*The Economist, 14 January, 2012).

A few days after the quote above was written, Kodak filed for bankruptcy, closing a glorious chapter in the history of the photographic industry. It has been widely acknowledged that a key reason for Kodak's sad demise was the inability of its top managers to envision a new business model, going beyond the razor-blade business model that had been so profitable in the film era but had been rendered obsolete by the advent of digital photography technologies (e.g. Gavetti et al., 2005; Munir, 2005). Perhaps less widely appreciated is the fact that Kodak's top managers had in front of them all the necessary elements to construct a new business model, but failed to see the connections between those elements. In fact, "Kodak's senior management certainly saw the advent of digital photography coming for more than 20 years" (Goldman, 2012). They had invested massively in digital technologies over two decades and had re-structured their organization accordingly, so that the firm was the first to invent digital cameras and sensors (Gavetti et al., 2005). However, Kodak's top managers did not connect their new organization and digital technologies with the new customer needs emerging "in an environment in which people do not 'preserve memories' but 'share experiences'" (Munir, 2006), and so the firm failed to profit from its own innovations. In other words, Kodak's top managers did not see "the cause-effect relationships between customers, the organization and money", which constitute the essence of what a business model is about (Baden-Fuller & Mangematin, 2013: 419; emphasis added).

Kodak's story demonstrates not only the key cognitive role of the business model in shaping top managers' attention, but also the fundamental importance of the 'causal structure*'* embedded in any business model – intended here as the pattern of cause-effect *relations that, in top managers or entrepreneurs' understandings, link a business model's* value creation and value capture activities. Recent research has emphasized that business models are cognitive devices representing and articulating a business' value creation and capture activities (e.g. Chesbrough & Rosenbloom, 2002; Doz & Kosonen, 2010; Baden-Fuller & Mangematin, 2013; Baden-Fuller & Haefliger, 2013). However, the majority of extant studies have focused on the content of business models – advancing different taxonomies (e.g. Kaplan & Sawhney, 2000; Osterwalder, Pigneur, & Tucci 2005) and

typologies (e.g. Wirtz, Schilke & Ullrich, 2010; Baden-Fuller & Mangematin, 2013) of business model components – but devoting less attention to conceptualizing the causal structures between those components. As a result, while these studies have greatly improved our understanding of business model elements over recent years, we still have limited knowledge about how top managers and entrepreneurs can identify the causal linkages connecting these elements. This is an important issue, because when top managers and entrepreneurs are unable to 'see' and analyze the - often hidden - causal connections embedded in their business model designs, their strategic choices are likely to be doomed to failure, as the Kodak story reveals.

In this paper, I address this issue by developing the idea that conceptualizing business models as cognitive maps allows an improved understanding and analysis of their underlying causal structures and mechanisms. In doing so, I respond to this special issue's call to advance knowledge about 'the cognitive nature of the business model' by outlining a cognitive mapping approach to business models and by integrating business model research with the strategic cognition literature on cognitive maps (e.g. Huff, 1990; Eden, Ackermann, Cropper, 1992). Generally, a cognitive map is a graphical representation of an individual's causal belief systems in specific domains (e.g. Axlerod, 1976; Nadkarni & Narayanan, 2005) and depicts their causal assertions (derived by texts or verbal communications) as a network graph made of nodes (concepts) and arrows (causal links between the concepts). In this paper, I conceptualize and discuss *business models' cognitive maps*, which depict an entrepreneur's or top manager's causal beliefs about the business model that they are designing. Adopting a business model design perspective, I focus on how cognitive maps can allow entrepreneurs and top managers (as well as academics studying them) to better see, understand, and analyze how the components of a business model are linked together via cause-effect relations. By representing a business model as a cognitive map, entrepreneurs and top managers can better appreciate otherwise implicit or hidden aspects of a business model's causal structure and probe further into the causal linkages embedded in that structure, thus improving their understanding of business model design. From this perspective, business models' cognitive maps are intended here as manipulable, dynamic, tools "that can be reasoned with…..that can be investigated to answer questions" (Baden-Fuller & Morgan, 2010: 163).

By leveraging the insights of numerous cognitive mapping studies in the strategic management literature (e.g. Barr, Stimpert & Huff, 1992; Calori, Johnson & Sarnin, 1994; Nadkarni & Narayanan, 2007; Nadkarni & Barr, 2008), I argue that conceptualizing business models as cognitive maps provides useful indications about four key properties of the causal

structures embedded in those models: 1) the complexity of causal structures; 2) their focus; 3) the degree to which they are clustered; 4) the mechanisms underlying the causal links in those structures. To illustrate these four properties, I focus in particular on Baden-Fuller and Mangematin's (2013) typology of business models, and use examples of business models drawn from the literature as illustrative vignettes. Finally, I highlight how the effective use of business models' cognitive maps as diagnostic tools for improving business model design requires careful interpretation and theory-based reasoning.

This paper makes two contributions to the literature. First, I contribute to the cognitive perspective on business models (e.g. Chesbrough & Rosenbloom, 2002; Doz & Kosonen, 2010; Baden-Fuller & Mangematin, 2013), complementing its focus on the content of business models by giving attention to the causal structures underlying these models. In particular, I illustrate how cognitive mapping can be a valuable theoretical and methodological approach to understanding the cause-effect relationships embedded in business models, showing how this approach allows the identification of four specific properties of the causal structure underlying the business model (complexity; focus; clustering; mechanisms). On the one hand, by doing so, I link and integrate the strategic cognition literature with business model research. This integration is useful given that these two research streams are both interested in investigating managerial cognitive structures, but have so far evolved independently with surprisingly limited dialogue between them. On the other hand, I complement the existing classifications of business model content (e.g. Baden-Fuller & Mangematin, 2013) by illustrating how such models can be classified not only on the basis of their content, but also on the basis of the different causal structures embedded in them. Second, I contribute to the strategic cognition literature by conceptualizing the business model as a distinctive cognitive structure that is worth investigation via cognitive maps, thus extending the repertoire of 'strategic cognitive structures' – i.e. top managers' belief systems about the environment, strategy and organization (e.g. Porac & Thomas, 2002) – so far examined in the literature. Particularly, the cognitive mapping approach outlined here elucidates that two features of the business model (i.e. the high degree of cognitive complexity and the strong emphasis on mechanisms) set this cognitive device apart from other cognate cognitive structures such as "strategy schemas" (Nadkarni & Narayanan, 2007).

The paper is structured in three main sections. First, I briefly review the existing studies that have analyzed the business model concept from the cognitive perspective. Second, I develop a cognitive mapping approach to business models. Third, I discuss the paper's

contributions to research and its implications for practice.

The Cognitive Perspective on Business Models

Over the last decade, the business model concept has attracted ever-increasing attention in strategy and entrepreneurship research (see Klang, Wallnofer & Hacklin, 2014; Zott, Amit & Massa, 2011 for recent reviews). Broadly speaking, two theoretical perspectives can be distinguished in business model research: 1) an activity-based perspective, conceptualizing the business model as a system of activities that firms use to create and capture value (e.g. Zott & Amit, 2010; Casadesus-Masanell & Ricart, 2010); and 2) a cognitive perspective, conceptualizing it as a cognitive instrument that represents those activities (e.g. Chesbrough & Rosenbloom, 2002; Baden-Fuller & Mangematin, 2013; Baden-Fuller & Haefliger, 2013). This latter perspective sees business models not as systems of activities in the real world, but rather as cognitive representations of those activity systems. Thus, these models can be said to 'exist' as mental representations in the minds of top managers and entrepreneurs who design them. These cognitive representations are typically encoded in the texts and discourses (e.g. Perkmann & Spicer, 2010) and the visual or physical objects (e.g. Doganova & Eyquem-Renault, 2009) that they use to articulate their business models.

These two theoretical perspectives are both important because they provide complementary insights. However, I focus in this paper on the cognitive perspective, aiming to contribute to this perspective by developing a cognitive mapping approach to business models' causal structures. Table 1 summarizes the definitions of the business model and its basic components offered by the major studies in the cognitive perspective.

