Routines, dominant logic and market dynamism: Reconfiguration challenges in Alberta's oil sands

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Routines, dominant logic and market dynamism:
Reconfiguration challenges in Alberta’s oil sands

by

Connie Van der Byl

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ABSTRACT

Energy companies must adapt to a rapidly changing and, at times, unpredictable business context. In response, some companies are looking inside their organizations to capabilities that can be reconfigured to capitalize on opportunities that will improve their economic and environmental performance. I use the dynamic capabilities framework to conduct a variance study examining challenges to reconfiguring capabilities for new technology adoption in Alberta’s oil sands. I find that a lack of formalized routines and deliberate planning associated with an entrepreneurial dominant logic are antecedents to negative reconfiguration outcomes. Informal routines are difficult to transfer and result in a ‘non transfer’ of capabilities in reconfiguration. In addition, fast paced planning can lead to a negative transfer where existing capabilities are not applicable to the new opportunity. I further find that a high velocity market intensified by the unpredictability of the natural system moderate the impact of an entrepreneurial dominant logic in reconfiguration. By explicating the micro foundations of a dynamic capability for reconfiguration, I provide insights into the tension between sensing and seizing opportunities in an entrepreneurial, incumbent firm and capability reconfiguration. I diverge from the extant literature by considering an entrepreneurial, fast paced response to external opportunity rather than one constrained by inertia and core rigidities. Data for this study is generated from 71 interviews conducted through an in-depth case study stemming from a creative sentence order connected to environmental noncompliance at Suncor Energy, Canada’s largest integrated energy company.
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For Mum
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CHAPTER 1: INTRODUCTION

“All glory comes from daring to begin.”
Eugene Fitch Ware

Organizations can be impeded by inertia as core rigidities develop over time (Leonard-Barton 1992; Sydow, Schreyoff & Koch, 2009; Schreyoff & Kliesch-Eberl, 2007). Entrenched processes and practices prevent the identification and development of new business ideas and innovations. Those organizations that have an entrepreneurial orientation are perceived to do better in the fast changing business environment of our times. Consequently, incumbent organizations are encouraged to develop entrepreneurial tendencies to counter rigidities (Eisenhardt & Martin, 2000; Teece, 2007). The literature on dynamic capabilities provides insight into how companies can better adapt to changes through sensing and seizing of opportunities and reconfiguring as necessary (Teece, 2007). While the disadvantages of inertia and rigidity are clearly identified in strategy literature, the challenges associated with entrepreneurialism in incumbent firms as they reconfigure capabilities are not addressed. In this in-depth case study, reconfiguration challenges are identified for an incumbent firm with an entrepreneurial dominant logic, defined as a mindset characterized by loose structures and sensing of opportunities (Ireland, Hitt & Sirmon, 2003; Meyer & Heppard, 2000; Prahalad & Bettis, 1996). I argue that there is a tension between an entrepreneurial dominant logic and effective capability reconfiguration for new technology development. In a high velocity market, sensing and seizing of opportunities may preclude development of formalized routines and deliberate thinking that mitigate reconfiguration challenges.

The tension between sensing and seizing opportunities is addressed in the dynamic capabilities and ambidexterity literatures (Teece, 2007; Tushman & O’Reilly, 1996; Raisch & Birkinshaw,
2008; Lavie, Stettner & Tushman, 2010; O’Reilly & Tushman, 2008). These research streams tend to focus on incumbent, established firms that have moved towards efficiency and are mired by inertia resulting in a tension between sensing (exploring) and seizing (exploiting) opportunities (Teece, 2007; O’Reilly & Tushman, 2008; Lavie et al, 2010; Eisenhardt et al, 2010; Eisenhardt & Martin, 2000; ). The recommendation for these organizations is to become more entrepreneurial. There is an inclination to focus on organizations that lack flexibility and a suggestion that core rigidities be overcome with entrepreneurial approaches (Teece, 2007). Teece (2007) and Lavie (2006) allude to the tension between sensing and seizing, and reconfiguration but do not explicate associated variables. Views in the extant literature are centred on the challenge of being entrepreneurial when growth has led to the establishment of structure and standardization. As asserted by Meyer and Heppard, “there is a real tension there” (2000, p. 19). Teece (2007) notes that the challenge is in staying agile after disciplines are instituted (p. 1347). However, less attention is given to organizations that grow quickly, where those disciplines may not be instituted before expansion through reconfiguration is executed. Challenges for these entrepreneurial organizations have not been explicated and connected to empirical evidence. Findings of this dissertation contribute to this research area.

The dynamic capabilities framework (Teece & Pisano, 1994; Teece, Pisano & Shuen, 1997) is used to explicate the micro foundations that underlie a dynamic capability for reconfiguration. Dynamic capabilities refer to an organization’s ability to adapt to changes in the external context through sensing and seizing of opportunities and reconfiguring as needed (Teece, 2007). While research in this relatively new theoretical area has expanded, there are still concerns over ambiguity (Zahra, Sapienza & Davidsson, 2006). The dynamic capabilities research to date has been predominantly conceptual with empirical evidence being limited (O’Reilly & Tushman,
Ambrosini and Bowman (2009) assert that qualitative fieldwork to derive the origins of resource creation and reconfiguration through detailed investigation within small sample studies of organizations is needed. In recent dynamic capabilities literature, effort is made to differentiate content analysis that focuses on ‘what’ constitutes a dynamic capability from the organizational and managerial processes that reveal ‘how’ dynamic capabilities are born (Peteraf, 2007, pp. 32 to 34). As a result, there is a call to explicate dynamic capabilities by looking at the micro foundations that underlie them. Teece (2007) defines micro foundations as, “distinct skills, processes, procedures, organizational structures, decision rules, and disciplines” (p. 1319).

This mandate to get at how capabilities come to be has historically affected the resource based view of the firm with requests to open the black box of how resources yield competitive advantage and how they are obtained (Priem & Butler, 2001). Felin, Foss, Hemeriks and Madsen (2012) set out to define the micro foundations of routines and capabilities with identification of three components: individuals, processes and interactions, and structure. The category of individuals reflects the importance of managerial cognition. This dissertation research focuses on processes and their relationship to cognition, as dominant logic, in the empirical setting of a firm. Individual managerial cognition is not considered in this dissertation since the level of analysis is the organization. Instead, dominant logic, as the mindset of the organization, is evaluated. Structure is included as an attribute of dominant logic. I contribute to dynamic capabilities literature by using the existing framework to empirically explicate dynamic capability micro foundations through an in-depth case study, taking the construct from the conceptual to the concrete. This research, then, provides a method for responding to Teece’s (2007) call to connect the framework to the ‘real world’.
Suncor Energy, Canada’s largest integrated oil company, is the source of empirical data for this dissertation. The single case study approach is used to facilitate in-depth study of the dynamic capability for reconfiguration. Dynamic capabilities theory focuses on a firm’s ability to adapt to changes in the external context (Teece & Pisano, 1994; Teece et al., 1997). Suncor Energy serves as an excellent case study given its attempt at corporate reconfiguration in the turbulent oil sands industry. In the late 1990s, as oil prices began their meteoric rise, Suncor expanded its core oil sands mining business into new development technology internally through reconfiguration of capabilities. This expansion was not without its challenges to Suncor, both operational and environmental. In April of 2009, Suncor was fined a record $675,000 for two environmental offences (Court Order, 2009). At the time Suncor was viewed as a leader in sustainability. The firm had made strides in climate change mitigation, renewable energy development and technology gains (Hall & Vredenburg, 2003). Not surprisingly then, the environmental noncompliance charges and the subsequent fine resulted in personal pain to key Suncor executives. This instance of sustainability strategy being decoupled from compliance implementation is not unique to Suncor. A number of recent pipeline incidents in North America beg the same question. Similarly, the infamous BP Deep Horizon catastrophe off the coast of Louisiana demonstrates a tension between strategic intent for sustainability and compliance execution (Hoffman & Jennings, 2011, p. 5). This challenge for sustainability is mirrored in the reconfiguration challenges faced by entrepreneurial organizations that grow quickly. The entrepreneurial dominant logic that permeated in Suncor and encouraged the growth and innovation that propels an industry forward also contributed to operational and compliance reconfiguration challenges. This paradox and the variables that led to it are central to this dissertation.
Energy markets are currently impacted by issues around security of energy supply, diminishing conventional resources, environmental legislation and heightened public scrutiny. All companies operating in Canada’s oil sands are being painted with the same ‘dirty oil’ brush. Factions of society call for an end to oil sands production or for a radical change to its development. In reality, there are many uncertainties and barriers associated with radical innovation (Hall & Vredenburg, 2003). Some companies are looking inside their organizations to the capabilities that can be reconfigured to capitalize on new and different opportunities. This approach to sustainability strategy stands in contrast to creative destruction and incremental change responses that have been prevalent in the literature (Hart & Milstein, 1999).

In sustainability theory, there is a need to bridge the external and internal business context to show why different companies respond differently to external pressures (Russo & Minto, 2012). The literature on Organizations and the Natural Environment (ONE) has focused on how organizations can respond to environmental demands and remain competitive (Bansal & Hoffman, 2012). Inherent in that research approach is a study of how organizations impact the natural environment and how that impact can be mitigated through environmental sustainability strategy. The environmental infractions and operational issues incurred by Suncor were a result of their real and potential negative impact on the environment. However, where this research diverges from existing sustainability strategy research is in its consideration of how the natural environment impacts firms with which it directly interacts. Increased unpredictability in the natural system requires an organization to adjust accordingly. I find that, through evaluation of the external context, the definition of market dynamism is extended to include the natural resource and environment.
Suncor Energy is studied to understand the dynamic capability for reconfiguring capabilities into a new business while maintaining the existing core business (Teece & Pisano, 1994; Teece et al., 1997; Teece, 2007; Penrose, 1959). As a result of the environmental infractions incurred by Suncor, a creative sentencing project was established to facilitate a regulatory compliance research project (Court Order, 2009). Creative sentencing in Alberta was developed in the late 1980s and allows prosecutors to use alternative measures to a traditional fine when prosecuting firms or individuals who fail to comply with environmental regulation. This creative sentence order, imposed by the Alberta provincial court, required Suncor to both fund and participate in a research project. Data for this dissertation was made available through the creative sentence. Interviews were conducted with 50 Suncor employees and 21 stakeholders from outside the organization. The single case study approach facilitated in-depth analysis of reconfiguration and was informed by a conceptual model linked to the dynamic capabilities framework (Teece & Pisano, 1994; Teece et al., 1997). I used qualitative data analysis methods to define constructs and interrelationships and to develop a causal model linked to outcome challenges (Miles & Huberman, 1994; Van de Ven, 2007). The overriding theoretical research question is: What are the micro foundations of a dynamic capability for reconfiguration? Practical questions sought to determine what led to the noncompliance and operational challenges as Suncor reconfigured into the in situ oil sands business.

Suncor’s exploration in new technology was conducted while the core business proceeded through a high growth phase. Expansion occurred through redeployment of capabilities from the existing business into the new and technologically different business. In redeployment, capabilities are transferred or shared between the new and existing businesses (Helfat and Peteraf, 2003). Early evidence showed this was not without its challenges. Much can be learned
from organizational failure and it remains a relatively untapped source of empirical data in management literature (Hoffman & Jennings, 2011; Hoffman & Bansal, 2012; Tinsley, Dillon & Madsen, 2011; Gino & Pisano, 2011). This study provides academic contributions to strategy and sustainability literature but also can provide lessons to practitioners through study of reconfiguration challenges in an entrepreneurial firm focused on growth.

I explicate dimensions of the dynamic capability for reconfiguration focusing on routines, dominant logic and the external context. Lavie (2006) identifies a need for theory of the antecedents and consequences of capability reconfiguration. Salvato (2003) considers the lack of studies tracing recombination of routines and the development of strategy. Existing studies of reconfiguration are conceptual and focus on challenges for incumbent firms where structure and processes are linked to inertia. This extant literature identifies tacit routines, managerial cognition, and uncertainty and low munificence in the external context as challenges to reconfiguration (Lavie, 2006; Sirmon, Hitt & Ireland, 2007; Galunic & Rodan, 1998). The cognitive challenge for managers in established, incumbent firms is to sense and seize opportunities (Teece, 2007). This dissertation research considers the constructs of routines, cognition and external context but in the setting of an entrepreneurial, incumbent firm that is not restricted by core rigidities in process and structure and that does not suffer from inertia. Suncor, instead, has an entrepreneurial dominant logic that encourages informal processes and fast thinking (Kahneman, 2011). The organization responds quickly to opportunities in a dynamic high velocity external context (Eisenhardt & Martin, 2000). I find that Suncor’s interaction with the natural resource and environment adds an additional layer of unpredictability to this dynamic context.
Literature on efficiency versus flexibility argues that in high velocity dynamic markets simple rules allow for the flexibility necessary to respond to the changing external context (Eisenhardt & Martin, 2000; Eisenhardt, Furr & Bingham, 2010; Bingham, Eisenhardt & Furr, 2007). These rules are defined as, “simple (not complicated), experiential (not analytic), and iterative (not linear) processes” (Eisenhardt & Martin, 2000, p. 1113). These simple rules may take the form of articulated heuristics that have been developed through experience or learning by doing (Bingham et al, 2007; Eisenhardt & Martin, 2000). Simple rules and heuristics allow for improvisation and adjustment (Bingham et al, 2007). As the external context changes, simple rules allow organizations to adjust and adapt accordingly. “When markets are very dynamic, or what is termed “high velocity”, change becomes nonlinear and less predictable” (Eisenhardt & Martin, 2000, p. 1111). In this study, I find that for an entrepreneurial firm attempting reconfiguration in a high velocity market, a lack of formalized routines in key foundational activities like compliance and operations leads to challenges and outcomes of environmental noncompliance and operational near misses.

I contend that the extant research does not adequately consider entrepreneurial firms that are adept at sensing and seizing opportunities but, because of their rapid growth, lack formalized explicit routines. This deficiency can lead to challenges as the organization attempts expansion internally that requires reconfiguration of capabilities. Challenges identified in this case study indicate that the informal routines and fast thinking linked to an entrepreneurial dominant logic lead to a non-transfer and negative transfer of capabilities in reconfiguration which created negative reconfiguration outcomes. I define non-transfer as a situation where a capability cannot be transferred from the existing to the new business because it is not formalized through codification. The construct of negative transfer is borrowed from the acquisitions literature to
identify the transfer of a capability from an existing business that is not applicable to the new initiative (Finkelstein & Habelstein, 2002).

The theoretical goal of this research study was to contribute to understanding of dynamic capabilities in organizations by explicating the foundations of reconfiguration. By examining the negative compliance and operational outcomes associated with reconfiguration, this dissertation identifies the importance of formalized routines and deliberate thinking in mitigating reconfiguration challenges for entrepreneurial firms operating in high velocity markets. The findings provide empirical evidence of the tension that exists between sensing and seizing opportunities, and reconfiguring in an organization. The fast thinking and informal structure associated with an entrepreneurial dominant logic results in reconfiguration challenges where informal explicit routines result in non-transfer and a lack of deliberate planning leads to negative transfer. This focus on an entrepreneurial firm that lacked codified, explicit routines provides a contrasting perspective to extant literature that focuses on incumbent firms that are efficiency driven and mired by formalized processes that lead to capability rigidity and inertia (Eisenhardt & Martin, 2000; Eisenhardt, Furr & Bingham, 2010; Teece, 2007; Lavie, 2006). For entrepreneurial firms growing quickly in response to external market dynamism, the taken for granted assumption of formalized foundational routines may not apply and challenges are not in sensing and seizing opportunities but in effective transfer of routines through reconfiguration.