Chesbrough and Rosenbloom (2002) are among the first to emphasize the cognitive nature of the business model, intended as "a focusing device that mediates between technology development and economic value creation" (p. 532). They include a variety of elements in their business model representations, ranging from the identification of market segments to the definition of the value proposition and the value chain (see Table 1). From a different theoretical perspective, Tikkanen et al. (2005) integrate evolutionary theory and managerial cognition, highlighting both material and cognitive aspects of the business model. The former aspects include a company's strategy, its business network and operations, and its finance and accounting activities, while the latter - cognitive - aspects include "the meanings and meaning structures which actors maintain about the [tangible] components of the business model" (p. 791). In a similar fashion, Doz and Kosonen (2010) distinguish between

Table 1 – Studies of Business Models from a Cognitive Perspective

Papers	Definition of Business Model	Components of Business Models (Business Model Content)
Chesbrough & Rosenbloom (2002)	The business model is "the heuristic logic that connects technical potential with the realization of economic value" (p. 529).	• Identification of market segment • Articulation of the value proposition • Definition of the value chain • Estimation of cost structure and profit potential • Description of the firm's position in the value network • Formulation of the competitive strategy
Tikkanen et al. (2005)	A business model "can be conceptualized as the sum of material, objectively existing structures and processes as well as intangible, cognitive meaning structures at the level of a business organization" (p. 790).	Material aspects of business models: • a company's strategy • business network • operation • finance and accounting Cognitive aspects of business models: • the systemic meaning structures or the belief system of a company. The belief system is seen as the driver of decision making and, subsequently, action (p. 790).
Baden-Fuller & Morgan (2010)	Business models are models –i.e. manipulable instruments that enable the model users to construct and discover knowledge about the world (cf. p. 163).	Not specified
Doz & Kosonen (2010)	Objectively, business models are "sets of structured and interdependent operational relationships between a firm and its customers, suppliers, complementors, partners and other stakeholders, and among its internal units and departments (functions, staff, operating units, etc.)" (p.371). Subjectively, business models are "a subjective representation of these mechanisms, delineating how it believes the firm relates to its environment" (p.371).	Objective elements of business models: • sets of structured and interdependent operational relationships between a firm and its customers, suppliers, complementors, partners and other stakeholders, and among its internal units and departments Subjective elements of business models: • cognitive representation of these mechanisms, delineating how it believes the firm relates to its environment.
Teece (2010)	A business model "reflects management's hypothesis about what customers want, how they want it, and how the enterprise can organize to best meet those needs, get paid for doing so, and make a profit. (p. 172).	• Value creation mechanisms • Value delivery mechanisms • Value capture mechanisms (monetization)
Baden-Fuller & Mangematin (2013)	A business model is a cognitive configuration "connecting customer needs, organizing delivery and monetization" (p. 422).	• customer identification • customer engagement (or value proposition) • monetization • value chain.
Baden-Fuller & Haefliger (2013)	A business model "is a system that solves the problem of sensing customer needs, engaging with those needs, delivering satisfaction and monetizing the value." (p. 419).	• customer identification • customer engagement (or value proposition) • monetization • value chain linkages.

objective and subjective definitions of the business model: objectively, business models are 'actual' relationships "between a firm and its customers, suppliers, complementors, partners and other stakeholders, and among its internal units and departments" (p.371-372); subjectively, they are "cognitive structures providing a theory of how to set boundaries to the firm, of how to create value, and how to organize its internal structure and governance" (p. 372), so standing as collective cognitive representations of firms' organization and value creation activities. Teece (2010), instead, uses the more parsimonious categories of value creation, value delivery and value capture mechanisms to describe the basic business model components.

Baden-Fuller and Morgan (2010) extend these insights further, by conceptualizing business models as scientific models – i.e. as instruments enabling inquiry and knowledge construction (e.g. Morgan, 2012). Differently from previous contributions, these scholars are the first to explicitly emphasize the manipulable aspects of the business model as a cognitive tool, highlighting that business models "offer the kinds of descriptions that can be reasoned with, the kind of resources that can be investigated to answer questions" (Baden-Fuller & Morgan, 2010: 163). This line of thought has been further developed in two recent contributions. Baden-Fuller and Mangematin (2013) provide a typology of four basic components defining the business model: customer identification; customer engagement; monetization mechanisms; and value chain - while Baden-Fuller and Haefliger (2013) extend this thinking by building on the same typological representation to conceptualize the dynamic and interactive relationships between the business model and technological development.

Taken together, the studies reviewed above have identified a variety of elements constituting the business model, greatly improving our theoretical understanding of this construct. At the same time, by focusing on the inner composition of business models, this emerging cognitive perspective has paid less attention to the conceptualization of the different types of causal structures that can underlie a business model. This is somewhat surprising, as studies in this tradition explicitly acknowledge the importance of the cause-effect relations that link different business model components. For example, Baden-Fuller and Mangematin (2013) emphasize that "the business model is a model – and embedded within it is a set of cause–effect relationships" (p. 423). Similarly, Baden-Fuller and Morgan (2010) argue that "business models cannot just be defined as the set of elements - to do so would be to ignore the fact that business models function as the recipes that draw the

elements together and 'cook' them - arrange and combine them in ways (old and new) through which firms may be successful or not" (p. 166; see also Sabatier, Rousselle & Mangematin, 2010). From a different theoretical perspective, Casadesus-Masanell and Ricart (2010) also highlight that a business model can be usefully represented "by means of a causal loop diagram, where choices and consequences are linked by arrows based on causality theories" (p. 198, emphasis in original). Yet, despite acknowledging explicitly the importance of the cause-effect structures in which business model components are arranged, previous studies have not systematically conceptualized and analyzed those causal structures. In the following section, I address this gap in the extant literature by developing a cognitive mapping approach to business models that makes the causal structures inherent in such models more explicit.

A Cognitive Mapping Approach to Business Models

To outline a cognitive mapping approach to business models, I first briefly introduce the concept of the cognitive map and its use in the strategic management literature. Second, I illustrate how business models can be usefully conceptualized and analyzed as cognitive maps, showing that doing so enables the assessment of four salient properties of business models' causal structures.

Cognitive Maps in Strategic Management

Cognitive maps are graphical representations of the structure of individuals' belief systems in a specific domain (cf. Nadkarni & Narayanan, 2005: 9; see also Huff, 1990). Typically, cognitive maps depict "the causal aspects of the structure of the belief system" (Axelrod, 1976: 58; emphasis added)[1] by representing the causal assertions people make (e.g. in their text or verbal communications) as a network graph composed of nodes and arrows: the nodes represent the concepts that individuals use in their causal assertions, and the arrows represent the causal links between those concepts. The arrows of a cognitive map are usually labelled with a symbol to indicate the type of causal influence relationship between concepts. For example, arrows can be labelled with the symbol '+'to indicate that one concept (the cause or subject concept) positively influences another (the effect or object concept), or with the

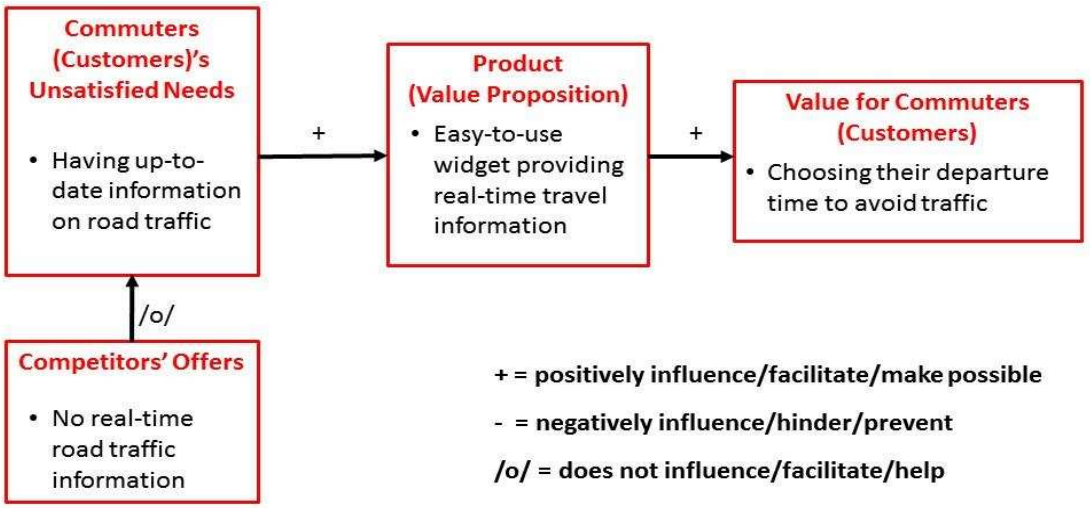
[1] Some researchers distinguish the concept of cognitive maps from the cognate notion of cause maps, defining the latter as one subset of a broader set of cognitive maps, such as maps of attention and association, or maps of categorization (see in particular Huff, 1990: pp. 15-16 and reference note 2, p. 28). Here, I follow the convention established in most strategic management and managerial cognition literatures by treating the two terms as synonyms (see, for example, Eden et al., 1992; Calori et al. 1994; Walsh, 1995).

symbol '-' to indicate a negative influence, or with the symbol '/o/' to indicate no influence or effect[2].