This research provides a contrasting perspective to the extant literature by considering the challenges of entrepreneurial, incumbent firms as they reconfigure capabilities. However, this study does not challenge previous research that incites incumbent firms to act more entrepreneurially. In fact, the entrepreneurial dominant logic that permeated in Suncor and contributed to its reconfiguration challenges also encouraged the growth and innovation that
propels an industry forward. In Suncor’s case, Firebag was later identified as the leading steam assisted gravity drainage (SAGD) project in Alberta for environmental performance in a 2010 study conducted by an Environmental Non-Governmental Organization or ENGO (Pembina, 2010). The Firebag in situ project was executed relatively quickly and resulted in, “the most prolific production wells in the business” (Suncor Energy Inc., 2011). Investment analysts attribute Suncor’s Firebag project with making a significant contribution to the record levels of production of bitumen in Alberta (Healing, 2011). So, rather than refute the extant literature, this study augments it by providing insights into the challenges that may accompany entrepreneurialism in incumbent firms as they attempt reconfiguration.

This dissertation is structured in the following manner. In Chapter 2 a review of the extant literature on capability reconfiguration is provided and connected to sustainability strategy. Material in this chapter establishes the theoretical foundation of the study. Chapter 3 outlines research methods. In Chapter 4 the external context is evaluated and defined as both a setting and a variable in the analysis. The oil sands industry is proven to be a high velocity dynamic market intensified by an unpredictable natural system. Suncor’s response to exogenous market pressures, including investor demands for production increase, was to grow quickly. Fast pace led to a short pilot period which, coupled with the unpredictability of the reservoir, resulted in operational issues. Chapter 5 and 6 outline the variables and causal model linking operational and compliance negative outcomes to antecedents. Finally, Chapter 7 discusses contributions of this research, managerial implications and directions for future research.
CHAPTER 2: THEORETICAL FOUNDATIONS

“In rapidly changing environments, there is obviously value in the ability to sense the need to reconfigure the firms’ asset structure and to accomplish the necessary internal and external transformation.” (Teece et al., 1997, p. 520)

Dynamic capabilities theory provides the foundation to guide decisions in this dissertation. Additional theoretical constructs that inform the study include sustainability strategy, market dynamism, and dominant logic. The dynamic capabilities framework is used to explicate the micro foundations of a dynamic capability for reconfiguration (Teece & Pisano, 1994; Teece et al., 1997) Reconfiguration is suggested as an intermediary option to creative destruction and incremental change for organizations developing sustainability strategies (Hart & Milstein, 1999; Albino, Balice & Dangelico, 2009). In keeping with the framework and based on the extant literature of capability reconfiguration the variables of routines, context and cognition actuate initial data analysis. Routines are defined conceptually by Teece (2007) as a micro foundation of dynamic capabilities along with skills, procedures, structure, rules and disciplines (p. 1319). Use of dynamic capabilities theory includes evaluation of both the internal and external business contexts. The implications of high velocity market dynamism, complicated by the unpredictability of the natural environment, are considered. Cognition, in this study, is defined as dominant logic – the mindset of an organization and associated structure in the organization (Prahalad & Bettis, 1996; Grant, 1988). The subject of this study is an organization with an entrepreneurial dominant logic characterized by loose structures and sensing of opportunities (Ireland, Hitt & Sirmon, 2003; Meyer & Heppard, 2000). Reconfiguration challenges in this study deviate from those identified in the literature for incumbent firms with core rigidities that lead to inertia. Analysis of these challenges contributes to theoretical conversations suggesting a
tension between entrepreneurial sensing and seizing of opportunities and reconfiguration (Teece, 2007; Lavie 2006).

2.1 Dynamic Capabilities
The dynamic capabilities framework was introduced by David Teece and Gary Pisano in their 1994 paper, “The Dynamic Capabilities of Firms: an Introduction”. The framework has evolved to define a firm’s capacity: “(1) to sense and shape opportunities and threats, (2) to seize opportunities, and (3) to maintain competitiveness through enhancing, combining, protecting, and, when necessary, reconfiguring the business enterprise’s intangible and tangible assets” (Teece 2007, p. 1319). This definition is an expansion on earlier work that identified dynamic capabilities as the source of competitive advantage and saw them clearly defined as, “the term ‘dynamic’ refers to the shifting character of the environment....the term ‘capabilities’ emphasizes the key role of strategic management in appropriately adapting, integrating and re-configuring internal and external organization skills, resources and functional competences toward the changing environment (Teece & Pisano, 1994, p. 538). Teece, Pisano and Shuen (1997) later added, “We refer to this as the ‘dynamic capabilities’ approach in order to stress exploiting existing internal and external firm-specific competences to address changing environments” (p. 510). In 2007, Teece advanced the framework by stating that dynamic capabilities can lead companies to, “continuously create, extend, upgrade, protect, and keep relevant the enterprise’s unique asset base” (p. 1319). The approach taken by Teece is supported by Helfat (2007), “a dynamic capability is the capacity of an organization to purposefully create, extend, or modify its resource base” (p. 4); including the capacity to, “identify the need or opportunity for change, formulate a response to such a need or opportunity, and implement a course of action” (p. 2).
Dynamic capabilities are about change (Helfat, 2007). This aspect of the theory distinguishes dynamic capabilities from the static capabilities of the resource based view of the firm. Schreyoff and Kliesch-Eberl (2007) define dynamic capabilities as the renewal of organizational capabilities as the external environment changes. Both internal capabilities and the external environment are dynamic (p. 914). Similarly, Daneels (2008) and Winter (2003) distinguish dynamic capabilities from ordinary capabilities and routines through change.

Nelson and Winter (1982) note the challenge of drawing upon specialized, infrequently used routines in response to changes in the environment of the organization. Helfat (2007) acknowledges that dynamic capabilities may involve some degree of patterned behaviour (p.1). In this way, dynamic capabilities differ from ad-hoc problem solving (Winter, 2003). While dynamic capabilities may be repeated, this is not likely to occur in a rote fashion given that their execution will change as the external business contexts changes (Helfat, 2007; Eisenhardt & Martin, 2000). More recent theorizing contrasts routinized capabilities with dynamic capabilities. Felin and Foss (2004) provide the explanation that, “Overall – to again distinguish routines from capabilities – the latter reflect the ability of the organization to reflexively revisit what it routinely does, particularly in dynamic, changing environments” (p. 11). In other work, dynamic capabilities are distinguished as higher order routines or meta routines (Teece & Pisano, 1994; Teece et al., 1997; Teece, 2007).

In dynamic capabilities research, the key to success is “identifying new opportunities and organizing effectively and efficiently to embrace them” (Teece et al. 1997, p. 509). There is an emphasis on gaining competitive advantage through strategic management but also through the firm assets and “how these assets can be deployed and redeployed in a changing market” (Teece et al. 1997, p. 529). Stated differently, Rugman and Verbeke (2000) describe dynamic
capabilities in this context as, “dynamic capabilities (at least implicitly) reflect the firm's ability to respond effectively, on the basis of its internal strengths/weaknesses, to external opportunities/threats. These dynamic capabilities include special company strengths to cope with the shifting character of the environment” (p. 378). Dynamic capabilities are typically associated with a firm’s ability to reconfigure, redeploy, or otherwise change existing resources in order to respond to environmental change (Feldman & Pentland, 2003). The key to unlocking dynamic capabilities in an organization is understanding how companies develop the capacity to sense opportunities and threats, seize opportunities and do things to assets to remain competitive (Teece, 2007).

Dynamic capabilities, in this dissertation, are defined as higher order capabilities that allow organizations to change resources to adapt to a changing external context. Dynamic capabilities include the abilities to sense and seize opportunities and to reconfigure capabilities when necessary to capitalize on those opportunities (Teece, 2007). Dynamic capabilities are deliberate and not ad hoc problem solving (Helfat, 2007). They typically occur infrequently and require adjustment as the context changes (Nelson & Winter, 1982, Felin & Foss, 2004).

Teece et al. (1997) contend that a firm’s competitive advantage lies in its organizational processes, which are shaped by the firm’s assets or positions and its evolutionary path. The firm’s ability to evolve is constrained by its positions and paths. Since competitors are similarly constrained, a competitive advantage stems from the firm’s ability to reconfigure and transform capabilities. The authors propose a framework for the dynamic capabilities approach that is based on three classes of factors that yield a firm’s distinctive competence and dynamic capability: processes, positions and paths (p.516). Teece and Pisano (1994) assert that by
understanding the interrelationships between these dimensions the performance of the firm can be predicted for various assumptions and external environment conditions.

**Figure 1: Dynamic Capabilities Framework**

Managerial and organizational processes are the routines of the firm or how things are done. These include integration, learning and reconfiguration processes (Teece, 1997). Teece (2007) later defines micro foundations that undergird the dynamic capabilities to sense, seize and reconfigure as, “distinct skills, processes, procedures, organizational structures, decision rules, and disciplines” (p. 1319). Peteraf and Maritan (2007) note that dynamic capabilities are observed through their underlying processes; however, this relationship is often implied and not explicitly stated. In addition, these underlying processes can affect organizational outcomes (Peteraf & Maritan, 2007). There is an opportunity to explicate the micro foundational processes that underlie a dynamic capability and to tie those processes to outcomes.

Position refers to the asset position of organizations. Assets include specialized plant and equipment and knowledge assets (Teece & Pisano, 1994; Teece et al., 1997). Teece et al. (1997) identify the following classes of assets: technological, complementary, financial, reputational, structural, institutional, market and organizational boundaries (p. 521). Path refers to where a
company has been and what alternatives are available to it moving forward (Teece, 2007). The contention is that history matters and that it conditions how managers perceive strategic options (Teece et al., 1997). This cognitive aspect of path is linked to the theoretical construct of dominant logic since dominant logic is defined by the organization’s mindset or cognitive maps and is shaped by the experiences of managers and employees (Amit, Brigham and Markman, in Meyer & Heppard, 2000).

Prahalad and Bettis (1986) first defined dominant general management logic as, “the way in which managers conceptualize the business and make critical resource allocation decisions” (p. 490). The authors linked dominant logic to diversification performance defining the need for multiple dominant logics where strategic variety existed in the diversified firm. Later, Bettis and Prahalad’s (1995) thinking evolved to view dominant logic as a filter for organizations adapting to changes in their external business environmental. The construct is often defined as a mindset linked to the beliefs and assumptions of managers (Lampel & Shamsie, 2000). The tacit nature of dominant logic leads to measurement challenges.

In response to measurement challenges, the literature has moved from viewing dominant logic primarily as cognition (Lampel & Shamsie, 2000), to linking the construct to organizational systems (Grant, 1988) or a combination of the two (Obloj, Obloj & Pratt, 2010). Obloj et al. (2010) find dominant logic to be embedded in organizational routines through codification of learning on one side and defined by sensing and proactivity on the cognition side. Grant’s (1988) attempt to operationalize dominant logic was founded in Bettis and Prahalad’s (1995) observation that dominant logic is, “incorporated into the strategy, systems, values, expectations and reinforced behaviour of the organization” (p. 7).
Definitions of culture and dominant logic share commonalities. Howard-Grenville and Bertels (2012), in their assessment of culture and environmental practices, review three perspectives on culture: shared norms or values; filter or frame; toolkit. It is evident that dominant logic and culture can both be defined in terms of filters and beliefs. However, definitions of dominant logic are linked to processes. Dominant logic supports visible features of the organization like strategy, structure and systems (Prahalad & Bettis, 1995). Grant (1986) propounded that measurement issues with the dominant logic could be addressed by operationalizing the construct as a reflection of the administrative tools in the organization. Other academics define dominant logic as a combination of the mindset and the processes of the organization (Obloj et al., 2010; Verbeke, 2010). Lavie (2006) suggests that when including political and cultural influences, internal organizational processes and associated path dependence and inertia have more effect on technological change than the nature of the technology. Lavie (2006), in effect, states that cultural influences or dominant logic, as defined in this study, affect organizational processes which in turn impact the response to technological change. This connection between dominant logic and processes supports the decision to equate path with dominant logic in the conceptual model for assessing the dynamic capability for reconfiguration (see Figure 2).

In further support, the empirical study of reconfiguration at Polaroid by Tripsas and Gavetti (2000) defines the link between managerial cognition, firm history and dominant logic. The historical environment of a firm influences managerial beliefs. In their study, the dominant logics that existed at Polaroid both enabled and impeded reconfiguration, ultimately leading to failure for Polaroid in transitioning to digital imaging. Similarly, Rosenbloom’s (2000) study of NCR’s reconfiguration into electronics attributes success to new leadership and their decision to pursue paths in electronics research and acquisition. This new leadership was not encumbered
by the pre-existing dominant logic that was deficient in learning and adaptation. These studies demonstrate the importance of path and, by extended definition, dominant logic in dynamic capability execution; in particular, the dynamic capability for reconfiguration.

Using Teece’s framework as a foundation and given a cursory understanding of key variables affecting Suncor’s reconfiguration, the following conceptual model was developed to influence data analysis:

**Figure 2: Conceptual Model**

This dissertation focuses precisely on the firm’s ability to reconfigure its assets or resource base. As its inceptor, David Teece (2007), contends, the dynamic capabilities theoretical framework seeks to explain the competitive advantage of a firm over time and a framework is connected to the real world. This research contributes to explicating the micro foundations of the dynamic capability for reconfiguration. There is a need in the developing literature to ascertain the processes that underlie a dynamic capability (Teece, 2007; Peteraf & Maritan, 2007). In the
dynamic capabilities framework position and path are expected to affect processes (Teece & Pisano, 1994; Teece et al., 1997). Dominant logic in my model is equated with path. Given concerns over ambiguity in definition (Zahra, Sapienza & Davidsson, 2006), I clearly define dynamic capabilities as deliberate, sometimes infrequent, capabilities to sense, seize and reconfigure as the external business context changes. The focus of this research study, given the details of the Suncor case, is the dynamic capability for reconfiguration.

2.2 Capability Reconfiguration
Renewing competitive advantage in changing contexts requires the development of new capabilities or the reconfiguration of existing capabilities into new capabilities leading to strategic innovations (Feldman & Pentland, 2003; Teece, 2007; Helfat, 2007). A firm’s ability to effectively reconfigure capabilities may indicate a dynamic capability for reconfiguration. Reconfiguration is defined as “the change of resources (or capabilities) within an organization” (Karim & Mitchell, 2000, p. 1066). It is a transformational construct through which organizations create new capabilities, dispose of some and transfer or redeploy capabilities to other organizational or geographic locations (Teece & Pisano, 1997; Teece, 2007; Helfat & Peteraf, 2003). Capability transfer can be costly as routines are often difficult to change (Teece, 2007). Capron, Dussauge and Mitchell (1998) define resource redeployment as, “the use by a target or acquiring business of the other business’s resources…” (p.631). Capability redeployment can take two forms. In one, capabilities are shared between the new and traditional or core business. In the second, capabilities are transferred from the old market to the new (Helfat & Peteraf, 2003, p. 1006). Resource redeployment can occur internally or through merger or acquisition (Teece, 2007). In summary, for this research study, reconfiguration entails the transfer and/or sharing of capabilities internally for expansion through technology development.
In the strategy literature, there are rival perspectives on how sustainability, and by extension environmental performance, can be achieved. Some scholars project corporate sustainability will be achieved through continuous improvement and greening efforts (Albino et al., 2009). Others see a need for creative destruction and competency destroying technological advancements (Hart & Milstein, 1999). In reality, there are many uncertainties and barriers associated with radical innovation (Hall & Vredenburg, 2003). Some companies have been successful by combining traditional approaches with new technology (Vredenburg & Westley, 1997).

Hart (1997) champions the ‘beyond greening’ philosophy. He calls for companies to move beyond greening strategies and to consider a world context in which sustainability strategies are not internally focused on greening alone. There is the potential for developing new technologies in existing consumer markets in an effort to reduce the environmental impact. In emerging markets new technologies should be implemented to avoid repeating environmental impact. Companies have the opportunity to develop new technologies, products and processes for a market with unmet basic needs. This perspective is extended by Hart and Christensen (2002) in literature on bottom of the pyramid marketing.

Only through significant changes in technology can the environmental burden that is initiated by growing populations and increasing affluence levels be stabilized. It is in this regard that Hart and Milstein (1999) foresee ‘creative destruction’, in the spirit of economist Joseph Schumpeter, as the sustainability solution. In creative destruction, innovative industry entrants oust incumbent firms and those companies relying on incremental improvements will fail to meet the challenge of a dynamically changing context (Hart & Milstein, 1999). Energy companies are predicted to find sustainability a “competency destroying challenge that calls for radical repositioning and new competency development” (Hart & Milstein, 1999, p. 25). Competency
destroying radical innovation is required rather than competency enhancing incremental innovation (Hall & Vredenburg, 2003). At the end of their paper, Hart and Milstein (1999) allow room for participation of incumbent companies in creative destruction but with a scepticism shared by Schumpeter.

Hall and Vredenburg (2003) acknowledge the challenges associated with radical innovation; the associated ambiguity and complexity of the issue. Sustainable development innovation is more complicated because of the ambiguous interests of various stakeholders. Its implementation may consequently prove costly. As a result, “companies prefer an incremental (or competency-enhancing) approach, because it allows them to continue profiting from their proven technology and organizational competency base” (p. 63).

In the sustainability literature, there exists an opportunity to consider an alternative response between these dichotomies of creative destruction and incremental change. I suggest that capability reconfiguration can be the intervening response. A dynamic capability for reconfiguration may be neither capability destroying nor enhancing but rather propel an organization into new, more sustainable businesses especially via technological change. The literature on sustainability has long considered innovation as an important response to environmental performance that can lead to competitive advantage (Porter & van der Linde, 1995).

A number of general strategic management theoretical models based either in dynamic capabilities or the resource based view (RBV) and contingency research streams address this void between creative destruction or competency destroying, incremental change and competency enhancing. These models focus, instead, on the construct of capability
reconfiguration. Lavie (2006), Sirmon et al. (2007), Galunic and Rodan (1998), and Helfat and Peteraf (2003) define dimensions of capability reconfiguration that go beyond the dichotomy of competency enhancing and destruction to an interim construct for capability reconfiguration where capabilities are transferred from the existing to the new business opportunity. Figure 3 presents the varied terminology in the strategy and sustainability literature tied to reconfiguration and the alternatives of incremental and radical change at either ends of the continuum. The opportunity to introduce reconfiguration to sustainability strategy is highlighted in Figure 3.

**Figure 3: Reconfiguration Continuum**

<table>
<thead>
<tr>
<th>Author (year)</th>
<th>Incremental</th>
<th>Reconfiguration</th>
<th>Radical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teece (2007)</td>
<td>Incremental</td>
<td>Transfer/Redeployment</td>
<td>Acquisition/Divestiture</td>
</tr>
<tr>
<td>Hart and Milstein (1999)</td>
<td>Incremental</td>
<td>Competency Enhancing</td>
<td>Creative Destruction</td>
</tr>
<tr>
<td>Hall and Vredenburg (2003)</td>
<td>Competency Enhancing</td>
<td>Transformation</td>
<td>Competency Destroying</td>
</tr>
</tbody>
</table>

Lavie (2006) uses dynamic capabilities and the technological discontinuities perspective to define capability mechanisms. Mechanisms are the actual methods that underpin a dynamic capability for reconfiguration. Capabilities can be reconfigured in response to technological change via substitution, transformation or evolution. Substitution involves the replacement of existing capabilities with new ones for technology development. Transformation has existing capabilities modified and knowledge integrated from various sources in adapting capabilities. At the other end of the capability reconfiguration continuum is evolution (Lavie, 2006). Capability evolution is akin to incremental change (Kolk & Pinkse, 2008). This evolution typically occurs
over time and may entail experimentation and trial and error. Evolution occurs internally and does not apply to new capabilities but only to existing ones (Lavie, 2006).

Through capability substitution, firms choose to retain, discard or acquire new capabilities in response to technological change (Lavie, 2006). The external market can be used for substituting existing capabilities through acquisition. This may be the case where knowledge or systems cannot be developed internally and where the market offers the required expertise. Capability acquisition can occur through mergers and acquisitions of companies, through alliances, industry associations, joint ventures and through hiring (Lavie, 2006).

The intermediate response to technological change is defined as capability transformation. Capability transformation occurs through modification via existing and new know-how. This mechanism combines existing with new capabilities in the firm. In this way, new and existing routines are integrated in response to technological change. Codification of routines is assumed to occur in the evolution stage, preceding transformation. The capability transformation process is influenced by both internal and external sources (Lavie, 2006).

In Lavie’s (2006) work, capability reconfiguration is a two stage process where the first stage involves a cognitive ability to redefine perceived value of capabilities in light of new technologies and the second is in the actual integration of the capability. Reconfiguration is subject to cognitive absorptive capacity costs from inaccurately identifying technological change and the required response. Operational absorptive capacity is part of transformation and refers to the cost of unsuccessful integration and challenges bringing the technology to market. Both cognition costs constitute opportunity costs to the organization. Lavie (2006) uses the example of IBM where cognitive absorptive capacity is more effective than operational absorptive capability. However, the tension between these constructs is not assessed.
Capability reconfiguration through transfer of capabilities from an existing business to a new technology has implications for sustainability theory. Lavie’s framework was applied in a study of multi-national enterprise (MNE) responses to climate change. In that study, Kolk and Pinkse (2008) find that while transformation holds promise for organizations dealing with climate change in actuality it has had mixed success.

Sirmon et al. (2007) attempt to look inside the black box of resource management in dynamic environments. In doing so, they theoretically integrate RBV, contingency and organization learning theory to explain resource management processes. Resource management is defined by structuring, bundling and leveraging the resource portfolio. Structuring the resource portfolio involves acquiring, accumulating and divesting resources. An organization's decision to structure resources through accumulation rather than acquisition from the external market may be affected by low munificence in the market which makes internal resource development attractive. In addition, internal accumulation can be ambiguous to outside competitors and create an isolating mechanism (Sirmon et al., 2007).

Bundling of resources to form capabilities can involve stabilizing, enriching or pioneering. Stabilizing involves minor capability improvement or incremental change. Where enriching extends existing capabilities, pioneering leads to the creation of new capabilities. Pioneering can involve recombination of existing capabilities or integration of new and existing ones (Sirmon et al., 2007)

Firms leverage or apply bundled capabilities to realize competitive advantage. The process of leveraging includes mobilizing, coordinating and deploying of capabilities. Mobilization is an upfront identification of the capabilities necessary for exploiting an opportunity or responding to a threat and the design of the associated capability configuration. This process becomes
challenging when uncertainty in the environment leads to ambiguity regarding identification of those capabilities that will lead to value creation (Sirmon et al., 2007).

Coordination has mobilized capabilities integrated for effective execution. Both explicit and tacit knowledge are shared through internal networks to achieve integration. Routines for integration based on experience can facilitate this process. An example of coordination would be the integration of engineering and R&D functions. Structurally, cross functional teams can support coordination efforts (Sirmon et al., 2007).

Challenges to integration are founded in the external context. In markets of low munificence it may be difficult to acquire capabilities due to their scarcity (Sirmon et al., 2007). Munificence is defined as, “the scarcity or abundance of critical resources needed by (one or more) firms operating within an environment” (Castrogiovanni, 1991, p. 542). High or low munificence is one dimension of external environment with dynamism being the second (Sirmon et al., 2007).

Galunic and Rodan (1998) find resource recombination mediated by variables of detection likelihood and exchange costs. That is, ex ante knowledge to conceptualize recombination and the cost of transferring knowledge across boundaries. Detection is a means for identifying a potential resource or recombination opportunities and is affected by the antecedents of explicit versus tacit routines. More explicit routines are correlated to more detection. Recombination of tacit routines requires transfer through social networks or via people. There are costs associated with this transfer of tacit routines and challenges in recombination by existing companies (Galunic & Rodan, 1998). Similarly, Grant (1996a) finds efficiency gains in the use of rules and routines to avoid costs of communication and knowledge transfer. Communication is reserved for complex, unusual, important tasks. However, the more explicit the routine the more likely
the routine will become less applicable in new settings because tacit analytical knowledge that identifies the application in the new setting will be missing (Galunic & Rodan, 1998).

The capability lifecycle has capabilities going through stages of founding, developing and maturity unless impacted by a selection event. External selection events might include changes in demand and science and technology, availability of inputs and government regulation. These events lead organizational transformation as defined by branches of the lifecycle and the six Rs – retirement (death), retrenchment, renewal, replication, redeployment and recombination. Branching can happen during development or maturity (Helfat & Peteraf, 2003). Renewal involves modifications to the capability, usually improvement, and may be likened to evolution of the capability. Replication and redeployment involve transfer of the capability with an associated cost. Replication may be ensued by a period of reduced performance as the capability ascends the experience curve in a new setting. Redeployment differs from replication because the market is for a different but closely related product or service. In redeployment, the capability is transferred or shared between the new and existing markets. Redeployment often requires some alteration of the capability and some development of the capability resulting in it looking quite different. Recombination becomes a form of renewal. A redeployment capability that facilitates internal growth is a dynamic capability. The lifecycle contributes to explaining the heterogeneity of capabilities in firms (Helfat & Peteraf, 2003).

The following table highlights this literature review and demonstrates that research is concerned with the challenges of reconfiguration and the dimensions of cognition (Lavie, 2006; Teece, 2007), routine (Galunic & Rodan, 1998) and context (Sirmon et al., 2007).
Table 1: Reconfiguration Literature Summary

<table>
<thead>
<tr>
<th>Terminology</th>
<th>Study</th>
<th>Mechanism</th>
<th>Cognition</th>
<th>Routines</th>
<th>Challenge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reconfiguration</td>
<td>Conceptual</td>
<td>Transfer</td>
<td>Sensing</td>
<td>Micro foundations – processes,</td>
<td>Entrepreneurship and Tension with Efficiency</td>
</tr>
<tr>
<td>Transformation</td>
<td>Conceptual</td>
<td>Combine (share) existing and new routines</td>
<td>Absorptive Capacity</td>
<td>Assumed codification occurs in evolution</td>
<td>Cognition Costs</td>
</tr>
<tr>
<td>Enriching</td>
<td>Conceptual</td>
<td>Coordination – integration and sharing</td>
<td>Mobilization</td>
<td>Explicit and Tacit Knowledge</td>
<td>Environmental Uncertainty - Munificence</td>
</tr>
<tr>
<td>Recombination</td>
<td>Conceptual</td>
<td>Transfer</td>
<td>Detection</td>
<td>Tacit routines and assumed codified explicit routines</td>
<td>Transfer Cost of Tacit Routines</td>
</tr>
<tr>
<td>Redeployment</td>
<td>Conceptual</td>
<td>Transfer Share</td>
<td></td>
<td>Task and coordination routines</td>
<td>External Selection</td>
</tr>
</tbody>
</table>

Despite differences in terminology, each of these reconfiguration approaches includes either transfer or sharing of capabilities. In this research study, transfer and sharing of both internal and external capabilities define reconfiguration. Each of the studies presented in the table also consider the challenges of cognition, routines and the external context in reconfiguration. Cognition assumes an assessment of external opportunities before transfer or sharing of capabilities. It also requires a deliberate assessment of the capabilities to be transferred (Lavie, 2006). In each study, upfront cognition occurs to identify opportunities through sensing, absorptive capacity, mobilization or detection (see Table 1). Capabilities are distinguished as explicit or tacit routines with more explicit routines facilitating transfer (Galunic & Rodan, 1998). There is an inherent assumption that explicit routines have been codified in the evolution of firm capabilities (Lavie, 2006, Galunic & Rodan, 1998). Low munificence and uncertainty in
the external context add to reconfiguration challenges (Sirmon et al., 2007; Helfat & Peteraf, 2003).

The extant literature on capability reconfiguration conceptually addresses the central question of challenges associated with reconfiguration. This dissertation contributes to that literature by providing empirical investigation of key constructs connected with reconfiguration challenges. This study diverges from past work by considering an incumbent organization that is entrepreneurial rather than constrained by rigidities and inertia. In congruence with both the reconfiguration literature (Table 1) and the conceptual framework developed (Figure 2) the theoretical constructs of routines, dominant logic and external context are evaluated in this dissertation and connected to negative outcomes or challenges.

2.3 Reconfiguration Challenges
Research indicates there are challenges associated with capability transfer (Lavie, 2006). From the studies considered in this chapter, I determine that reconfiguration challenges include: ambiguity in tacit routines; managerial cognition; and external market munificence. The studies on capability reconfiguration identify challenges at both the routine and cognition levels. Maritan and Brush (2003) find that heterogeneity between plants leads to isolating mechanisms in managerial approaches and resource endowments and causes challenges in replication of routines and transfer of best practices. These challenges, connected to tacit routines and managerial cognition, have application to both internal expansion through diversification and to organizational growth through acquisitions.

Challenges in transferring tacit routines are confirmed in other research streams. The knowledge transfer literature states that ambiguity in knowledge, as indicated by tacitness, complexity and specificity, is found to negatively impact transfer. At the same time, an opposing benefit to tacit
routines lies in ambiguity preventing imitation by rivals (Zander & Kogut, 1995; van Wijk, Jansen & Lyles, 2008). Knowledge transfer is defined implicitly but also as knowledge sharing and knowledge acquisition (van Wijk et al., 2008). Transfer success is augmented through codification of knowledge or through transfer of people (Teece, 2007). Transfer of tacit knowledge can result in additional costs to the organization in time and unsuccessful transfer. Zollo and Singh (2004) find that firms learn through the process of articulating and codifying experiential learning. They find a strong and positive relationship between codification and performance in acquisitions, “at increasing levels of complexity, the benefits of explicitly extracting lessons learned from previous experiences appear to exceed the costs connected to codification activities” (p. 1252). Tacit capabilities lead to causal ambiguity and, lacking codification, are challenging to transfer to new sites (Szulanski, 1996; Zander & Kogut, 1995).

The negative implication of codification is that it is easily replicated by competitors (Eisenhardt & Martin, 2000). However, the authors argue that more than the codified routines themselves, the process of creating them yields competitive advantage. The act of codification itself requires deliberate learning. In the act of codification, employees become more familiar with the process, thereby developing associated tacit knowledge as well (Zollo & Singh, 2004). Martin and Eisenhardt (2010) found high performance in collaboration was tied to deliberate learning prior to the collaboration decision. In their study, deliberate learning activities are, “explicit attempts to gain new information from experience” (p. 279). It can thus be concluded that codified routines are more easily transferred. Detailed analysis of capability transfer in this dissertation will yield insights into the potential for explicit, uncodified routines leading to challenges.