Suppose that, for instance, in an interview or in a presentation to a group of venture capitalists, an entrepreneur makes the following assertions concerning the business model that she or he is designing:

> " ….. in order to meet commuters' unsatisfied need of having up-to-date information on road traffic, our business will provide real-time travel time information on an easy-to-use widget, so that commuters will be better off by choosing their departure time depending on the traffic. The current offers of our competitors in the market do not provide real-time road traffic information, so they are not able to satisfy the urging need of driving commuters of having real-time travel information"[3].

Figure 1 – An Example of a Simple Business Model's Cognitive Map



[2] Many more symbols have been developed in the cognitive mapping literature to indicate a variety of influence relationships between concepts: see Axelrod (1976: 291-332) for a repertoire of the symbols used in coding cognitive maps and Huff, Narapareddy and Fletcher (1990) and Barr, Stimpert and Huff (1992: 22) for applications of this coding in strategic management.

[3] This example is inspired by Koala's business model, as studied by Doganova and Eyquem-Renault (2009), which I use more extensively in the following section to illustrate the cognitive mapping approach proposed here. As I explain in more detail below, it is important to note that this example is not meant to be a methodologically rigorous illustration of how to derive or elicit cognitive maps empirically. The cognitive mapping approach requires accurate methodological choices that have been discussed elsewhere (e.g. Huff, 1990; Hodgkinson, Maule & Bown, 2004), but which are beyond the scope of this paper.

As commonly accepted in cognitive mapping studies (e.g. Nadkarni and Narayanan, 2007), the words 'in order to' or 'so' (highlighted here) can be taken as identifying causal statements linking the concepts used in these assertions (e.g. "commuters' unsatisfied need" and "real-time information provided on a widget"), so they can be represented as a simple cognitive map, as shown in Figure 1.

Starting with the pioneering work of Axelrod (1976) in political science, the cognitive mapping approach has become widely diffused and accepted in managerial cognition research over the last two decades (see Hodgkinson & Healey 2008 for review), and in particular in the strategic cognition literature (e.g. Huff, 1990; see Porac & Thomas, 2002 for review). Scholars in the strategic management field have typically used cognitive maps to capture "the top management's beliefs about the environment, about strategy, and about the business portfolio and state of the organization" (Narayanan, Zane & Kemmerer, 2011: 307).

These top managers' belief systems have been variously defined as "strategic cognitive structures" (Porac & Thomas, 2002), "strategic schemas" (Nadkarni & Narayanan, 2007), "environment-strategy causal logics" (Nadkarni & Barr, 2008) or simply "top managers' mental models" (e.g. Barr, Stimpert, Huff, 1992) and "CEOs' cognitive maps" (Calori et al. 1994). Empirically, these studies have derived cognitive maps from a variety of different texts produced by top firm managers, such as interviews with CEOs (Calori, Johnson & Sarnin, 1994) and, more typically, CEOs' letters to shareholders in annual reports (Nadakarni & Narayanan, 2007; Nadkarni & Barr, 2008; Barr, Stimpert, Huff, 1992).

Taken together, this research stream has demonstrated the value of a cognitive mapping approach to detecting top managers' cognitive structures, showing that their cognitive maps are relevant in understanding the heterogeneity in firms' performance because they shape those managers' attention (e.g. Ocasio, 1997) and their strategic choices and actions (e.g. Nadkarni & Barr, 2008) by filtering environmental cues and information. More specifically, these studies have shown that there are two crucial aspects of cognitive maps that can explain strategic choice: 1) the content of the cognitive map (i.e., the concepts included in the map); 2) the structure of the cognitive map (e.g., the number and types of causal relations connecting those concepts). For example, Calori et al. (1994) demonstrate how the level of complexity of CEOs' cognitive maps - measured as the numbers of such concepts and links that they include - influences their strategic decisions about their firms' scope.

These important findings constitute a fundamental starting point for analyzing

business models as cognitive maps, and provide a useful conceptual and methodological apparatus to investigate the causal structures underlying those business models, and improve our understanding of the implications of different types of business models' causal structures.

Business Models as Cognitive Maps

Drawing on the insights of the cognitive mapping approach in strategic management, I argue that the causal structures embedded in business models can be usefully conceptualized and represented as cognitive maps. From this perspective, *a business model's* cognitive map is a graphical representation of *an entrepreneur or top manager's* beliefs about the causal relationships inherent in that business model. By emphasizing the causal nature of business models, this definition is consistent with previous studies viewing business models as sets of choices and the consequences of those choices (e.g. Casadesus-Masanell & Ricart, 2010), and with studies that explicitly highlight the importance of cause-effect relationships in business models' cognitive representations (e.g. Baden-Fuller & Haefliger, 2013; Baden-Fuller & Mangematin, 2013). Business models' cognitive maps can be derived from the texts that entrepreneurs and top managers use in designing their business models, or to pitch their projects to various audiences (including investors, customers, policy makers); or they can be derived from primary interviews with entrepreneurs and top managers. Thus, the content of a business model's cognitive map can be idiosyncratic, depending on the particular individual's cognitive schemas and on the language they use. The raw concepts that entrepreneurs and top managers use in their causal statements identify the elements of a business model's cognitive map that are induced empirically (see Steps 1-2 in the Appendix). At the same time, such maps may include elements deduced theoretically from extant theories about business models - i.e. the conceptual categories developed in such theories (such as "value proposition", "monetization mechanisms") - that can be useful to classify the raw concepts used by entrepreneurs and top managers, providing a basis for comparing different individuals' cognitive maps (see Step 3-4 in the Appendix). Thus, business models' cognitive maps include both inductive and deductive elements, as do other types of cognitive maps (e.g. Axelrod, 1976; Bryson et al., 2004).

For the sake of illustrating examples of business models' cognitive maps, I focus particularly on the business model representation developed by Baden-Fuller and Mangematin (2013). Among the several business model representations suggested in the literature (see Table 1), I adopt this typological representation because it strikes a balance between parsimony and generality, thus meeting the criteria typically recommended for solid

theory-based typologies (e.g. Doty & Glick, 1994; Delbridge & Fiss, 2013). Specifically, this typology includes the essential building blocks of the business model as covered by other business model representations (see Table 1), thus having a general scope in terms of content. At the same time, it uses a more parsimonious set of categories than other business model representations in covering this general scope (see Table 1). For this reason, in the cognitive maps' illustrations provided below, I used the four constructs characterizing this business model representation ("customer identification", "customer engagement (or value proposition)", "value chain" and "monetization") as organizing categories. Although I use this specific business model representation here for illustrating business models' cognitive maps, the cognitive mapping approach developed in this paper can be used, more generally, with any other business model representation, depending on the analyst's preferences and research objectives.

To provide vignette illustrations of how business models' cognitive maps might look, I draw on the descriptions of two business models provided by Doganova and Eyquem-Renault (2009), representing them as cognitive maps in Figures 2 and 3. These maps do not aspire to be a methodologically rigorous application of the cognitive mapping approach[4] - rather, they are reported here only as illustrative vignettes. However, for the sake of clarity, I illustrate in the Appendix how I coded the original texts reported in the authors' paper to obtain the two cognitive maps illustrated in these figures. Before comparing the two cognitive maps and illustrating their different properties, I provide some brief background information about these business models as the authors described them, to aid understanding the vignettes.

Doganova and Eyquem-Renault (2009) report the findings from a case study of Koala, an academic spin-off entrepreneurial venture "aimed at commercializing a technology based upon an algorithm that allows processing data incoming from vehicles in order to calculate travel times" (p. 1563). The study shows that Koala's entrepreneur adopted two different business models at two distinct phases of the venture's development: 1) a "software editing" business model, targeting professional vehicle fleet drivers (a B-to-B business model), which Koala experimented with in the first phase of its evolution in 2006 (Doganova and Eyquem-Renault, 2009: 1566-1567); and 2) a "location-based service provider" business

[4] The different techniques by which cognitive maps can be elicited and coded from texts are of great importance and have been the subject of much debate in the literature (e.g., Hodgkinson, Maule & Bown, 2004). However, these important methodological aspects are beyond the scope of this paper: I refer the interested reader to the appropriate sources devoted to this topic (e.g., Huff, 1990; Nadkarni & Narayanan, 2005).

model, targeting commuters who drive the same route every day and know it well (a B-to-C business model), experimented with in 2007 during the second phase of the venture's evolution (Doganova and Eyquem-Renault, 2009:1563-1565). The two cognitive maps illustrated in Figure 2 and 3 represent these two distinct business models.

Figure 2 – Koala's 1st Business Model (2006) as a Cognitive Map

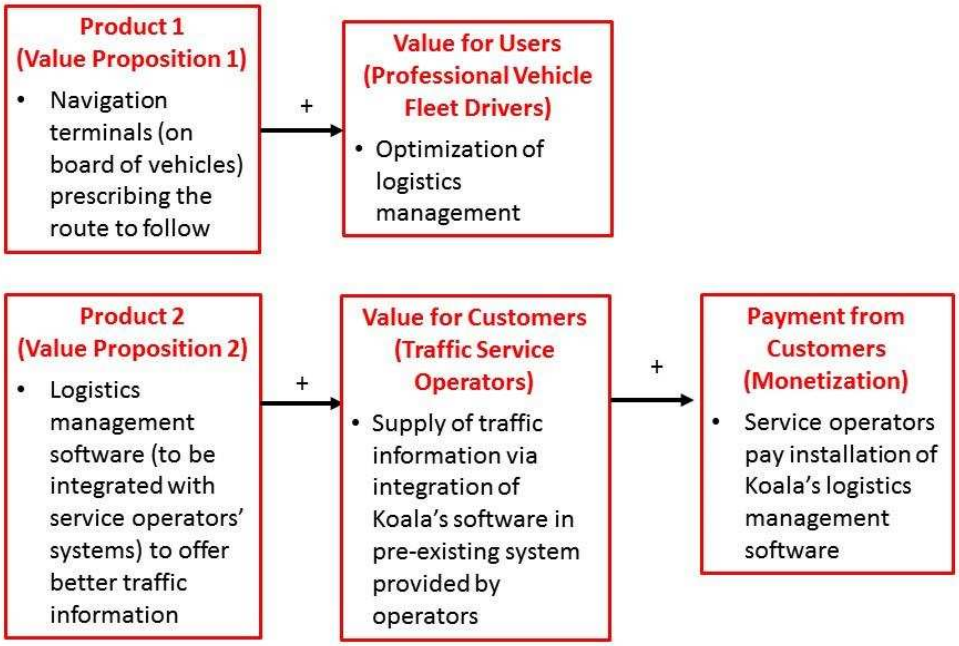
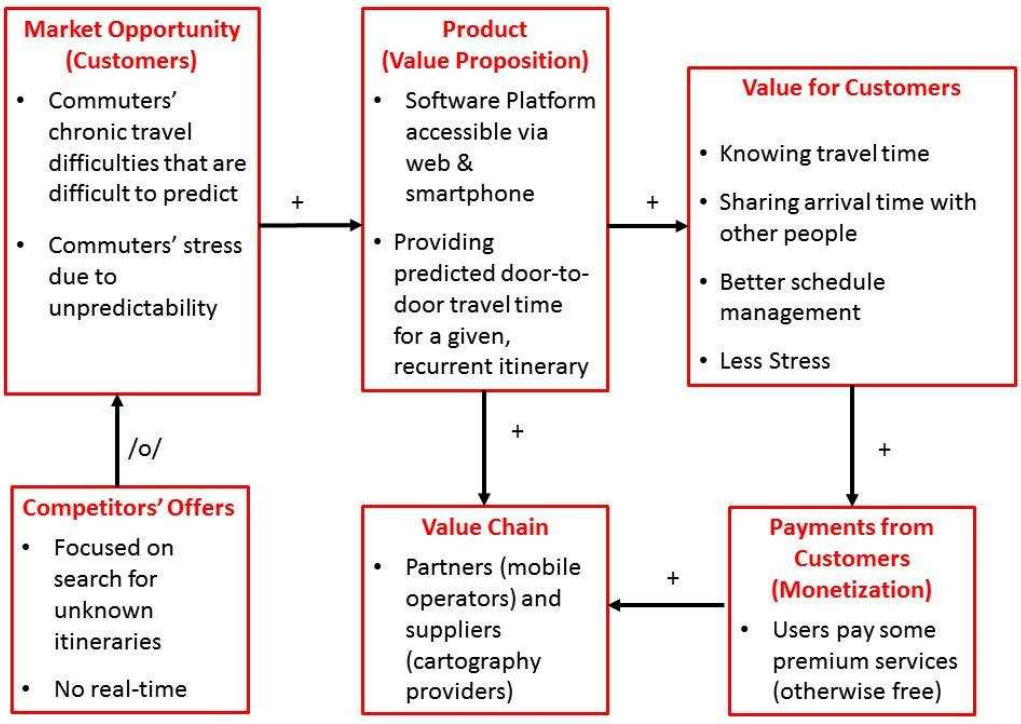


Figure 3 – Koala's 2nd Business Model (2007) as a Cognitive Map



A simple 'eye-ball' look at these two business models' cognitive maps reveal important differences in the causal structures of the two business models, as understood by Koala's founding entrepreneur. In particular, in terms of structural properties, the first business model's cognitive map (Figure 2) is characterized by fewer causal links between its elements, depicting a more fragmented and less focused causal structure in which there is apparently no core element. In contrast, the second cognitive map (Figure 3) is characterized by a denser causal structure, with more links and featuring a central concept (the product/value proposition), which is the business model element most linked to the others. As I discuss in more detail below, these properties of a business model's causal structure can provide useful indications when they are compared to benchmarks derived either from established theories or from data. For example, a comparison between the cognitive map illustrated in Figure 2 and existing business model theories would reveal that there is an important disconnection in the map between the value created for users and that created for customers - which prompts the question: how are the two groups (users and customers) linked? Theories of two-sided business models (Rochet & Tirole, 2003; Eisenmann, Parker & Alstyne, 2006) recommend that these two groups are connected via the business model, but there is no causal link connecting the offerings and value created for these two groups in Koala's business model's cognitive map (Figure 2), indicating that - in the understanding of Koala's entrepreneur - these two elements were not connected. This example shows that cognitive maps can be powerful diagnostic tools for business model design when they are complemented by further information coming, typically, from theories or from data.

Building on studies of cognitive maps in strategic management (Eden et. al. 1992; Jenkins & Johnson, 1997), I illustrate below how a business model's cognitive map can provide useful indications about four properties of a business model's causal structure: 1) its complexity; 2) its focus; 3) its clustering; 4) the mechanisms underlying its causal links. I illustrate each of these four properties below, and show how they can be used diagnostically to improve business model design. In particular, I highlight how they can prompt questions about, and further investigations into, important aspects of a business model's causal structure, thus improving entrepreneurs', top managers', and researchers' abilities to understand and practice business model design. Table 2 summarizes these four properties of a business model's causal structure; the features of the business model's cognitive map that capture these properties; and how the information they provide can be used diagnostically to improve business model design.

Table 2 – Properties of a Business Model's Causal Structure Captured by the Features of a Business Model's Cognitive Map

Properties of the Business Model's Causal Structure	**Features of the Business Model's Cognitive Map Capturing the Property**	**Diagnostic Use of the Cognitive Map for Business Model Design** (questions that can be asked and further investigated by using the map)
Complexity	Number of different concepts and causal links connecting the concepts.	• Is the business model's causal structure too complex or too simple as compared to the level of environmental complexity? • Is the business model's causal structure too complex or too simple as compared to established theories of business models? • Does the business model's causal structure feature missing links and/or concepts if compared with the environment and established theories?
Focus	Degree of centrality of each concept and average centralization of the cognitive map.	• Is the core element of the business model's causal structure part of the firm's resources and capabilities or is it outside of its control? • Is the business model too dependent on a core element? What if that core element does not work as expected? • Are there other elements that can be added to buffer and protect the core elements of the business model?
Clustering	Extent to which the concepts in a cognitive map cluster in separate groups	• Is the business model's causal structure too fragmented as compared to the level of fragmentation in the environment? • Is the business model's causal structure too fragmented as compared to established theories of business models? • Are there "bridging" elements that connect otherwise disconnected elements of the business model's causal structure?
Mechanisms	Processes underlying the causal links between concepts in the cognitive map	• Are the mechanisms plausible on the basis of what we know from established theories and comparative cases? • Are there convincing arguments that can support the plausibility of the mechanisms? • What if the hypothesized mechanisms do not work as expected?