Replication and transfer of capabilities in mergers and acquisitions and international expansion is well chronicled in the literature (Teece et al., 2009). In the acquisitions literature, an additional
challenge to capability transfer is identified as negative transfer. Finkelstein and Halebian (2002) draw on psychology literature to extend individual transfer effects to the organization, specifically in the context of corporate acquisitions. Negative transfer is defined as occurring, “when a prior event inhibits subsequent performance” (p. 36). This is more likely when, “the two events are dissimilar – particularly when the events share surface similarities but have significant and greater underlying dissimilarities” (p. 36). A positive transfer refers to, “a prior event facilitating performance on a subsequent event” and is enabled when, “a prior and current event are similar” (p.36). In their paper, Finkelstein and Halebian (2002) find that strong acquisition performance is linked to positive transfer of applicable knowledge from prior acquisitions. The appropriateness of that knowledge, in the form of routines, is contingent upon the relatedness of the industries in which the acquisitions occur. Where industries differ, a negative transfer ensues. In this case, the acquisition is assumed to be similar to a previous acquisition, prior knowledge or routines are applied, and, in actuality, the new acquisition is significantly different form the previous rendering prior knowledge inappropriate. The consequence is poor acquisition performance. Of course, there is the potential for ‘bisociation’ to transpire where two or more previously unrelated bundles of skills combine effectively (Ireland et al., 2003). However, Finkelstein and Halebian (2002) draw attention to the plausibility of negative transfer and support their supposition with empirical data. In this study, the construct of negative transfer is applied to internal diversification, providing further insights to the literature on reconfiguration challenges.

Absorptive capacity is identified as one of the most prevalent antecedents to knowledge transfer (van Wijk et al., 2008). Cohen and Levinthal (1990) define absorptive capacity where, “prior related knowledge confers an ability to recognize the value of new information, assimilate it, and
apply it to commercial end” (p. 128). Reconfiguration studies assessed in this chapter include a cognition variable where capabilities are assessed or sensed and subsequently seized or made operational. In Lavie’s study (2006), these actions are clearly linked to absorptive capacity. Challenges associated with cognitive actions are identified on two levels. The first is as an opportunity cost of not identifying technology potential at the point of exploration or sensing. The second is ineffective integration or coordination at the operational or seizing point. Teece (2007), Sirmon et al. (2007) and Galunic and Rodan (1998) similarly identify the importance of sensing opportunities prior to reconfiguration. With cognition in this research represented by dominant logic, this leads to the research question: how does dominant logic affect an organization’s dynamic capability for reconfiguration?

The dynamic capabilities literature identifies a tension between firm capacities for sensing, seizing and reconfiguring (Teece, 2007). However, while acknowledged, this tension is not assessed explicitly or in depth. Dynamic capabilities research tends to focus on the importance of entrepreneurship and entrepreneurial approaches for achieving successful performance in changing markets (Teece, 2007). The centrality of the concept’s origins can be traced to the work of Edith Penrose (Teece & Augier, 2009). For dynamic capabilities to exist, firms must be entrepreneurial in their approach to adaptation. That is, they must be able to sense opportunities and seize them (Teece 2007). The literature on reconfiguration discusses the impact of core rigidities and path dependencies in prohibiting incumbent firms from these entrepreneurial activities (Lavie, 2006). There is tension between a firm’s ability to sense and seize opportunities (Teece, 2007). Lavie (2006) identifies tension between an absorptive capacity that facilitates identification of an opportunity due to technological change and operational absorptive capability required to actually alter the capability. This tension is addressed in the ambidexterity
literature as exploration versus exploitation (Raisch & Birkinshaw, 2008). It is also studied in research that considers flexibility and efficiency (Eisenhardt et al., 2010). In this literature, simple routines are posited as providing flexibility and encouraging entrepreneurial actions that lead to responsiveness especially in high velocity or dynamic markets (Bingham et al., 2007; Eisenhardt & Martin, 2000; Eisenhardt et al., 2010). In these varied literatures, exploration, sensing and flexibility are necessary for entrepreneurial responsiveness to market change. Companies that are shackled by rigid routines and path dependencies become inert and unresponsive thereby foregoing opportunities. Overall, the role of firm age in knowledge transfer has not been conclusively determined. However, some research finds that organization age negatively impacts transfer of knowledge due to inertia and learning and adaptation limitations (van Wijk et al., 2008). An inherent assumption in these literatures is that incumbent firms have achieved a level of exploiting, seizing or efficiency that entails the development of explicit, codified routines. These codified routines exist as companies then reconfigure assets for further growth through expansion. Organizations that expand through reconfiguration without having established exploitive, efficiency routines that are codified and thereby more easily transferred are not studied. What if growth is accelerated and exploitation through efficient routines bypassed? This may be likened to Rumelt’s (2011) suggestion that some companies attempt expansion before they have the basics in place (p. 115).

The tension between reconfiguration and sensing and seizing capabilities has been alluded to in the literature but not directly addressed. Teece (2007) asserts that reconfiguration is facilitated by decentralization and affected by the risk of ‘decomposability’. That is, the inability to balance autonomy with coordination or integration as reconfiguration unfolds. This study provides insights into that tension, its potential consequences and possible prevention. The
ability of entrepreneurial firms to sense opportunities and to respond due to simple routines or heuristics may contribute to challenges, as a lack of codification makes transfer difficult. These challenges extend to the sustainability strategy where an entrepreneurial dominant logic, characterized by growth and the execution of innovation opportunities, is reflected in a proactive environmental strategy. Russo and Fouts (1997) similarly find a correlation between innovative organizations and environmental strategies that go beyond compliance.

In entrepreneurial firms with a proactive environmental strategy, a decoupling may occur between the overriding sustainability policy of the organization and its execution. This tension between sustainability strategy and compliance implementation represents a compelling area for research. In their framework, Winn and Angell (2000) define “unrealized greening” as a scenario where management professes the importance of the environment but there exists a lack of corporate environmental management (CEM) systems. The authors find that, “while the importance of the environment is professed by top management, it does not appear to have priority over other organizational goals” (p. 1131). They cite three possible explanations for this: greening washing where actual implementation was never intended; the organization exists at an intermediate stage before ramping up to implementation; a disconnect between top and middle management as middle managers are also responding to other corporate goals that might take precedence. An entrepreneurial organization with a proactive environmental strategy may be slow to establish implementation and a high velocity external context may increase the likelihood of conflicting, concurrent goals.

Through explicating micro foundations, I garner insights into the tension between sensing and seizing opportunities and reconfiguration as well as between a proactive environmental strategy and compliance implementation. In the dynamic capabilities, ambidexterity and efficiency
versus flexibility literatures, an underlying assumption is that incumbent firms have established processes for efficiency that render them suspect to an inertia and capability rigidity that prevents entrepreneurial responses to changes in the business context (Bingham et al., 2007; Eisenhardt et al., 2010; Leondard-Barton, 1992; Teece, 2007). Similarly, both conceptual and empirical research in capability reconfiguration assumes codification of explicit routines as companies reconfigure (Galunic & Rodan, 1998; Lavie, 2006; Rosenbloom, 2000; Tripsas & Gavetti, 2000).

The literature on dynamic capabilities, and reconfiguration more specifically, does not consider the challenges of reconfiguration for entrepreneurial firms that grow quickly moving through expansion at an accelerated pace. This dissertation, through evaluation of the challenges of reconfiguration at Suncor Energy, provides insights into this phenomenon and thereby contributes to dynamic capabilities theory. By explicating the routines and cognition, or dominant logic, that impact a dynamic capability for reconfiguration, a contribution is made to the extant literature on the challenges of capability reconfiguration. Identified challenges are augmented by considering the applicability of the negative transfer construct from the acquisitions literature (Finkelstein & Halebian, 2002). In addition, by considering the effect of the external environment, assertions regarding the flexibility of routines are challenged in the efficiency versus flexibility discussion.

2.4 Research Questions
The data for this dissertation, in explaining negative operational and compliance outcomes, provides empirical evidence of actual challenges associated with reconfiguration. In so doing, opportunities to contribute to the extant literature on the dynamic capability for reconfiguration are identified. The central research question of this dissertation is in response to the invitation in the dynamic capabilities literature to reveal the micro foundations or underlying processes of
dynamic capabilities through empirical data analysis from actual organizations (Ambrosini & bowman, 2009; Felin et al., 2012; Teece, 2007). The overriding research question in this research study, then, is:

What are the micro foundations that underlie a dynamic capability for reconfiguration?

By adopting the dynamic capabilities framework and through review of the extant literature on capability reconfiguration, the focal dimensions of the reconfiguration phenomenon are: routines, cognition vis a vis dominant logic and market dynamism. Both the literature on reconfiguration and the data for this in depth case study converge on the identification of challenges associated with reconfiguration. Challenges associated with transfer of non-codified routines, cognition or dominant logic and market dynamism are considered and augmented through application of the negative transfer construct. Where this research diverges from the extant literature is in examination of an entrepreneurial, incumbent organization rather than an incumbent organization with established and rigid processes and structures.

Finally, in explicating the micro foundations of a dynamic capability for reconfiguration related to routines, dominant logic and market dynamism, insights are garnered into the tension between an entrepreneurial dominant logic that supports sensing and seizing of opportunities while being deficient in requirements for reconfiguration. This tension extends to the discussion of a proactive environmental strategy decoupled from compliance implementation.

Research questions connected to the overriding research question regarding dynamic capability micro foundations and informed by the literature and the data are:
How are process, position and path, as defined in the dynamic capabilities framework, related to the dynamic capability for reconfiguration?

What impact does the changing context have on reconfiguration?

How does reconfiguration occur in an empirical setting?

What reconfiguration challenges lead to negative operational and compliance outcomes?

What insights can be garnered regarding the tension between capacities for sensing, seizing and reconfiguring, and, by extension, a proactive environmental strategy and compliance execution?

2.5 Definitions
Definitional concerns that plagued the resource based view of the firm (Priem & Butler, 2001) have, predictably, extended to dynamic capabilities theory. Over the years, strategic management theorists have embraced the dynamic capabilities framework but with mixed results. Many bemoan inconsistencies, contradictions and ambiguous inferences in their review of the literature (Zahra et al., 2006). Given these ambiguities, constructs must be clearly defined. I begin with foundations in the Resource Based View of the firm and define resources. I then seek to distinguish between processes, routines and heuristics which form the micro foundations of capabilities.

Resources

A resource is an asset or input to production either tangible or intangible (Helfat & Peteraf, 2003; p. 999). This echoes Penrose’s (1959) definition of tangible physical resources and human resources used collectively by the firm according to administrative decisions. Wernerfelt (1984)
formalized resources as tangible and intangible assets tied to the firm. Intangible assets were said to include brand names, knowledge and procedures. In Grant’s model, knowledge is the resource which forms the foundation of capabilities (Grant, 1996b). Knowledge can be either tacit reflecting ‘how’ to do things or explicit determining ‘what’ to do (Grant, 1996a). Barney (1991) argued that resources could lead to sustained competitive advantage when they are valuable, rare, inimitable and non-substitutable. Priem and Butler (2001) conclude that in the resource based view of the firm virtually anything associated with a firm can be defined as resource. Despite this criticism, I define, in rather general terms, resources as tangible or intangible assets of the firm.

**Processes, Routines and Heuristics**

Distinctions between processes and routines in the extant literature are unclear as the terms are frequently used interchangeably in papers. Since this dissertation is significantly concerned with the processes or routines defining dynamic capabilities this poses a challenge. The position taken is that repeated actions are processes, processes are equated with routines and heuristics are informal or non-coded routines. Peteraf (2007) states, “processes are mechanisms by which dynamic capabilities are put into use, and the mechanism by which organizations can develop dynamic capabilities.” The authors go on to suggest that dynamic capabilities are often confused with processes because of their close link (p. 30). Later, in 2009, Teece argues that rules and routines exist as micro foundations, but the capability to change them is dynamic (Augier & Teece 2009, p. 417). Processes are equated with routines (Teece & Pisano, 1994; Teece et al., 1997). Both are found to be the integration of assets leading to the execution of activities (Teece, 1997). Routines are sequenced actions (Grant, 1996a). Nelson and Winter’s (1982) definition of capability is highly routinized and
equated with skills which are defined as, “a capability for a smooth sequence of coordinated behaviour that is ordinarily effective relative to its objectives, given the context in which it normally occurs” (p. 73). A skill may be a capability to be executed or a choice to be made (p. 73). When a choice becomes more deliberate it is a higher level of skill or “large-scale behaviour” and poses a trade-off to the routinization of skills (p. 85). It is helpful to think of the car driving example provided by the authors. The driving that occurs almost without thinking is the skill of driving, the necessity to decide to turn onto a specific exit represents more of a deliberate choice and large-scale behaviour. The more an act is completed or the increased frequency of it, the more likely it becomes a skill (p. 83). In their theorizing, skills at the individual level equate with routines at the organizational level. According to Winter (2003), a routine is “behavior that is learned, highly patterned, repetitious, or quasi-repetitious, founded in part in tacit knowledge” (p. 991).

Tacit knowledge, according to Grant’s definition (1996b), is differentiated from explicit knowledge that takes the form of rules, directives and policies. Similarly, I define routines as explicit or tacit with explicit routines being susceptible to formalization or standardization and implicit routines being tacit or informal and less amenable to codification. Grant (1996a) purports that the key distinction between tacit and explicit knowledge is in the transferability of that knowledge. Knowledge that cannot be codified is more costly to transfer and subject to more uncertainty. In this study, and in congruence with Teece and associates (Teece & Pisano, 1994; Teece et al., 1997) and Nelson and Winter (1982) processes are equated with routines.

Heuristics are simple rules of thumb that remain flexible to adjust to opportunities (Eisenhardt et al, 2010; Bingham et al., 2007). Heuristics leave room for improvising and so are not routines as defined by Winter (2003). Honed heuristics are expected to apply to various firm opportunity
responses. Organizational processes are a key attribute of capabilities. Articulated heuristics lead to organizational processes. Therefore, heuristics are central to firm capabilities. Experience is translated to shared heuristics which in turn lead to high performing processes which are central to capabilities. Capabilities are formed not solely by tacit knowledge but on articulated heuristics (Bingham et al., 2007). The use of simple rules as heuristics rather than formal processes brings flexibility to organizations (Eisenhardt et al., 2010). Heuristics are the articulation of experience that may or may not be repeated and that allow for adjustment. The Bingham et al. paper (2007) focused on internationalization of entrepreneurial firms and articulated heuristics took the form of informal guides as to which countries to enter and how, as well as pacing and pritoiry of internationalization. Heuristics were operationalized through articulation of behavioural actions and cognitive perspectives by multiple informants. In this research I use the Bingham et al. (2007) definition of heuristics as, “simple, deep and flexible knowledge structures that underpin capabilities” (Bingham et al., 2007). I further equate tacit processes and articulated heuristics.

Capabilities

An activity becomes a capability when it has reached a minimum threshold of functionality. A capability is a set of routines (Helfat & Peteraf, 2003). In Teece’s definitions of dynamic capabilities, capabilities are the skills, resources and competencies of the firm (Teece & Pisano, 1994; Teece et al., 1997). Schreyogg and Kliesch-Eberl (2007) equate the term ‘capability’ with the following constructs used in the literature: (core) competence, collective skills, complex routines, best practices or organizational capabilities (p. 914). Helfat (2007) states that, “a capability, whether operational or dynamic, is the ability to perform a particular task or activity” (p. 1). Capabilities are formed by the bundling of resources (Sirmon et al., 2007). Grant (1996b)
equates organizational capabilities with knowledge integration which occurs through the development of processes.