Complexity of a *Business Model's Causal Structure*

Representing a business model as a cognitive map can provide useful indications about the complexity of its causal structure. In fact, complexity is one of the structural dimensions

typically analyzed in studies of cognitive maps (e.g. Eden et al. 1992). The level of complexity of a cognitive map generally refers to both the differentiation (the number of different concepts) and integration (the number of causal links between them) illustrated in the map (Walsh, 1995). A high level of differentiation has often been interpreted as indicating comprehensiveness (e.g. Calori et al., 1994) or detail (e.g. Clarke & Mackaness, 2001) in the causal belief system of the individual whose map is examined, while a high level of integration has been interpreted as an indication of the connectedness (e.g. Calori et al. 1994) or coherence (Clarke & Mackaness, 2001) of that causal belief system. A common measure of cognitive maps' complexity is the ratio of causal links to concepts (i.e. a map's density), where "a higher ratio indicates a densely connected map and supposedly a higher level of cognitive complexity" (Eden et al., 1992: 313).

From a business model design perspective, interpreting the complexity of a business model's cognitive map requires asking a key question: is the business model's causal structure too complex or too simple? Of course, this question is difficult to answer unless a benchmark is established against which to assess and interpret the 'right' level of complexity for a given business model. I suggest two types of benchmarks that can be useful in this respect. One is the level of complexity and dynamism in the environment in which the business model is going to compete. According to Ashby (1958)'s famous law of requisite variety, the internal diversity of a system has to match the diversity of its environment for that system to survive. Building on this insight, previous studies of strategic cognition have demonstrated empirically that the fit between the complexity of the environment and the complexity of top managers' cognitive maps is positively associated with performance (e.g. Nadkarni and Narayanan, 2007; Calori et al. 1994). Using the level of environmental complexity as a benchmark, entrepreneurs and top managers aspiring to compete in highly complex and dynamic environments can take very simple business model causal structures (characterized by few concepts and few linkages) as a warning signal. Following the logic of requisite internal variety, the narrower set of concepts and linkages involved in a simple business model's causal structure is likely to make it inadequate or insufficiently adaptable to meet the demands of highly complex or dynamic environments

A second benchmark against which it is possible to compare the level of complexity of a given business model's causal structure is based on theory: are any important concepts and linkages (that existing business model theories have proved to be key) missing from the business model's cognitive map? Top managers and entrepreneurs designing a business model can leverage established theories - or use their own - to interpret the level of

complexity of their business models' causal structures, and evaluate whether important concepts or cause-effect links are missing from them. They can also leverage their knowledge of existing "iconic business models" in their industry (Baden-Fuller and Morgan, 2010; Sabatier et al., 2010), or recall their previous experiences with comparable business models. For example, in the case of Koala's first 'software editor business model' (illustrated in Figure 2) several key concepts and causal links - emphasized as important by established theories of two-sided business models (see above) - were missing from the cognitive map, such as links connecting users and customers, and the value generated for these distinct groups. This theory-based interpretation of the causal structures underlying a business model's cognitive map can also lead to the discovery of new cause-effect configurations (Soda & Furnari, 2012).

Focus *of the Business Model's Causal Structure*

Representing a business model as a cognitive map can provide useful indications also about the focus of its causal structure. Focus refers to the degree to which the business model's causal structure is centralized around a few 'core' concepts (Nadkarni & Narayan, 2007), rather than distributed among many similarly central concepts. Typically, the focus of a cognitive map is measured by looking at how central its different concepts are – i.e. by calculating the number of causal links that connect a given concept to the others in the map (Eden et al., 1992). The centrality scores of the different concepts can then be used to compute a centralization measure for the entire map (i.e. how centralized the whole cognitive map is around one or a few concepts). Thus a focused, highly centralized cognitive map shows a clear distinction between core and peripheral concepts. Previous research has shown that the central concepts in a cognitive map generally refer to ideas which are deeply ingrained in decision-makers' cognitive schemas, and that these concepts have usually developed over long periods and are therefore hard to change (e.g. Carley & Palmquist, 1992; Lyles & Schwenk, 1992). Research in strategic cognition has also shown that a cognitive map's level of focus matters because it directs managers' attention to a narrow set of concepts, and often guides their problem-solving towards a hierarchical, modular structure (Nadkarni & Narayanan, 2007; cf. Simon, 1969). From this perspective, focused cognitive maps tend to promote a narrower set of strategic actions than do more distributed maps.

Detecting the level of focus of a business model's causal structure via a cognitive map can prompt diagnostic questions that are important in designing a business model. First, one important question concerns whether a business model's core elements are part of the focal

firm's actual resources and capabilities. Research has shown the importance of core elements in organizational configurations (e.g. Siggelkow, 2002; Grandori & Furnari, 2008) and business model configurations (e.g., Aversa, Furnari & Haefliger, 2015), demonstrating that a firm's control of these core elements is positively associated with its performance. In contrast, if the elements that emerge as core from an analysis of the business model's causal structure are beyond the firm's control (i.e. not part of its resources and capabilities), this can be a warning sign for entrepreneurs and top firm managers who are designing its business model. Second, the focus of a business model's causal structure, as shown by its cognitive map, can also indicate whether the business model is 'un-balanced', focusing too much attention on one single element (on which the others may depend), and the risks of this lack of balance in its causal structure. One way of examining this issue is through counterfactual thinking, by asking what would happen if that particular element did not work as expected (e.g. Soda & Furnari, 2012; Morris & Moore, 2000). Analyzing the level of focus of a business model's causal structure can also provide insights into whether it is possible to 'buffer' or reinforce core business model elements with additional elements (cf. Thompson, 1967; Siggelkow, 2002).

Clustering of *the Business Model's Causal Structure*

Representing a business model as a cognitive map can also provide useful indications about the level of clustering of the business model's causal structure, which refers to the degree to which the concepts in a cognitive map group in separate clusters. Typically, the detection of such clusters is based on two principles: 1) the concepts grouped within one cluster are more closely connected to each other via causal links; 2) the number of causal links between clusters is lower (Eden et al. 1992: 315). A common measure of the degree of clustering in a cognitive map is the ratio of clusters to concepts (from 0 - when each node is a separate cluster - to 1, when there is only one cluster including all the map's concepts). This measure reflects the fact that the degree of clustering can be thought of as a continuum ranging from, at one extreme, a map that shows no discrete clusters, to the other extreme, where it is constituted of just one cluster of strongly interconnected nodes. Usually, a cognitive map is in between these two extremes, being composed of several clusters of concepts that are moderately connected by a few bridging links. In other words, many cognitive maps show the near-decomposability of modular hierarchical systems noted by Simon (1969).

The analysis of clustering can provide a number of insights into a business model's causal structure. First, maps in which the ratio of clusters to concepts is close to zero (i.e.

when each node forms a more or less disconnected island) have often been interpreted as indicating a highly fragmented causal structure and, generally, a lower level of coherence of thought (e.g. Clarke & Mackaness, 2001), while maps with cluster-to-concept ratios closer to 1 can be seen as indicating "a more coherent view of an issue" (Clarke & Mackaness, 2001: 154). Another important insight provided by the degree of clustering is in identifying those bridging ideas that link different concept clusters, which are seen as potentially "potent" because they have "ramifications for a large number of themes" (Eden et al., 1992).

Mechanisms Underlying Causal Links *in the Business Model's Causal Structure*

Another important property of the causal structures represented in a business model's cognitive map is the mechanisms underlying the causal links it represents. In broad terms, a mechanism indicates a process by which an event takes place or an effect is brought about (English Oxford Dictionary, 2014). In this sense, examining the mechanisms underlying a business model's causal links invites us to think in terms of process, echoing Lave and March (1993)'s call that "a good model is almost always a statement about a process, and many bad models fail because they have no sense of process" (p. 40). One way of paying attention to the mechanisms in a model is to ask why a cause is connected to an effect (cf. Tilly, 2008), and to think about the different reasons and processes that might explain the causal link between the two. More formally, mechanisms can be defined as "frequently occurring and easily recognizable causal patterns that are triggered under generally unknown conditions or with indeterminate consequences" (Elster, 1998: 45). In other words, by definition we do not know the causes and effects of a mechanism, but we know that it is a frequently occurring process and one that can be easily recognized. For this reason, mechanisms are typically evaluated on the basis of their plausibility –the extent to which they are 'worthy of belief'- rather than their empirical validity or truthfulness. In fact, given that the causes and effects of mechanisms are not observable, mechanisms per se cannot be empirically confirmed or falsified (Davis & Marquis, 2005: 340). However, mechanisms that occur more frequently and are more easily recognizable can be considered as more plausible mechanisms (i.e. more worth believing) than those that occur less frequently and are less easily recognizable.

Thinking about the mechanisms underlying a business model's causal structure can provide useful diagnostic indications for business model design. The first important question that entrepreneurs and top managers designing a business model need to ask themselves is: are the mechanisms hypothesized to sustain the causal links of their business model plausible? This is a difficult question to answer, because it typically involves judgment in

situations "where the necessary evidence or proof is not available or confusing" (Huff, 1990: 31). I suggest two possible alternatives to evaluate the plausibility of the mechanisms hypothesized to underlie the cause-effect links in a business model. First, plausibility can be evaluated with respect to available and established theories (Soda & Furnari, 2012), comparing how the mechanisms are expected to operate in the business model in question with what has been previously theorized and found about similar mechanisms in comparable business model designs. Second, plausibility can be evaluated by crafting convincing arguments – intended here as "sequences of interlinked claims and reasons that, between them, establish the content and force of the position for which a particular speaker is arguing" (Toulmin et al., 1979: p. 13). This argumentative logic is rooted in a long-standing tradition of legal studies (and studies of rhetoric), and has been suggested as an interesting alternative to evaluate the plausibility of claims in the absence of direct proofs or data (e.g. Suddaby & Greenwood, 2005).

Discussion

In this paper, I illustrate the potential of a cognitive mapping approach for understanding and analyzing the causal structures embedded in business models, and explore the value and implications of this approach for business model design. To this end, I highlight how cognitive mapping can allow entrepreneurs and top managers to see how the components of their business model designs relate to each other in a network of cause-effect relationships. Specifically, I illustrate four key properties of a business model's causal structure (complexity; focus; clustering; mechanisms) that are more easily understandable via cognitive maps, explaining how each of these properties can provide useful diagnostic information for business model design.

In doing so, I make two contributions to extant research. First, I contribute to the cognitive perspective on business models (e.g. Chesbrough & Rosenbloom, 2002; Doz & Kosonen, 2010; Baden-Fuller & Mangematin, 2013; Baden-Fuller & Haefliger, 2013) by extending its dominant focus on the content of business models to give attention to the causal structures underlying these models. In particular, I draw on insights from the managerial and strategic cognition literatures to introduce cognitive mapping as a valuable theoretical and methodological approach for understanding the cause-effect relationships embedded in business models; and illustrate how this approach allows for identifying four specific properties of their causal structures (complexity, focus, clustering, mechanisms). By doing so,

I contribute to a dialogue between the strategic cognition and the business model literatures, which have remained surprisingly separate so far. In addition, I integrate the existing classifications of business model content (e.g. Baden-Fuller & Mangematin, 2013) by illustrating how their different components can be linked together via different types of cause-effect structures characterized by different structural properties. In this respect, this paper contributes towards a more systematic classification of business models' structural properties, complementing existing content-based classifications and enhancing the comparability of business models' representations on the basis of their structural properties (so facilitating comparisons across different, content-based, business model categories).

The cognitive mapping approach developed in this paper paves the way for future research aimed at comparing business models' cognitive maps more systematically, and other kinds of representation of business model causal structures, such as causal loop diagrams (Casadesus-Masanell & Ricart, 2010) or the mathematical representations of business models developed by economists (Rochet & Tirole, 2003). While these two types of representations share an important similarity with business models' cognitive maps – i.e. the fact that they focus on the cause-effect relations between business model elements - they differ from cognitive maps in two important ways. First, both causal loop diagrams and mathematical business model representations are typically more deductive in nature, providing an analyst's representation of a business model. In contrast, as discussed above, cognitive maps have an important inductive component, being elicited and derived from textual materials, such as interviews with managers and entrepreneurs, official communications with stakeholders, and other documents describing firms' business models (e.g., Markoczy & Golberg, 1995; Hodgkinson et al., 2004)[5]. As a result, business models' cognitive maps tend to be populated by words and symbols used by the subjects whose beliefs and cognitions are being investigated (such as entrepreneurs and managers describing their business models). In contrast, causal loop diagrams and mathematical representations contain words and symbols (e.g., concepts, labels, mathematical formulas) that the investigator uses to describe the business model components and the cause-effect linkages between them (on the deductive aspects of formal/mathematical models more generally, see also Morgan, 2012: 20-21).

Second, causal loop diagrams and mathematical representations typically feature a

[5] Cognitive maps vary in the extent to which they can also include deductive components (e.g. conceptual categories developed by the investigator), from maps that are purely inductive and empirically grounded (e.g. Bryson et al. 1992), to those that include both deductive and inductive components, depending on the methods used to derive and elicit them empirically (Markoczy & Golberg, 1995; Hodgkinson et al., 2004).

higher level of abstraction than cognitive maps, describing business model components through abstract symbols (or higher-order constructs) and depicting the linkages between them either with relatively simple cause-effect relations (as in Casadesus-Masanell & Ricart's (2010) causal loop diagrams) or by mathematical formulas (Rochet & Tirole, 2006). In contrast, cognitive maps provide a more specific and fine-grained form of representation, in which: a) the description of business model components is typically grounded in the language and texts used by the subjects whose beliefs are being investigated; b) the cause-effect linkages between business model components are described via a broader variety of fine-grained 'operators' than in mathematical formulas or causal loop diagrams, including weighted cause-effect relations, indifference relations, and numerous specific causal connectors (see Huff, 1990; Axelrod, 1976: 291-332 for a complete list of causal connectors used in cognitive maps).

These important differences notwithstanding, cognitive maps, causal loop diagrams and mathematical representations are best viewed as complementary forms of representing business models' causal structures, each with distinctive advantages and limitations. In fact, the parsimony of mathematical representations and causal loop diagrams means that they run the risk of leaving out substantive elements, which can be more easily taken into account in more inductive and empirically grounded forms of representation such as cognitive maps. At the same time, the specific content of cognitive maps can be made more generalizable (i.e. more comparable across individual cases and contexts) by enriching them with more abstract forms of representation, such as mathematical models and causal loop diagrams (e.g., Laukannen, 1994). One useful way to combine these different forms of business model representation is to use them iteratively in a business model design process, starting with more inductive representations (such as cognitive maps) and progressively abstracting their content into more formal representations by using higher-order concepts and mathematical language.

Another interesting avenue for future research would be to investigate empirically the links between business models' cognitive maps and the actual choices that top managers and entrepreneurs make in designing and implementing their business models. In fact, the correspondence between beliefs and managerial action might be less direct than is expected. It is important to explore empirically how the causal structures "asserted" by entrepreneurs and top managers translate into actual practice – for example, verifying empirically, once the business model is implemented, what the actual cause-effect relations between the business model's activities are. From a conceptual standpoint, this line of research also has the

potential to integrate the activity-based and cognitive perspectives on business models. In the same way, it would be important to explore how top managers' and entrepreneurs' cognitive maps change over time, especially over a firm's life cycle. For example, future empirical studies could examine how the initial beliefs an entrepreneur holds at the founding stages of a new business change over time as it grows, matures and eventually declines.

This paper's second contribution is to the strategic cognition literature. Although the cognitive mapping approach is well-known in this literature (e.g. Huff, 1990; Porac & Thomas, 2002), business models have not been previously examined as cognitive maps, raising the interesting issue of whether and how business models' cognitive maps might differ from other types of "strategic cognitive structures" - such as "environment-strategy causal logics" (e.g. Nadkarni & Barr, 2008) or "strategy schemas" (e.g. Nadkarni & Narayanan, 2007) - that have been analyzed more traditionally in the literature to capture top managers' belief systems about the environment, a firm's strategy and its organization. This paper offers three preliminary insights into this issue, thus contributing to integrating the strategic cognition literature and business model research. First, one difference between business models' cognitive maps and other types of "strategic cognitive structures" (Porac & Thomas, 2002) is the configurational and systemic nature of the former types of cognitive representations. Whereas other types of cognitive maps analyzed in the strategic management literature concern bi-variate cause-effect relationships between two concepts - for example, "strategy" and "environment" (e.g. Nadkarni & Barr, 2008) or "strategy" and "organizational structure" (e.g. Calori et al., 1994) - business models' cognitive maps tend to include a multitude of elements and multiple cause-effect relations among them. In this sense, they can be interpreted as "cognitive configurations" (Baden-Fuller & Mangematin, 2013: 418), characterized by a generally high level of cognitive complexity (as discussed above). Second, an important difference between business models' cognitive maps and other types of strategic cognitive structures concerns the stronger emphasis on causal mechanisms in the former. In fact, several business model studies (e.g. Baden-Fuller & Mangematin, 2013; Casadesus-Masanell & Ricart, 2010; Baden-Fuller & Morgan, 2010) have emphasized how the mechanisms underlying the cause-effect relations embedded in them are crucial and distinctive components of what business models are. In sum, this paper contributes to the strategic cognition literature by conceptualizing the business model as a particular kind of cognitive map, characterized by several features that make the construct distinctive from other cognate concepts such as 'strategy', thus contributing to the ongoing debate on the relationship between these two concepts (e.g. Casadesus-Masanell & Ricart, 2010). In

particular, an implication of this paper is that the business model concept is distinct from other types of strategic cognitive structures (see Porac & Thomas, 2002 for review), such as "strategy schemas" (Nadkarni & Narayanan, 2007), because of the high degree of cognitive complexity and the emphasis on mechanisms that typically characterize business models.