Helfat (2007) draws a distinction between dynamic organizational and managerial capabilities. Both arise from prior learning and experience but the former lie in the processes and routines of the organization and the latter in the managers themselves or the managerial processes created (p. 3). Winter (2003) defines an organizational capability as a high level routine or collection of routines that with input provides alternatives to an organization’s management for achieving certain outputs. An organizational capability is, “the ability of an organization to perform a coordinated set of tasks, utilizing organizational resources, for the purpose of achieving a particular end result” (Helfat & Peteraf, 2003, p. 999). Based on these academic assessments, I define capabilities as high functioning routines in an organization that facilitate execution of activities.

Summary of Definitions

Given ambiguity and tautology, clear definitions are critical in resource and capabilities research. The following table (Table 2) summarizes the definitions of key theoretical constructs that will be used in this dissertation.
Table 2: Theoretical Construct Definitions Table

<table>
<thead>
<tr>
<th>Theoretical Construct</th>
<th>Pattern</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resource</td>
<td>Tangible or Intangible</td>
<td>Organizational Asset</td>
</tr>
<tr>
<td>Process or Routine</td>
<td>Explicit or Tacit</td>
<td>Integration of organizational assets for an activity</td>
</tr>
<tr>
<td>Heuristic</td>
<td>Tacit</td>
<td>Simple rules or informal processes</td>
</tr>
<tr>
<td>Capability</td>
<td>Explicit or Tacit</td>
<td>High Functioning Routines</td>
</tr>
<tr>
<td>Dynamic Capability</td>
<td>Infrequent, Deliberate and Adjusted</td>
<td>Higher Order Capabilities that facilitate organizational change</td>
</tr>
</tbody>
</table>

The following diagram (Figure 4) summarizes the relationship between theoretical constructs:

Figure 4: Construct Definitions Diagram
CHAPTER 3: METHODOLOGY

“Not everything that can be counted counts, and not everything that counts can be counted”
Albert Einstein

I use a qualitative single case study research method to study the phenomenon of corporate reconfiguration. The single case study approach allows for in-depth insights to be developed through analysis of the dynamic capability for reconfiguration. Data is sourced predominantly from interviews with Suncor employees as well as individuals from outside the organization. Empirical data from the case study informs strategy literature on dynamic capabilities, market velocity, dominant logic, and sustainability.

3.1 Single Case Study Strategy
At the outset, the primary objective of this research was to contribute to dynamic capabilities theory by examining the micro foundations of the dynamic capability for reconfiguration and the impact of changes in the external context. The purpose of qualitative research is to develop and extend theory through in depth analysis of a phenomenon within its context (Bryman & Bell, 2003). Further, the value of qualitative research is in garnering insights from business activities within real life contexts (Eriksson & Kovalainen, 2008, p. 3). A qualitative research strategy is appropriate, therefore, given the importance of context in the study and given the opportunities for contributing to theoretical development in the dynamic capabilities literature.

The single case study yields in-depth insights while the multiple case study identifies generalizable patterns (Eisenhardt, 1991; Dyer & Wilkins, 1991). A trade-off exists in increasing the number of cases and sacrificing depth of knowledge (Dyer & Wilkins 1991, p. 614). The question is not whether more cases are necessarily better, but whether answers to theoretical
questions are found and a contribution to the literature is made (Eisenhardt, 1989, p. 622).

During the proposal phase of the dissertation, I expected to conduct a comparative multiple case study of two energy companies. However, after two rounds of interviews with Suncor Energy participants and associated data analysis, I determined that the data involved relationships between constructs that deserved in-depth study. The single case study approach allows for complex theory development in which relationships between constructs are illuminated (Eisenhardt & Graebner, 2007). The single case study approach is appropriate given the research goal of explicating micro foundations of the phenomenon of reconfiguration. Organizations are motivated to conceal those constructs underlying a competitive action like corporate reconfiguration (Teece, 2007). This ambiguity, then, requires a researcher to conduct in-depth case study research. The creative sentence, in particular, provided the opportunity to access candid observations from various levels and departments within the firm.

Rather than a grounded theory approach (Glaser & Strauss, 1967), I conducted this research with a priori constructs from dynamic capabilities theory (Eisenhardt, 1989). I was not bound by the theory or constructs, but it did provide a framework for approaching the research. As will be shown in subsequent chapters, research findings led to the augmentation of theory in dynamic capabilities, market dynamism and sustainability strategy.

This research began as a descriptive case study (Yin, 2009) describing the phenomenon of corporate reconfiguration in the setting of a firm in Canada’s energy industry. As data was collected to answer this research question, complex causal links in the data were identified rendering the case study explanatory as well (Yin, 2009, p. 4; Eisenhardt & Graebner, 2007, p. 27). In essence, the study evolved from analysing what happened in Suncor’s efforts to
reconfigure the oil sands business to then understanding why reconfiguration and the associated environmental noncompliance occurred.

In summary, the single case study approach is taken with the goals of:

1. Contributing to dynamic capabilities theory. Unlike quantitative research, qualitative research is generalizable to theory and not to population (Van de Ven, 2007).
2. Studying the phenomenon of capability reconfiguration in the context of a changing external context characterized by both economic and environmental pressures and,
3. To facilitate in depth study including the interrelationships among theoretical constructs.

To address concerns regarding the rigour and procedures applied to qualitative research (Eisenhardt & Graebner, 2007, Yin, 2009, Parkhe, 1993), data analysis procedures as prescribed by Miles and Huberman (1994) and Van de Ven (2007) are used. This structured approach is preferred but with acknowledgement that it will be emergent (Eisenhardt, 1989, p. 536).

The level of analysis used in the dissertation is the organization. Context is critical to both the single case study approach and to the dynamic capabilities theory. In evaluating context in the case of Suncor Energy, the oil and gas industry in Alberta must be considered. Therefore, the level of analysis shifts to the industry as well. The unit of observation is both the individual in primary data collection and the organization in secondary data collection.

An objective, realist ontology is adopted whereby the organization is analyzed with respect to the strategy that exists and the way it is established and reconfigured. Applying this explanatory approach to the research entails asking questions and analysing data to understand how individuals in the organization produce, implement, and change strategy.
3.2 Case Selection
Case selection hinged on two key factors:

1. My research interest in dynamic capabilities theory and my expectation that energy companies have the ability to successfully transfer capabilities from their existing businesses to new more sustainable businesses.

2. Data accessibility. Gummesson (1991) emphatically contends that access to reality is the number one challenge facing business researchers (p. 11). Canada’s energy industry is competitive with many companies of varying sizes. This presents both opportunities and challenges to accessibility. On the one hand, the number of formal and informal industry associations is rising. In these forums, companies are willing to share information with the goal of moving the industry further ahead on important issues. In contrast, however, the competitive nature of the industry continues to make some companies proprietary about internal processes and strategic initiatives. Suncor data was made available via a research project stemming from a creative sentence in response to environmental infractions incurred by the organization (please see Appendix A for details).

As noted, my research interests were in the area of dynamic capabilities and sustainability strategy. My review of upfront project information showed that the Firebag infractions occurred as Suncor was reconfiguring capabilities in its oil sands business from focusing on mining technology to developing a new SAGD technology. The Suncor project, therefore, could provide empirical data connecting a dynamic capability for reconfiguration with underlying micro foundations.

Suncor’s capability reconfiguration in expanding into the new in situ technology satisfies theoretical sampling requirements of selecting a case to extend theory and identify relationships
among constructs (Eisenhard & Graebner, 2007, p. 27). The chosen research strategy should be aligned with the research questions or problem being considered (Eriksson & Kovalainen, 2008; Bryman & Bell, 2003). Given the need to align research study and research question, the dissertation study was designed with the following overriding research question:

What are the micro foundations of a dynamic capability for reconfiguration?

3.3 Data Collection
The project data set includes both primary and secondary data. Primary data were comprised of interviews with Suncor employees and external stakeholders as well as site observations at Firebag. Secondary data included third party consultant reports on the root causes of Suncor's Firebag infractions, internal audits and documents, media reports, annual reports and government and research firm assessments.

Interviews
The creative sentence project provided a unique opportunity to conduct an in depth case study and obtain candid insights from Suncor employees and external stakeholders. The unique nature of the creative sentence was such that Suncor was compelled to share information with the research team. As a senior executive with Suncor commented, “it’s unusual not to worry about being candid for fear of legal action because in this case the legal action has already taken place”. Consequently, the research team was awarded forthright assessments of events and initiatives.

Also, given that Suncor executives agreed to this creative sentence as part of a negotiation with the Crown, there was strong support for the research project from the top of the organization. This was beneficial in eliciting responses from targeted informants and also in obtaining administrative support in organizing interview logistics. In Suncor, our interviews started at
higher level executives and snowballed to management and frontline employees. Initially, we spoke to executives either involved in the noncompliance or in responding to it via transformation of systems and culture. These executives then identified lower level employees who were similarly connected to the noncompliance or to the execution of change initiatives.

From September 2009 to January 2011, a total of 72 interviews were conducted, 51 within the organization and 21 interviews with external stakeholders. The final dataset contained 71 interviews as we did not receive consent to use one of the Suncor interviews. Most of the interviews were conducted in person in Calgary. Stakeholder interviews with Crown, legal and regulatory representatives accounted for 14 of the external to Suncor interviews. These interviews were conducted with a mandate of understanding how best practices and regulations are established in Alberta’s oil sands. In this dissertation, causes of Suncor’s infractions as defined by these external-to-Suncor informants were used to corroborate or refute findings resulting from analysis of the Suncor data.

All but two of the Suncor interviews were conducted by pairs of researchers to enhance the reliability of the findings through corroboration. A semi-structured approach was used for interviews that lasted between 30 and 90 minutes with the average interview time being 60 minutes. A panel interview was conducted on site at Firebag, north of Fort McMurray.
Table 3: Interview Statistics

<table>
<thead>
<tr>
<th>Total Number of Interviews</th>
<th>71</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Number of Informants</td>
<td>62</td>
</tr>
<tr>
<td>Interviews in Suncor</td>
<td>50</td>
</tr>
<tr>
<td>Suncor Informants</td>
<td>41</td>
</tr>
<tr>
<td>Executive Level (VP and above)</td>
<td>10</td>
</tr>
<tr>
<td>Director Level and Below</td>
<td>31</td>
</tr>
<tr>
<td>Interviews with Regulators, Legal and Crown</td>
<td>14</td>
</tr>
<tr>
<td>Other Interviews – industry players and NGOs</td>
<td>7</td>
</tr>
</tbody>
</table>

Inaugural questions asked informants to provide background on their education and career trajectory up to their current role in the organization. Next, they were asked to recount their involvement or knowledge of the infractions that occurred at Suncor's Firebag project. Informants who did not have firsthand knowledge of the incidents provided their understanding. These informants were typically involved in the development of systems and initiatives to improve Suncor's performance in light of the Firebag and other incidents.

All interviews were recorded on audio tape and transcribed by a third party. These 71 interviews resulted in more than 1500 pages of interview transcripts. Next, transcripts were read and cleaned to correct for any spelling or grammatical errors. As I cleaned the transcripts, I analysed them for themes emerging in the data. I maintained a spreadsheet of themes and insights garnered from the interviews. I used this data to begin developing a conceptual model for the
research and later the themes would inform the initial codes used. Once cleaned, I sent the transcript back to participants allowing them the opportunity to edit or flag aspects of the interview as confidential. I included transcripts verified by participants in the final data set for coding. I edited two transcripts to mark portions as confidential and I deemed one interview as inadmissible because consent was not provided.

Specific interview questions asked interview participants for the insights on why the environmental noncompliance charges were incurred and what was being done to remedy their causes. These questions were to meet the court mandated requirement to determine the root causes for Suncor’s noncompliance and to assess learnings for the industry (see Appendix B for the “Interview Guide”). Answers to these questions also revealed problems the firm encountered in reconfiguring existing capabilities to capitalize on an opportunity to further exploit resources through in situ oil sands development. Responses to follow up and clarification questions on capabilities and reconfiguration further informed this research. In recounting issues around the noncompliance, insights on deficiencies in processes, the effect of an entrepreneurial mindset and the pace of expansion were provided. In this way, important micro foundations of the dynamic capability – processes, procedures, disciplines, organizational structures (Teece, 2007) - were not only identified but linked to outcomes. In this case, outcomes were related to operational and environmental challenges.

Interviews were conducted with an awareness and dedication to ethical concerns. Informants were shown respect and consideration at all times. Interview times were planned to be limited to one hour in courtesy to the busy time schedules of individuals. Interviews that exceeded that time limit were at the agreement of the participant. Interviews took place at times and places
convenient to the interview participants. Most Suncor interviews were completed on site in conference rooms and offices.

Data collection was governed by the Conjoint Faculties Research Ethics Board (CFREB) at the University of Calgary as well as the ethics board at Simon Fraser University. Given the nature of the creative sentence and the sensitivity of the issues, Suncor as an organization can be named in published documents and presentations but individual identities must be kept confidential. In addition, all interview data must be stored electronically on a secure computer system and hardcopy information stored in a locked cabinet. Please see Appendix C for copies of the University of Calgary ethics approval and individual consent forms. Interviewing continued until theoretical saturation occurred (Glaser & Strauss, 1967). At that point, key themes and important findings had been repeated. For this dissertation, themes regarding processes, pace and entrepreneurial mindset had been frequently repeated. In addition, all informants that had been identified as critical were approached for an interview.

Observations

The project team conducted a panel interview with three individuals at the Firebag project site located 65km northeast of Fort McMurray, Alberta. We reached the site by vehicle so that we could get a sense of the remoteness of the location. The journey took over two hours from Fort McMurray because of road conditions and industrial traffic headed to projects owned by other companies in the area. This on site visit provided an opportunity to directly observe the site, appreciate the magnitude of it and make equipment and buildings tangible that had hereto with been described and two dimensionally viewed. In addition, we observed the dynamics between operations employees and Environment, Health and Safety (EH&S) employees as compared to informant assessments.
In all interviews, I observed and documented in fieldnotes any notable individual reactions - body language, intonations etc.

Secondary Data
I triangulated primary data via secondary data sources. These sources included: media reports, government publications and reports, NGO reports, corporate archived data, analyst reports, consultant reports and court documents. These sources were particularly relevant in fact checking data provided by informants and in corroborating informant assessments of industry growth and market velocity (see Chapter 4). In addition, consultant reports and court documents provided corroboration and validity assessments for dissertation findings. Court documents cite insufficient compliance assurance systems as leading to prosecution (please see Appendix D). A third party audit found inadequacy with the management of change process, informal compliance and integration processes, ineffective audit implementation, absence of compliance culture, incomplete pilot data and rapid growth as contributing to compliance and operational issues at Firebag (CH2MHill, 2008).

3.4 Data Analysis
In this dissertation, I bound the study by restricting analysis to events that led to the environmental infractions and operational issues with a clear focus on the reconfiguration of capabilities from the existing mining business to the piloted new technology. The incidence of Suncor and PetroCanada merging was beyond the theoretical interest and timeline of the research study. Consequently, this is a variance study that seeks to explain what led to compliance and operational challenges as Suncor reconfigured capabilities to exploit a new opportunity in a technology that would unlock untapped resources of bitumen. As such, a causal model is developed. However, as Van de Ven (2007) indicates, to truly understand why an independent
variable causes a dependent variable in variance analysis, one needs to consider the process and associated temporal events that underlie those variables (p. 159). To that end, data analysis includes, before establishing a causal model, an evaluation of the reconfiguration process at Suncor.