In this vein, I suggest that potential avenues for future research include the empirical exploration of the distinctive features of business models as compared to other more frequently studied "strategic cognitive structures" (Porac & Thomas, 2002). In fact, if business models are first of all models (Baden-Fuller & Morgan, 2010), an important question for future research is what makes them distinctive from other types of top managers' mental models previously addressed in the literature. In particular, it would be valuable to identify the specific analytical dimensions along which we could distinguish different types of models, such as formal models, role models, scale models or explanatory models (e.g. Massa, 2014; Baden-Fuller & Morgan, 2010; Morgan, 2012). In addition, it would be worth exploring more structural properties of business models' cognitive maps beyond the four examined here. For example, Axelrod (1976: 260-261) called for more research on the strength and confidence of the causal links between cognitive maps' concepts, arguing that conditional or interactive causation should also be studied (as well as the simple causation logic underlying the cognitive maps illustrated here). In a similar fashion, the conceptualization and analysis of business models as cognitive maps would be greatly enriched by including other types of causal links, especially given the configurational nature of business models discussed above.

This study has also some limitations. First, as in any study adopting a cognitive mapping approach, it is important to re-iterate Korzybski (1933)'s famous statement that "a map is not the territory": in other words, cognitive maps – as any other type of map - are simplifications and abstractions of the outside world, and so they can sometimes be misleading because of the information that is not reported in the map. It is therefore crucially important to maintain a critical attitude and a reflexive stance towards cognitive maps (e.g. Eden et al., 1992). Second, as discussed, the cognitive mapping approach cannot fully capture all the relevant properties of a business model's causal structures. For example, the nuanced reasoning underlying the cause-effect relations between concepts – as hypothesized by top managers and entrepreneurs – cannot be fully represented in business models' cognitive maps.

Despite these limitations, this paper has important implications for the practice of business model design. In fact, previous research has shown that understanding the

underlying structure of a cognitive representation can improve the quality of decision-making, allowing decision-makers to avoid framing traps and biases (e.g. Hodgkinson et al. 1999). Thus, from a practical standpoint, a systematic analysis of business models' causal structures can support top managers and entrepreneurs in designing better business models. Training them to 'see' and understand the causal structure of their business models better would enable them to design better business models (and to better understand their models' logical consistency). In this regard, the cognitive mapping approach to business models echoes Axelrod (1976)'s pioneering finding that "when a cognitive map is pictured in graph form it is then relatively easy to see how each of the concepts and causal relationships relate to each other, and to see the overall structure" (p. 5).

At the same time, it is important to note that there are multiple ways in which business models' cognitive maps can be used in business model design practice. For example, Fiol and Huff (1992: 273) distinguish two basic uses of cognitive maps: as "products, designed to remain relatively stable over time"; or as "tools which people expect to modify over time". This paper emphasizes this second conception of cognitive maps, and shares the view that business models' cognitive maps are dynamic tools that can be modified as new information becomes available, and as the model builders and users (i.e. entrepreneurs and top managers) explore and discover new ideas through the business model. In this regard, business models' cognitive maps are not only the passive product of top managers' and entrepreneurs' past cognitions. Rather, they are also - and more importantly - active sense-making tools that can generate inputs into the continuous stream of decisions that entrepreneurs and top managers need to make in the process of designing their business models. From this perspective, the cognitive mapping approach to business models outlined in this paper contributes to our understanding of business models as manipulable instruments "to enquire into and to enquire with" (Morgan, 2012: 217) and aims at stimulating scholars to further investigate how top managers and entrepreneurs use these models both to reconstruct their business worlds and to act within them.

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References

Ashby W.R. (1958). Requisite variety and its implications for the control of complex systems, Cybernetica, **1**(2): 83-99.

Aversa P., Furnari S. & Haefliger S. (2015). Business model configurations and performance: A qualitative comparative analysis in Formula One racing, 2005–2013. Industrial and Corporate Change, **24**(3): 655-676.

Axelrod R.M. (Ed.).(1976). Structure of decision: The cognitive maps of political elites. Princeton: Princeton University press.

Baden-Fuller C. & Morgan M. (2010). Business Models as Models, Long Range Planning, **43**(2-3): 156-171

Baden-Fuller C. & Haefliger S. (2013). Business models and technological innovation, Long Range Planning, **46**(6): 419-426.

Baden-Fuller C., & Mangematin V. (2013). Business models: A challenging agenda, Strategic Organization, **11**(4), 418-427.

Barr P.S., Stimpert J.L. & Huff A.S. (1992). Cognitive change, strategic action, and organizational renewal. Strategic management journal, **13**(S1): 15-36.

Bryson J.M., Ackermann F., Eden C. & Finn, C.B. (2004). Visible thinking: Unlocking causal mapping for practical business results, John Wiley & Sons.

Calori R., Johnson G. & Sarnin P. (1994). CEOs' cognitive maps and the scope of the organization, Strategic Management Journal, **15**: 437-457.

Carley K. & Palmquist M. (1992). Extracting, representing, and analyzing mental models. Social forces, **70**(3): 601-636.

Casadesus-Masanell R. & Ricart J.E. (2010). From Strategy to Business Models and onto Tactics. Long Range Planning, **43**(2-3): 195–215.

Chesbrough H. & Rosenbloom R.S. (2002). The role of the business model in capturing value from innovation: Evidence from Xerox Corporation's technology spin-off companies. Industrial and Corporate Change, **11**(3): 529-555.

Clarke, I., & Mackaness, W. (2001). Management 'intuition': an interpretative account of structure and content of decision schemas using cognitive maps. Journal of Management Studies, **38**(2): 147-172.

Davis G.F. & Marquis C. (2005). Prospects for organization theory in the early twenty-first century: Institutional fields and mechanisms. Organization Science, **16**(4): 332-343.

Delbridge R. & Fiss P.C. (2013). Editors' comments: styles of theorizing and the social organization of knowledge. Academy of Management Review, **38**(3): 325-331.

Doganova L. & Eyquem-Renault M. (2009). What do business models do?: Innovation devices in technology entrepreneurship. Research Policy, **38**(10): 1559–1570.

Doty D.H. & Glick W.H. (1994). Typologies as a unique form of theory building: Toward improved understanding and modeling. Academy of management review, **19**(2): 230-251.

Doz Y.L. & Kosonen M. (2010). Embedding Strategic Agility: A Leadership Agenda for Accelerating Business Model Renewal. Long Range Planning, **43**(2–3): 370–382.

Eden C., Ackermann F. & Cropper S. (1992). The analysis of cause maps. Journal of Management Studies, **29**(3): 309-324.

Eisenmann T., Parker G. & Van Alstyne M.W. (2006). Strategies for two-sided markets. Harvard business review, **84**(10): 92.

Elster J. (1998). A plea for mechanisms. in Hedström, P., & Swedberg, R. (Eds.). Social mechanisms: An analytical approach to social theory. Cambridge University Press.

Fiol C.M. & Huff A.S. (1992). Maps for managers: where are we? Where do we go from here? Journal of Management Studies, **29**(3): 267-285.

Gavetti G.M., Henderson R. & Giorgi S. (2005) Kodak and The Digital Revolution (A). Harvard Business School Case #705-448.

Goldman I. (2012) 'Poor decisions that humbled the Kodak giant'. Financial Times. 13 April.

Grandori A. & Furnari S. (2008), A chemistry of organization: Combinatory analysis and design, Organization Studies, **29**(2): 315-341.

Hodgkinson G.P., Bown N.J., Maule A.J., Glaister K.W. & Pearman A.D. (1999). Breaking the frame: An analysis of strategic cognition and decision making under uncertainty, Strategic Management Journal, **20**: 977-985.