Fundamentally, variance studies are built backward from an observed outcome to defining prior causal variables while process studies are built forward from a series of events to an outcome. Events are a series of variables (Van de Ven, 2007). This overall research project has elements of both. The creative sentence requirement was to explain why the environmental infractions of missing equipment and failure to disclose occurred. In this way, the study is clearly a variance study working back from a compliance failure outcome to identifying its causal variables. However, in ascertaining those variables, interview participants were asked to recount the events leading up to the failure. In this way, a retrospective longitudinal process was defined which lead up to the failure outcome. Similarly, interview questions extended to the current day asking what changes were taking place in the organization to address the failure that occurred.

Gephart (2004) offers some suggestions for avoiding pitfalls in qualitative data analysis. Included is the suggestion to use stronger empirical techniques including computer aided software for text analysis. This type of research takes more time and may require iterations. I analysed data using the computer program, Atlas.ti. Initially, I used open coding with my approach informed by the a priori conceptual model presented in Figure 2 in Chapter 2. In this way, I tended to borrow from both data and theory driven approaches to data analysis. This approach has the potential to, “maximize the findings of an analysis and to balance reliability and validity” (Namey, Guest, Thairu & Johnson, 2008). However, a theory-driven approach would have been more structured with a more defined analysis process.
Upon completion of the first round of coding of the 50 Suncor interviews, 152 codes were generated (see Table I and II in Appendix E). Of these 152 codes, 12 were deemed to be out of scope for the dissertation and were discarded leaving 140 codes for further analysis (Perlow, Okhuysen & Repenning, 2002). These codes and associated data extended beyond the phenomenon of capability reconfiguration to solutions undertaken by Suncor in response to the environmental failure outcomes. These variables are linked to Suncor's resilience in response to threats to their business (Dewald & Bowen, 2009). Suncor’s response includes the evolution of their dominant logic from entrepreneurial and flexible to more structured with an emphasis on operational excellence.

Given that the infractions occurred from 2003 to 2007 and the interviewing began in the fall of 2009, Suncor had already taken steps to remedy some of the corporate systems and cultural deficiencies linked to the infractions. A number of third party and internal assessments had been completed to determine root causes of the infractions. Suncor used these assessments to determine that a new legal corporate registry needed to be developed to maintain the firm's regulatory requirements. In addition, a cultural shift was occurring to create a focus on operational excellence and discipline. While strategically interesting, these corporate initiatives were beyond the scope of this dissertation which focuses on challenges in capability reconfiguration at an entrepreneurial firm growing quickly in a high velocity market. Data on the response to negative outcomes in reconfiguration will be considered for academic papers outside the dissertation that focus on resilience, flexibility versus efficiency, and dominant logic evolution.
As the research study evolved from descriptive to explanatory, research questions applied in data analysis expanded as well. Using Van de Ven’s (2007) variance model and working backwards from outcomes, questions considered in the analysis beyond the overriding question of dynamic capability micro foundations included, but were not restricted to:

- How are process, position and path, as defined in the dynamic capabilities framework, related to the dynamic capability for reconfiguration?
- What impact does the changing context have on reconfiguration?
- How does reconfiguration occur in an empirical setting?
- What reconfiguration challenges lead to negative operational and compliance outcomes?
- What insights can be garnered regarding the tension between capacities for sensing, seizing and reconfiguring, and, by extension, a proactive environmental strategy and compliance execution?

Following the Miles and Huberman (1994) approach for data reduction, I further reduced the 140 codes to 85 codes with 55 being of extremely low frequency, unrelated to the conceptual model, and thus deemed less critical to the research study (see Table I in Appendix E). I clustered the remaining 85 codes into 13 categories (see Appendix E). Since open coding was used, many of the 85 codes were very specific, detailed aspects of larger constructs. A combination of consideration of the literature, understanding of the evolving commonalities in the data and my own experience were used in applying logic to cluster the codes into categories. When I completed coding of the Suncor interviews, I used computer outputs of codes and their associated extracted quotes and downloaded them to Excel for further analysis. I created
spreadsheets to evaluate and organize quotations. In effect, coding in Atlas.ti resulted in level 2 codes. Level 1 and 3 codes were created in Excel as I more clearly defined and clustered codes based on specifics of the quotations. Through this process I could also evaluate co-occurrence, defined as two or more codes associated with one quotation (Namey et al., 2008). By reviewing quotations with multiple codes in detail in Excel, I could assess which code was most pertinent to which data table and ensure double counting did not occur. This process was manual and time consuming and might have been averted by having a more directed coding scheme based on the conceptual model (Figure 2) in place prior to the first round of coding. A superior approach might have been to be more theory driven in data analysis from the outset (Namey et al., 2008).

My approach to clustering is best demonstrated through an example. For example, as shown in Appendix E, I found each of the following codes from Atlas.ti, through consideration of the literature and the quotations associated with these codes, to be connected to the Level 1 code of dominant logic (dl):

- Distance
- Cost Schedule Compliance
- Culture
- Discipline
- DL (dominant logic) Firebag
- DL (dominant logic) Suncor
- Dominant logic (DL)
- Don't know what don't know
- Learn by Doing
- Oil sands Focus
- Silos

Each of the above codes is tied to the mindset or structure of the reconfigured organization. I analysed quotations connected to each of these level 2 codes in Excel spreadsheets. In some cases the theme expressed in the quotation was more aptly associated with one of the other level
2 codes or in some cases a new level 3 code was created. Clustering led to refinement of the codes to: Suncor or Oil Sands dominant logic (Table 9), Firebag dominant logic (Table 10), and distance. At this point in the analysis, I maintained distance as a level 3 code or variable so that the effect of distance in reconfiguration could be analysed. Distance reflects both the geographic and structural or institutional distance of the new in situ SAGD business at Firebag and the core business, oil sands mining. Distance is therefore an attribute of Firebag dominant logic (see Figure 10). Tables 9 and 10 are the result of re-evaluation of quotes and clustering and de-clustering of initial codes. This process of linking lower level codes to categories is shown in Table III in Appendix E. For the most part, I maintained lower level codes as attributes. I then used these level 1 codes and associated attributes to create data tables in Microsoft Word. In the end, there were 10 categories of codes: context, dominant logic, process, people, transfer, structure, outcome, sustainability, quotes and statistics (see Table II in Appendix E).

I conducted a similar process for all of the Atlas.ti output. I produced data tables, as seen in upcoming chapters, with data categories associated with attributes and linked to the conceptual model (Figure 2) dimensions of processes, path and position. I completed a number of iterations of table development as attributes and constructs were refined. My analysis led to a redefinition of those dimensions, based on the data, as processes, dominant logic and people. I evaluated data categories as causes and outcomes of the capability reconfiguration phenomenon. In a variance study, causes and outcomes are framed as variables (Van de Ven, 2007). Given these definitions, I transformed the conceptual model to a causal model that establishes variables as either antecedents or consequences leading to operational and compliance failure (Van de Ven, 2007). Please see Chapter 6 for more details on this process and the resulting causal model.
During this analysis, I further refined categories with scale, technology, pace and regulations defined as variables in Suncor's external context. I established distance as its own variable rather than an attribute of dominant logic and I expanded "misc" to include statistics (interview demographics) and quotes. The result was a reduction of 13 categories to 11: context, distance, dominant logic, outcome, people, process, quote, statistics, structure, sustainability and transfer. Please see Appendix E for details. Context, dominant logic, people, process and outcome are directly connected to the conceptual model. Distance, structure, sustainability and transfer are aspects of reconfiguration as it occurred at Suncor and clustered further in development of the causal model in Chapter 6.

The dynamic capabilities framework provides a priori constructs that shape the research conducted in this dissertation. Dynamic capabilities research requires an assessment of both the internal and external organizational contexts. This perspective suited this dataset since causes of the infractions were tied by informants to internal process and cultural deficiencies as well as external market pressures.

I found, a priori, that the Suncor research project had important empirical links to sustainability theory. Suncor has been identified in the sustainability strategy literature as having a proactive environmental strategy (Hall & Vredenburg, 2003). In addition, SAGD technology allows deeper reservoirs of oil to be tapped in situ or in place. This technology, while not currently at zero carbon emissions, does have a smaller footprint than oil sands mining. There are also promising developments in SAP (solvent assisted process) and THAI (toe heel air injection) technology that have the potential to reduce steam oil ratios and lead to lower CO2 emissions (CAPP, 2013). Suncor reported a 51% decrease in emissions from 1990 to 2006 due to technology and efficiency gains (Charpentier, Bergerson & MacLean, 2009).
I tied *a priori* theoretical constructs from the dynamic capabilities literature of process, path and position to data variables of processes, dominant logic and people. I identified processes as a key variable, with lack of formalization contributing to negative outcomes. In keeping with dynamic capabilities theory, I determined that the external context also significantly impacted the dynamic capability for reconfiguration in Suncor. Specifically, a high velocity market characterized by industry growth, investor pressures, and low munificence led to challenges.

I used extant sustainability strategy theory to consider the implications of the natural environment and of the tension between high level sustainability strategy and lower level implementation. Here again, the need for formalized and not taken for granted compliance routines is established.

**3.5 Validity and Reliability**

To ensure validity, method and data triangulation as well as respondent validation were implemented (Silverman & Marvasti, p. 260). Eisenhardt (1989) recommends multiple data collection methods for triangulation of evidence and stronger substantiation of constructs. Method and data triangulation were achieved through multiple data collection methods – interview, observation, and archival data. Analysed data was reviewed with the respondents for validation of content, context and interpretation through the process of sending them their transcripts for review.

In Van de Ven's (2007) work on engaged scholarship, it is suggested that research validity can be increased by testing theories and findings with informants, organizations or industries. A requirement of the creative sentence imposed by the Crown was for the research team to hold a Knowledge Forum open to the public and inviting industry players. At this Forum research project findings would be shared and discussed. The Executive Briefing made public at this
event is provided in Appendix F. Drawing your attention to page 189, you will note that the root causes depicted in that diagram are directly connected to the variables outlined in the causal model of Chapter 6 of the dissertation. This document is linked to the dissertation in defining the role processes and procedures played in noncompliance failure. However, the dissertation goes into greater depth at unearthing the micro foundations underlying the failure and linking those findings to strategic management theory.

The presentation at the Knowledge Forum and associated Executive Briefing were reviewed and approved by executives and legal representatives at Suncor. This provides respondent validation of the findings of this dissertation. Further, this dissertation and the case study were presented to a class of Global Energy Executive MBAs in April, 2012. Several students were executives in the oil sands and one had been a Suncor employee connected to these infractions. Students provided feedback and validation of the dissertation findings and causal model. One student suggested that processes were in place at Suncor but not followed. This supported my findings that routines were not formalized. In preparing for these presentations and in responding to questions and engaging in discussions, I was able to consider alternate explanations and discuss them with the project team and my supervisor. I presented dissertation findings at various academic conferences (see Appendix G for a list of conferences). In this way, theoretical perspectives could be challenged.

I open coded interviews conducted outside of Suncor with government, crown, industry and NGO representatives in a separate hermeneutic unit (HU) or database to prevent analysis of this data from being biased by codes associated with perspectives from inside the organization. I coded interviews external to Suncor for variables linked to the outcomes of environmental compliance and operational failure. These variables are provided in Appendix H and cross
referenced to Suncor interview causes. It can be seen that the external interviews corroborate coding based on Suncor data and link the failure outcomes to causes of deficient regulatory systems.

Research reliability was increased by using multiple investigators in the interview process. In this way, corroboration of general intent and meaning were achieved and interview nuances were captured in field note documentation. In addition, emerging theories could be tested in group meetings and writing workshops with alternative explanations being considered.

3.6 Methodological Limitations
This dissertation is a single in depth case study and so prone to criticism for lack of generalizability. It is therefore worth noting that the objective of this research is to generalize to theory and not to a larger sample (Van de Ven, 2007). However, validation initiatives outlined in the above section have led to comments that suggest challenges in moving too quickly in response to market conditions, the impact of the natural environment and the need for processes are not unique to Suncor.

This study is subject to recall bias given that events occurred from the late 1990s to 2007 and interviews began in August of 2009 (Eisenhardt & Graebner, 2007). The risk of informants recalling events from several years past in interviews and the use of dated documents is that retrospective reviews are subject to bias. At the same time, however, interviews took place when the macro economy was contracting and the oil and gas industry in Alberta had slowed down. This slowdown in industry growth allowed Suncor time for reflection and planning. Potential recall bias is also minimized by interviewing a large and hierarchically diverse group of individuals (Eisenhardt & Graebner, 2007).
Finally, it is possible that this dissertation suffers from selection bias in that data for analysis has been selected based on the dependent variable or outcome of environmental and operational challenges associated with capability reconfiguration (Van de Ven 2007). However, there are important benefits to theory and practitioner implications that can stem from studying failures and near misses (Hoffman & Jennings, 2011; Bansal & Hoffman, 2012; Tinsley et al., 2011; Gino and Pisano, 2011).
"Conservation means development as much as it does protection".
Theodore Roosevelt.

In case study research, the context is considered an important element to analysis of the empirical data (Eisenhardt & Graebner, 2007). The external context and how firms respond to changes in it is a fundamental aspect of dynamic capabilities theory (Teece & Pisano, 1994; Teece et al., 1997). In this study, context moves beyond providing a descriptive setting for the research, to being a critical variable in the analysis. In this chapter, context is defined both by setting and as a variable. The setting is the Alberta oil sands industry and Suncor Energy. The context variable in this analysis is argued to be dynamic and characterized by a high velocity market complicated by the unpredictability of the natural system. Informant and secondary data are used to support identification of these dimensions of the external context. I argue that Suncor executed capability reconfiguration in a dynamic context characterized by high velocity market growth and an unpredictable natural resource. In subsequent chapters, Suncor’s dynamic capability for reconfiguration is explicated and the relationship between this external context variable and antecedents and consequences is evaluated.

4.1 Context as Setting: Suncor and Alberta’s Oil Sands
Suncor's history in Canada dates back to 1917 when its US based parent company, Sun Company later Sun Oil, opened an office in Montreal. Sun Company expanded during the 1930s and 1940s and opened Sunoco gasoline stations in eastern Canada. Not surprisingly, during these years of war and depression there was concern over dependence on foreign oil. Suncor’s downstream business, providing energy to customers as opposed to the upstream business of
producing energy, has its roots in this history with a refinery being built in Sarnia in the late 1940s (Suncor, n.d.).

In the 1950s the Government of Alberta released a report using data from an experimental oil sands plant to demonstrate the viability of oil sands commercialization (Oilsands Developers Group Oil Sands Technologies, n.d.). Shortly after that report was released, Suncor's upstream business was established when Sun Company incorporated Great Canadian Oil Sands (GCOS) Limited in 1953. GCOS, which later became Suncor Energy Inc., began acquiring patents and leases in the Fort McMurray area. Fourteen years later the company produced its first barrel of oil. The creation of that company took vision, an entrepreneurial spirit and a financial commitment of $250million (Suncor, n.d.).

Suncor’s foray into oil sands development was described by some as a great gamble. It was that pioneer spirit that provided the foundations for Suncor. At the time, president and chairman of Sun Oil, J. Howard Pew, said, "This is a great challenge to the imagination, skill and technological know-how of our scientists and engineers ... I am convinced this venture will succeed, and that it will be the means of opening up reserves that will meet the needs of the North American continent for generations to come" (Suncor, n.d.).

Alberta ranks third, after Saudi Arabia and Venezuela, in proven crude oil reserves. Of Alberta’s 171 billion barrels of proven oil reserves, about 170 billion barrels are found in Alberta’s Athabasca, Peace River and Cold Lake oil sands (Appendix I Map) (Government of Alberta Energy, 2011). Oil sands are composed of bitumen, quartz sand, clay, trace minerals, and water. Bitumen is a heavy and viscous oil that acts like cold molasses at room temperature. The surface deposits of the Athabasca oil sands were initially mined using bucket wheels and
conveyor belts. Giant excavators called bucket wheels would scoop up the sand and place it on a conveyor belt. Syncrude, which started operations in 1978, introduced draglines that dropped buckets into the mine to remove the oil sand. A significant technology improvement in oil sands mining occurred with the introduction of trucks and shovels. This approach allowed better access to the oil sands and was more cost effective. Over time, the size of the equipment used in the oil sands has increased (see Appendix J). Once removed, the oil sand is transported to an extraction plant where the bitumen is separated from the water and sand. The bitumen is then upgraded into a synthetic product — a light crude oil that could be processed by a refinery (Government of Alberta Energy, 2010; Oilsands Developers Group Oil Sands Technologies, n.d.).

While a mining process could be used for surface deposits, only 20% of oil sands reserves in Alberta were mineable, the remaining 80% were too deep to be extracted using mining techniques (Oilsands Alberta, n.d.). Instead, various in situ or ‘in place’ technologies were used to access bitumen in deep reservoirs. In situ technology was developed by Dr. Roger Butler of the University of Calgary in the 1970s while he worked with Esso. The first commercial use of the technology was called cyclic steam simulation (CSS) and was developed by Imperial Oil in the Cold Lake region of Alberta in 1985. (Kelly, 2009)

Advancements in horizontal drilling technology in the mid 1990s made steam assisted gravity drainage (SAGD) technology viable. This approach involves drilling a pair of horizontal wells into the reservoir, one a few metres above the other, and injecting steam into the upper wellbore to heat the bitumen and reduce its viscosity, causing it to drain into the lower wellbore, where it is extracted (Kelly, 2009). See Appendix K for a diagram of the SAGD oil sands operation process.
In situ oil sands development is arguably less harmful to the environment than surface mining. There is less land impact and a shorter reclamation period associated with in situ recovery. In-situ projects eliminate the need for tailings ponds. (Oilsands Alberta, n.d.). Compared with mining techniques, in-situ was less water intensive and there were fewer associated nitrous oxide emissions. However, greenhouse gas and sulphur dioxide emissions were more intensive than in mining (Pembina, 2010). Figure 5 compares GHG emissions for various sources of oil. While in situ ranks in the lower half of the list, industry players believe technology innovations can result in lower steam to oil ratios (SOR) and a lower level of emissions. SOR measures the amount of steam generated to the amount of oil produced. The lower this ratio, the more efficient the process and the less steam required therefore reducing the GHG emissions associated with burning natural gas to heat water to produce steam.
Figure 5: Well-to-wheels Greenhouse Gas Emissions for Oil Sands and Other Crudes

Well-to-wheels Greenhouse Gas Emissions for Oil Sands and Other Crudes

- West Texas Intermediate
- Canadian Heavy (Bow River)
- Saudi Medium (Jen)
- Average US Domestic Crude (2005)
- Mexico-Mayza
- Average US Barrel Consumed (2005)
- Canadian Oil Sands: Mining Dilbit
- Venezuela-Bahaquer
- Canadian Oil Sands: Mining Bitumen
- Canadian Oil Sands: SAGD Dilbit
- Average Oil Sands Imported to United States (2009)*
- Canadian Oil Sands: Mining SCO
- Nigeria Light Crude
- Canadian Oil Sands: SAGD Bitumen
- Venezuelan Partial Upgrader
- California Heavy Oil
- Canadian Oil Sands: SAGD SCO
- Middle East Heavy Oil**
- GSS Bitumen***

Kg CO₂e per Barrel of Refined Products

Well-to-well pump  Fuel Combustion

Source: HS CERA.
Results of a meta-analysis of 13 publicly available life-cycle studies.

Assumptions:
*Assumes 55 percent of exports to the United States are dilbit blends and 45 percent are SCO (source: NER 2009 oil sands exports).
**Steam injection is used for production.
***Assumes SOR of 1.3.
12 percent mass of volume upgrading bitumen to SCO.
All SAGD and production cases assume an SOR of 1.3.
All oil sands cases marked "Dilbit" assume the diluent is consumed in the refinery,
with no recycle of diluent back to Alberta, and only 70 percent of the base is from oil sands.
All oil sands cases marked "Bitumen" assume the diluent is recycled back to Alberta,
and all of the base processed at the refinery is from oil sands.
00738-2
New technologies include VAPEX (vapour extraction process) and SAP (solvent assisted process) which use solvent in the SAGD process. THAI (toe-to-heel air injection) uses burning crude to partially upgrade the bitumen in the reservoir. (Oilsands Developers Group Oil Sands Technologies, n.d.) In a presentation by IHS CERA, a representative from one oil sands producer suggested that technology advancements can raise \textit{in situ} performance to the rank of number three on IHS CERA’s list (April, 2012).

\textit{Suncor’s Firebag Project}

Suncor’s \textit{in-situ} Firebag project was announced in 2000 and had its official opening in 2004. It is located about a two hour drive northeast of Ft. McMurray, Alberta in the Athabasca oil sands area (Appendix I). Oil sands leases in the area north of Fort McMurray were nearing their term and so activity had to be undertaken. At the same time, oil sands production had been increasing and was coming under fire for its environmental impact. Also, commodity prices were on the rise leading to the viability of costly \textit{in situ} oil sands development.

By 1997, Suncor had done enough exploration drilling to realize there was a significant \textit{in situ} deposit in the oil sands. A strategy was established for acquiring land quietly. It is practice in the oil and gas industry to acquire lands without attracting attention from competitors. Much of the potential for competitive advantage in the industry rests on acquiring valuable land leases for development of resources. The mineral rights to resources like bitumen, oil and natural gas in approximately 80 percent of Alberta are owned by the provincial government. Every two weeks, companies can submit bids at auctions sales to obtain the rights to those resources (Government of Alberta Energy, n.d).
Given the competitiveness of this activity, companies sometimes engage in tactics to identify land leases that have been purchased, by whom and for how much. Such information can indicate development plans and the potential for advantage.

Engineering, Procurement and Construction (EPC) firms were used to determine costs as the Major Projects group in Suncor did not exist at the time. Suncor had three leases. They sold one to Nexen Opti (Long Lake), piloted Burnt Lake and subsequently sold it because of its more remote location, and developed Firebag. The project was to use SAGD technology to extract bitumen from the oil sands. The Alberta oil sands are an important sector in Canada’s economy, providing jobs and revenue. Suncor Energy is a pioneer in Canada’s oil sands industry. Through technology advancements Suncor has reconfigured capabilities to access new reserves of bitumen. The SAGD approach has less environmental footprint than mining and, through further technology gains, has the potential for reducing GHGs. While consistent with oil sands development, SAGD represents a departure from Suncor’s established mining approach and required capability reconfiguration.

4.2 Context as Variable: Market Dynamism
As determined in Chapter 2, what distinguishes the dynamic capabilities framework from its theoretical predecessor, the Resource Based View of the firm, is change. Change inside an organization and change in the external context (Teece & Pisano, 1994; Teece et al., 1997). The context in which organizations exist today is often turbulent and the oil and gas industry is no exception. In this section, I use informant data supported by secondary data sources to define a dynamic external context characterized by high market velocity and an unpredictable natural system.
Table 4 provides a summary of informant data related to context as a variable impacting Suncor and the outcome challenges studied in this dissertation. Appendix E lists the codes associated with the category of context – complexity, reconfiguration, growth, industry, maturity, pace regulations, regulator, reservoir, scale, size, society, technology, investors. These codes are presented in Table 4 and are further categorized based on their relation to the external market context versus the external natural system context. The natural system is defined, in this study and drawing on biological definitions\(^1\), as those factors interrelated to one another and directly connected to the natural resource. Specifically, natural system includes the codes of regulations and the regulator, the reservoir, technology and society. Each of these codes has a direct connection to the natural resource and, together, impact the organization as it connects to the natural resource. Market and natural system context variables were identified by informants as impacting the firm’s ability to execute capability reconfiguration as captured under the reconfiguration code.

In particular, as shown in Table 4 pace, growth and technology were market factors frequently mentioned by informants as impacting the company's performance. Frequency counts are typically provided in content analysis to identify repeated ideas (Namey et al., 2008). Frequency counts are used in Table 4 and later in the dissertation to reflect the prevalence of themes through codes. To better indicate thematic importance, the number of individual participants is also provided (Namey et al., 2008). This is done to counter the potential impact to analysis if one individual in one interview comments on one theme frequently. Frequency counts provide support to my analysis of the key themes emerging but do not replace the need to apply

\(^1\) [http://www.merriam-webster.com/dictionary/natural%20system](http://www.merriam-webster.com/dictionary/natural%20system): a biological classification based upon morphological and anatomical relationships and affinities considered in the light of phylogeny and embryology; specif: a system in botany other than the artificial or sexual system established by Linnaeus
judgement and knowledge to the analysis. My use of frequency counts reflects my desire to increase or establish a level of objectivity to this qualitative data analysis.

Informant references to the challenges associated with the natural system indicate external conditions that increase the dynamism of the market. The impact of the natural system on organizations through the unpredictability of the natural resource and the natural environment (weather, location) are not effectively acknowledged in the literature.

The attributes of context connected to the market, as defined by Suncor informants, are: industry and organizational growth encouraged by investor pressures and pace and scale of growth. Informants describe a market environment characterized by rapid growth. Growth of the industry is matched by Suncor’s response of, “growth, growth, growth”. Suncor responded to industry growth through internal growth and this reaction was reinforced by investor pressures for production. As one energy analyst comments, “And if you’re not growing production, you’re losing investors’ attention” (Berkow, 2012). These market pressures for growth require a fast pace to meet with investor expectations and to exceed competitor performance. In the oil and gas industry increasing production requires large scale projects (Jergeas, 2008). Scale presents further challenges, especially to organizations undertaking a large scale project using new technology. The growth of the industry also led to low munificence in the market with human resources, especially in the new SAGD technology, being constrained.

Taken together, these factors of growth, rapid pace, large scale and low munificence create a dynamic market context for Suncor. Added to these market factors are the unpredictability of the reservoir, challenges posed by location, the newness of the technology, public scrutiny and the complexity of regulations affecting the natural system in which oil and gas companies operate.
As the industry grew, regulations became more complex with longer time frames and an increased number of requirements. These observations of the regulatory context made by Suncor employees is supported by data provided by regulatory representatives (see Appendix H).
### Table 4: Context Variable Description

<table>
<thead>
<tr>
<th>Variable</th>
<th>Code, Informant Frequency</th>
<th>Source of contextual variable</th>
<th>Representative Quote</th>
<th>Attribute</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Growth</td>
<td>46, 26</td>
<td>Industry</td>
<td>It’s the dynamic nature of the upstream in oil sands makes it far more complex than any downstream system that could exist.</td>
<td>Dynamic</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Fifteen years ago, the number of oil sands operations in the province you could count on one hand. You know, there’s Imperial’s Cold Lake, there was Syncrude, Suncor. You know, it was pretty small. As the oil price went up and the resource became more profitable, you’ve had a tremendous number of new entrants.</td>
<td>Increasing Number of Players</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Investors</td>
<td>They (investors) want us to deliver and so we need to deliver with consistent operations and with projects that are being built the right way, on budget and on time.</td>
<td>Investor Pressure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Suncor</td>
<td>Right because we were not just a bunch of horses running, we were a bunch of horses running in different directions and so we were being pulled all over the place going and everything for growth, growth, growth, but I mean to the detriment of our operations and of our integration and not to our - thankfully not to the detriment of our Safety.</td>
<td>Aggressive Growth</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>We were on this great growth profile, this great trajectory, and it’s growth, growth, growth.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Whereas we were doubling the company. It was, you know, we did that with our millennium project once and you know and you could say we got through that without having any big compliance issues so, gee, with the Voyageur project let’s double again.</td>
<td></td>
</tr>
<tr>
<td>Pace</td>
<td>20, 15</td>
<td>Industry</td>
<td>The vociferous pace of change through this business over the last decade has been a contributor I’d say to some of this as well right. So the, you know we have built asset after asset after asset in a hyperactive labor environment in a region of Alberta that’s kind of difficult to get to and has its own unique challenges.</td>
<td>Fast</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>You know one thing is just rapid growth and the fact that when you grow</td>
<td>Low Munificence</td>
</tr>
</tbody>
</table>
Suncor extremely rapidly and you're in an industry that is kind of in hyperinflation and you just you're not only having issues internally with having people move very quickly and people in positions for short tenures, but then you have got all these competitive pressures that are happening as well.

Our change was a bit bumpy through that time and you just look at the change in assets and technology we were going through the whole period. So you kind of look back on that period now and say wow, we really imposed a lot of change on our business through that period of time.

I mean, my guess is that probably at the heart of our Firebag VRU was speed, you know, speed was – we are trying to get things out and therefore to review this or to do an extra check on this would have taken a little extra time...

We were in quite a hurry to go commercial.

And it’s almost the evolution and the need to get better and better at all this and the company’s processes and systems for managing these things didn’t keep up with the pace of change going on around it.

<table>
<thead>
<tr>
<th>Fast Pace</th>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Lack of systems and processes</th>
</tr>
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</table>

<table>
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<tr>
<th>Scale</th>
</tr>
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<tbody>
<tr>
<td>9,5</td>
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</table>

Suncor We didn’t have a deep experience base in commissioning large capital projects. We’d had some experience but you know again fairly small group of people who actually knew what it took to get these projects from the drawing board to actually starting them up and turning them into successful facilities.

Lack of experience

<table>
<thead>
<tr>
<th>Natural System</th>
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<table>
<thead>
<tr>
<th>Natural Resource or Reservoir</th>
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</thead>
</table>

Natural Environment 14, 7

We think through the project development phases what I think we’ve come to appreciate and it’s easy in hindsight to appreciate this but every reservoir, every specific project is very different, every in situ project... And the fact is the geology is very different across the whole Athabasca region and we see it in our own sites.

Unpredictable Reservoir

<table>
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<tr>
<th>Risk</th>
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</table>

Weather

The facilities are a lot more complicated and spread out. They tend to be in colder environments. When you go and look at the facilities up north compared to refining, refining doesn’t show up as much. If you look at the upstream facilities it tends to not be as many plants. And so, they’re huge complex systems. With significant environmental risks that need to be managed appropriately.