Hodgkinson G.P. & Healey M.P. (2008). Cognition in organizations, Annual Review of Psychology, **59**: 387-417.

Hodgkinson G.P., Maule A.J. & Bown, N.J. (2004). Causal cognitive mapping in the organizational strategy field: A comparison of alternative elicitation procedures, Organizational Research Methods, **7**(1): 3-26.

Huff A.S. (1990). Mapping strategic thought. Chichester, UK: Wiley.

Huff A.S., Narapareddy V. & Fletcher K.E. (1990). Coding the causal association of concepts in Huff, A.S. Mapping strategic thought, New York: John Wiley and Sons.

Jenkins M. & Johnson G. (1997). Entrepreneurial intentions and outcomes: A comparative causal mapping study. Journal of Management Studies, **34**: 895-920.

Kaplan S. & Sawhney M. (2000). B2B E-Commerce hubs: towards a taxonomy of business models. Harvard Business Review, **79**(3): 97-100.

Klang D., Wallnöfer M. & Hacklin F. (2014). The Business Model Paradox: A Systematic Review and Exploration of Antecedents, International Journal of Management Reviews.

Korzybski A. (1933). Science and Sanity. International Non-aristotelian Library Publishing Co. Lakeville, CT.

Laukkanen M. (1994). Comparative cause mapping of organizational cognitions, Organization science, **5**(3): 322-343.

Lave C.A. & March J.G. (1993). An introduction to models in the social sciences, University Press of America.

Lyles M.A. & Schwenk C.R. (1992). Top management, strategy and organizational knowledge structures. Journal of Management Studies, **29**: 155-174.

Markoczy L. & Goldberg J. (1995). A method for eliciting and comparing causal maps, Journal of management, **21**(2): 305-333.

Massa L. 2014. Evaluating the appropriateness of different formal representations of the business model: a randomized controlled experiment. Working paper presented at EGOS Colloquium, Rotterdam, the Netherlands.

Morgan M.S. (2012). The World in the Model. Cambridge and New York: Cambridge University Press

Morris M.W. & Moore P.C. (2000). The lessons we (don't) learn: Counterfactual thinking and organizational accountability after a close call, Administrative Science Quarterly, **45**(4): 737-765.

Munir K.A. (2005). The social construction of events: a study of institutional change in the photographic field. Organization Studies, **26**(1): 93-112.

Munir K. (2006). 'Cut ties to sentimental images of the past', Financial Times, 5 December.

Nadkarni S. & Barr P.S. (2008). Environmental context, managerial cognition, and strategic action: an integrated view. Strategic Management Journal, **29**(13): 1395-1427.

Nadkarni S. & Narayanan V.K. (2005). Validity of the structural properties of text-based causal maps: An empirical assessment, Organizational Research Methods, **8**(1): 9-40.

Nadkarni S. & Narayanan V.K. (2007). Strategic schemas, strategic flexibility, and firm performance: The moderating role of industry clockspeed, Strategic Management Journal, **28**: 243-270.

Narayanan V.K., Zane L.J. & Kemmerer B. (2011). The cognitive perspective in strategy: An integrative review. Journal of Management, **37**(1): 305-351.

Ocasio W. (1997). Towards an attention-based view of the firm. Strategic Management Journal, **18**: 187-206.

Osterwalder A., Pigneur Y. & Tucci C.L. (2005). Clarifying business models: Origins, present, and future of the concept. Communications of the association for Information Systems, **16**(1): 1-40.

Perkmann M. & Spicer A. (2010). What are business models? Developing a theory of performative representations. Research in the Sociology of Organizations, **29**: 265-275.

Porac J.F. & Thomas H. (2002). Managing cognition and strategy: Issues, trends and future directions. In A. Pettigrew & H. Thomas & R. Whittington (Eds.), Handbook of strategy and management: 165-181. London: Sage.

Rochet J.C. & Tirole, J. (2003). Platform competition in two-sided markets. Journal of the European Economic Association, **1**(4): 990-1029.

Sabatier V., Mangematin V. & Rousselle T. (2010). From Recipe to Dinner: Business Model Portfolios in the European Biopharmaceutical Industry. Long Range Planning, **43**(2/3).

Siggelkow N. (2002). Evolution toward fit. Administrative Science Quarterly, **47**(1): 125-159.

Simon H.A. (1969), The sciences of the artificial, Cambridge, US: MIT Press.

Soda G. & Furnari S. (2012) 'Exploring the Topology of the Plausible: Fs/QCA Counterfactual Analysis and the Plausible Fit of Unobserved Organizational Configurations', Strategic Organization **10**: 285–96.

Suddaby R. & Greenwood R. (2005). Rhetorical strategies of legitimacy. Administrative science quarterly, **50**(1): 35-67.

Teece D.J. (2010). Business Models, Business Strategy and Innovation. Long Range Planning, **43**(2-3): 172–194.

The Economist (2012). 'The last Kodak moment?' The Economist. 14 January.

Thompson J.D. (1967). Organizations in action: Social science bases of administrative theory. Transaction Publishers.

Tikkanen H., Lamberg J.-A., Parvinen P. & Kallunki J.-P. (2005). Managerial cognition, action and the business model of the firm. Management Decision, **43**(6): 789–809.

Tilly, C. (2008). Why? Princeton University Press, Princeton.

Toulmin S., Rieke & R. Janik A. (1979). An introduction to reasoning, CollierMcMillan,

Walsh, J. P. (1995). Managerial and organizational cognition: Notes from a trip down memory lane. Organization science, **6**(3): 280-321.

Wirtz B.W., Schilke O. & Ullrich S. (2010). Strategic Development of Business Models: Implications of the Web 2.0 for Creating Value on the Internet. Long Range Planning, **43**(2–3): 272–290.

Zott C. & Amit R. (2010). Business Model Design: An Activity System Perspective, Long Range Planning, **43**(2-3): 216–226.

Zott C., Amit R. & Massa L. (2011). The Business Model: Recent Developments and Future Research. Journal of Management, **37**(4): 1019–1042.

Biography

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Appendix

To derive the business models' cognitive maps illustrated in Figure 2 and 3 above, I coded the original quotes and texts reported in Doganova and Eyquem-Renault (2009) to describe Koala's first (pp. 1566-1567) and second (pp. 1563-1564) business models. These quotes and texts are taken from the secondary documents and PowerPoint presentations that Koala's entrepreneur used in designing the two business models, which are the objects of Doganova and Eyquem-Renault's (2009) empirical investigation[6].

Although, as explained above, the cognitive maps shown in Figure 2 and 3 are intended to serve as illustrative vignettes (rather than as rigorous methodological illustrations of how to derive cognitive maps), in coding Doganova and Eyquem-Renault (2009)'s text into cognitive maps I followed the coding procedures recommended by Axlerod (1976: pp. 291-332) and then refined by Huff, Narapareddy and Fletcher (1990). These coding procedures are commonly accepted in studies of cognitive maps in strategic management (e.g. Barr et al. 1992; Calori et al., 1994; Nadkarni & Barr, 2008), and are described in detail elsewhere (e.g. Nadkarni & Narayanan, 2007: 254 and 268-270). Briefly, they consist of four steps (see Figure 4):

1) identifying causal statements;
2) separating the raw causal concepts from the raw effect concepts in each of those identified causal statements;
3) organizing the raw concepts identified into conceptual categories;
4) connecting the conceptual categories via causal links and casting them into a coded cognitive map.

The conceptual categories in which raw concepts are organized can be derived from extant theories. As discussed above, I use the typology of business model components developed by Baden-Fuller and Mangematin (2013) to derive these conceptual categories in this illustrative vignette. Figure 4 reports an example of how I applied this procedure for coding the text of Doganova & Eyquem-Renault's (2009) paper, with particular reference to one causal statement identified in that text (see p. 1565). Following this same coding procedure for all the causal statements identified in the text that I coded (Doganova &

[6] I coded the original text of the secondary documents as reported by the study's authors. However, in few instances this original text was intertwined with other text from the authors. In those few instances, I coded both the original text and the authors' text. If this were a methodological illustration of the cognitive mapping approach, I am aware that this practice would not have been fully orthodox from a methodological standpoint. However, since the cognitive maps are derived and reported only for illustrative purposes, I considered this practice was acceptable.

Eyquem-Renault, 2009: pp. 1563-1567), I obtained the two cognitive maps illustrated as Figures 2 & 3.

Figure 4: Typical Steps to derive a Cognitive Map