Complexity

<table>
<thead>
<tr>
<th>Complexity</th>
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</table>

Sensitive Areas

Well and (certain companies) experienced very complex operations. You know, operating in the bayous in Louisiana. Or the difficult muskeg conditions in Russia with kind of harsh environmental concepts and some of those things. They
tend to be more familiar with how to manage sensitive environmental areas and they tend to be a lot more mature in their processes and standards.

| Technology  | 25, 15 | Suncor | So those are fairly well defined processes that are not nearly as complex as what you would see in the downstream but I think they were oversimplified. Remember this is very different than conventional oil and gas.
We were learning a lot about the technology and how it performed at a different scale.
But in a mature industry those debates have already been taken, like the road has been well travelled. Here is the embedded best practice and, therefore, yes everyone else does it this way so of course you're going to do it that way and even EPC firms that is the way they design it right. It becomes part of the normal package, right, and so you know probably there is a link there that the debates we were having to take around gee what do you commit to for SAGD were almost pioneering types of things without the assumptions again back to design criteria. |
|------------|-------|--------|---------------------------------------------------------------|
| Public Scrutiny | 11, 8 | ENGOs | What’s changed though is the expectations of the public and of government responding to public concern especially around the oil sands businesses. I think you all know there’s been dramatic increase in stakeholder interest and just visibility of the whole thing.
There’s been just such a lot of focus on our operations, on the environmental footprint of the oil sands business that you know that’s one level of pressure, it’s just our corporate reputation, our license to operate in the long term depends on us getting this right.
And I think unfortunate right now is that there’s been an adversarial or polarization that’s occurred as a result of this campaigning and this environment I think everybody’s operating under which is causing adversarial and polarized relationships to develop. |
| Regulations | 9,8  | Regulator | You need a small army of people to pull out all the things that are written in your 5,000 pages and say oh ... we made 700 commitments. Right. How do we actually manage it? Believe me, in the old applications I think some of these were, I don’t know how far back you have to go, but some of them were as skinny |

| Oversimplification | Learn by Doing | Maturity | Pressure | Polarization | Increased Number |
as 100 pages. And I’ve actually read some that I think were as little as 24, 25 pages. In 25 pages, you haven’t said anything that you have to comply with.

If you have an application that deals with a land grant and electrical transmission or generation facilities, which most of ours do, we do big things, we now have that many more hurdles just based on reorganization of the government to deal with. Separate and apart from what any one regulators doing to up the ante for what the requirements are. So it’s interesting. So that is being appreciated. You can see that our group has grown from what used to be five people to now 14 people and I don’t think the growth is finished.

I think, obviously, not filing your application as early as we do, that whole queue issue, it would be easy to say that obviously the solution is just don’t file early. But you’re talking about delaying a project that you think is going to make you tonnes of money in over two years, and that’s just huge. And in all reality that’s just not going to happen.

But it took (the regulator) a long time to, oh my, you know, gee there’s a boom; what do we do?
4.3 High Velocity Market Dynamism
Suncor informant data describes a context characterized by fast paced growth and natural system unpredictability contributing to an overall market dynamism. That market dynamism is intensified by investor and public pressures, increasing competition, new technology and evolving regulations. Grant (2003) assesses the oil and gas industry as turbulent, citing oil shocks in the 1970s and increasing competition as factors contributing to transformation of the industry, “from one of stability and continuity to one of uncertainty and turbulence” (p. 496). In Chapter 5, I use informant data to examine the routines at Suncor. In this section, I use the Eisenhardt and Martin (2000) definition of high velocity market dynamism to establish that Suncor operated in a high velocity market. In Chapter 6, I consider the relationship between the high velocity market context, Suncor’s internal capabilities and the outcomes of environmental and operational challenges.

A high velocity market is defined as one in which,

“change becomes nonlinear and less predictable. High-velocity markets are ones in which market boundaries are blurred, successful business models are unclear, and market players (i.e., buyers, suppliers, competitors, complementers) are ambiguous and shifting. The overall industry structure is unclear. Uncertainty cannot be modeled as probabilities because it is not possible to specify a priori the possible future states. In these markets, dynamic capabilities necessarily rely much less on existing knowledge and much more on rapidly creating situation-specific new knowledge. …’ (Eisenhardt & Martin, 2000, p. ).

The authors argue that in highly dynamic markets, successful companies will have simple routines in place that allow them to respond more quickly and effectively to changes in the market. Informant data, as provided in Table 4 indicates that Suncor was moving quickly in response to external pressures from investors and was growing rapidly in response to an industry that was in “hyperinflation” or a “boom”. During this time informants describe an industry that
was growing in number of players, number of projects, scale of projects, development of new technologies, regulations and overall complexity. At the same time, there was pressure from investors to meet production targets and from the public to meet compliance obligations and sustainability goals. These informant observations suggest a dynamic market. To test this argument, informant observations are compared with Eisenhardt and Martin’s (2000) market velocity definition. Eisenhardt and Martin (2000) provide specific criteria with which to determine whether a market should be defined as moderately or highly dynamic. These criteria are outlined in Table 5 and measured against informant observations and secondary data used to corroborate and extend observations. The resulting argument made is that, at the time of Suncor’s capability reconfiguration into SAGD oil sands development, they operated in a high velocity market.
Table 5: Market Dynamism Characteristics and Industry Data

<table>
<thead>
<tr>
<th></th>
<th>Moderate</th>
<th>High Velocity</th>
<th>Oil Sands Industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry Structure</td>
<td>Stable</td>
<td>Ambiguous</td>
<td>Ambiguous (changing players, changing supply demand dynamics, alternative energy sources, low munificence leading to resource constraints)</td>
</tr>
<tr>
<td>Players</td>
<td>Identifiable</td>
<td>Ambiguous and Shifting</td>
<td>Ambiguous and Shifting (mergers, incumbent expansions, new entrants, foreign ownership, new markets)</td>
</tr>
<tr>
<td>Change</td>
<td>Linear and Predictable</td>
<td>Non Linear, Unpredictable</td>
<td>Non Linear, Unpredictable (fluctuating commodity prices)</td>
</tr>
<tr>
<td>Market Boundaries</td>
<td>Defined</td>
<td>Blurred</td>
<td>Blurred (integrated companies in conventional vs unconventional production and mining vs in situ)</td>
</tr>
<tr>
<td>Business Model</td>
<td>Clear</td>
<td>Fluid</td>
<td>Fluid (new technologies leading to new business models)</td>
</tr>
</tbody>
</table>

Applying Eisenhardt and Martin (2000) definitions of high velocity market dynamism, I find that informant data identifying an increasing number of industry players, projects and scale as well as low munificence (Table 4) support a finding of industry structure and player ambiguity (Table 5). To further support the argument that the oil sands industry was dynamic, I use additional market attributes defined by Eisenhardt and Martin (2000) and secondary data to assess the level
of dynamism in the industry. The following sections use secondary data to argue that changing players in the industry and demand and supply dynamics were contributing to market ambiguity, unpredictability, blurred market boundaries and necessitating fluid business models.

Players

In 1978, Syncrude joined Suncor in mining the Athabasca oil sands. A combination of technology improvements, such as the aforementioned use of truck and shovel method, coupled with attractive royalty terms for the oil sands encouraged a wave of development (Oil Sands Developers Group, Mining, n.d.) In 2008, the companies with mining operations in the oil sands included, from smallest to largest in cumulative production of mineable crude bitumen reserves: Shell ($49 \times 10^6 \text{m}^3$), Suncor ($250 \times 10^6 \text{m}^3$) and Syncrude ($371 \times 10^6 \text{m}^3$). CNRL, PetroCanada, Imperial Oil and Shell also had mining projects under active development at the time (Royal Society of Canada, 2010). By December, 2010 there were 95 active oil sands projects in Alberta with six of them in mining (Government of Alberta, n.d.).

According to the “Agreed Statement of Facts” document produced by the Court of Alberta for the hearing at which Suncor was sentenced (Agreed Statement of Facts, 2009), at the time Suncor began designing the Firebag project there were no commercial SAGD projects operating in the Athabasca region. Encana was concurrently piloting a project at Foster Creek and PetroCanada piloted MacKay River in 2002. Encana’s Foster Creek project became commercial in 2001 as the firm began piloting Christina Lake (Patton et al., 2006). By 2008, there were nine producing SAGD projects in the Athabasca region with one project piloted and two proposed and ten active companies in the region (see Appendix L for a graphical representation of Alberta’s oil sands projects in 2008 and 2011). ConocoPhillips and Devon were multinationals operating in
the area. In July 2011, the number of producing projects had modestly increased to thirteen and eight projects were under construction. Remarkably, nineteen thermal projects, mostly SAGD, were proposed for the Athabasca region in 2011 (Appendix L).

In addition to more players entering the industry, the type of players was changing. Statoil had entered the industry via acquisition and Total, the large multinational oil company with headquarters in France, had set up office in Calgary and announced project partnerships with Suncor Energy, Sinopec and ConocoPhillips (Statoil, n.d.; Total, n.d.). Oil sands are viewed as an attractive investment opportunity for international oil companies that are subject to dwindling low cost resource opportunities around the world. The size and capacity of these companies allows them to contend with the high capital costs and long lead times of oil sands projects. Their power also has the potential to leave an indelible impact on the industry with some estimates suggesting 40% of oil and gas profits in Canada going to foreign companies (Weber, 2012). The industry experienced a variety of merger and acquisitions activity contributing to the ambiguous and shifting nature of the industry (Els, 2011). Investment analysts are bullish on crude oil because of increasing global markets, technology advances and global political risk (Dwivedi, 2012).

*Demand and Supply Dynamics*

Figure 6 graphically depicts the turbulent oil prices of the past decades. With each rise in commodity price, oil producers seek to increase production to capitalize on potential profits. In this way, their ability to be nimble and react quickly is directly tied to their competitive advantage in the industry. Between 1995 and 2008, the price of crude oil rose from US$20/bbl to US$145/bbl (EIA, n.d.).
In 1995, it was expected that oil sands development would reach a million barrels a day of production by 2020. That target was achieved in 2004 – 16 years ahead of schedule. During that time frame, oil sands production increased 133% (Pembina, 2005). *In situ* oil sands production was becoming a key strategic initiative for the oil sands industry and for Suncor. In 2008, Alberta’s production of bitumen was 1.3 million bbl/d with surface mining accounting for 55% and *in situ* for 45% (Government of Alberta, n.d.). Industry sources expected surface mining production of bitumen to double and for *in situ* production to increase 2.5 to 3 times to become about 50% of total bitumen production by 2020 (Royal Society of Canada, 2010).
Conclusion

In this section, I have shown that during the period of time Suncor reconfigured capabilities to capitalize on opportunities for in situ development of oil sands reserves, the oil sands industry was characterized as a high velocity market according to Eisenhardt and Martin’s definition (2000). The oil sands industry met criteria for ambiguous industry structure with changing market dynamics; ambiguous and shifting players as new entrants increased and the types of companies and the joint ventures and merger activity also intensified; change was not linear especially given commodity price fluctuations; market boundaries were blurred and business models were fluid as new technology was developed.

4.4 The Natural System and Market Dynamism
Suncor informants also commented on the impact of the environment on their ability to effectively reconfigure capabilities for in situ oil sands development. As shown in Table 4, the reservoir was unpredictable and Suncor came to understand that every reservoir reacts differently. This knowledge is shared by other industry participants, as one interview informant from a competing organization explained,

“It’s, and that’s kind of some of the knowhow is it’s easy to say I’ve got a reservoir, it looks like Cenovus’ reservoir so I’m just going to do what they’re doing. And that’s not always going to work ‘cause every reservoir is unique. And so part of the knowhow is recognizing this is how this recovery process works kind of at a more fundamental level and therefore will it or will it not work in this reservoir”.

The regulator also acknowledges the challenges associated with the reservoir:

“The facilities themselves are a big challenge, not even thinking about the reservoir which is you know even more mysterious.”
In addition, the climate of northern Alberta and the sensitivity of the areas in which reserves are found further complicate the activities of oil companies (Jergeas, 2008). These factors are defined as the natural resource (reservoir) and environment (weather, location) and are part of the natural system which also includes technology, regulations and stakeholder concerns. The natural system captures the interconnectedness of nature with the activities of those organizations dependent on natural resource development. Environmental impacts on oil company operations are not new. The first oil sands plants were a study in persistence. Production targets were not met because of start-up problems. Engineers from San Francisco who worked on early projects in the oil sands were unfamiliar with operating in Canada’s harsh winters (Kelly, 2009).

Success in developing Canada’s oil sands has been predicated upon technological advances. The transition from draglines and buckets to truck and shovels, while seemingly simplistic in innovation terms, marked a significant leap forward in the economic development of mined oil sands. It took over thirty years for oil sands mining companies to produce 600,000 barrels per day (bd), equivalent to the output of a medium-size oil company. Since 2000, technology development, and associated oil sands output, has risen in response to higher oil prices. With the economic downturn of 2008, the industry put projects on hold or what Suncor calls “safe mode” until production again became economic. By 2009, however, oil sands production reached 1.3 million barrels per day (mbd) (IHS CERA, 2009).

Development of in-situ technology was a true collaborative effort among industry, academia, and government. Roger Butler developed the idea for SAGD at the University of Calgary in the early 1980s, but it took collaboration between government and industry through the Oil Sands Technology and Research Authority (AOSTRA) to prove that Dr. Butler’s idea could be commercially viable. While collaborative government and industry funded research persists
today, innovation also comes from small entrepreneurs as well as departments within large oil companies (Kelly, 2009).

More recently, the oil sands industry is looking to improve efficiencies and environmental performance for in situ development. A number of promising innovations are being considered including: SAP (solvent assisted process) and THAI (toe heel air injection). These and other technologies have the potential to reduce steam oil ratios and lead to lower CO2 emissions. Suncor reported a 51% decrease in emissions from 1990 to 2006 due to technology and efficiency gains (Charpentier, Bergerson & MacLean, 2009). According to the IHS Cera Report (2009), “the pace of technological innovation in the oil sands has been substantial, and further advances should be expected.”

Technology advances are propelling the industry forward in environmental responsiveness (NRCan, n.d.). However, as indicated in Table 4, Suncor faced challenges in pioneering SAGD technology. Like many other oil and gas companies, they approached the new technology with an optimism that led to oversimplification (Jergeas, 2008). The immaturity of the technology required a learn by doing approach.

Regulations connected to the natural environment also affect oil companies (see Table 4). In particular, increased activity in the oil industry has resulted in longer lead times for regulatory applications. Also, as environmental impact increases the amount of regulation also grows to ensure protection of the ecosystem and the community members affected by higher industry activity. Neither Eisenhardt and Martin (2000) nor Russo and Fouts (1997) directly consider the impacts of market velocity or industry growth on the level of regulation. In addition, the extant literature does not clearly acknowledge the impact of the natural resource itself and environmental conditions to the dynamism faced by companies. The added complexity of these
factors increases the velocity of the market and adds a new dimension to Eisenhardt and Martin’s (2000) model.

Table 6: Market Velocity Criteria Extended to Include the Natural Environment

<table>
<thead>
<tr>
<th></th>
<th>Moderate</th>
<th>High Velocity</th>
<th>Oil Sands Industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry Structure</td>
<td>Stable</td>
<td>Ambiguous</td>
<td>Ambiguous (changing players, changing supply demand dynamics, alternative energy sources, low munificence leading to resource constraints)</td>
</tr>
<tr>
<td>Players</td>
<td>Identifiable</td>
<td>Ambiguous and Shifting</td>
<td>Ambiguous and Shifting (mergers, incumbent expansions, new entrants, foreign ownership, new markets)</td>
</tr>
<tr>
<td>Change</td>
<td>Linear and Predictable</td>
<td>Non Linear, Unpredictable</td>
<td>Non Linear, Unpredictable (fluctuating commodity prices)</td>
</tr>
<tr>
<td>Market Boundaries</td>
<td>Defined</td>
<td>Blurred</td>
<td>Blurred (integrated companies in conventional vs unconventional production and mining vs in situ)</td>
</tr>
<tr>
<td>Business Model</td>
<td>Clear</td>
<td>Fluid</td>
<td>Fluid (new technologies leading to new business models)</td>
</tr>
<tr>
<td>Natural Resource and Environment</td>
<td>Clear</td>
<td>Fluid</td>
<td>Unpredictable and complex</td>
</tr>
</tbody>
</table>
In this section, I tested primary informant and secondary case data against Eisenhardt and Martin’s (2000) criteria for high velocity market dynamism. I find the oil and gas industry, at the time of the case, was highly dynamic owing to fast paced industry growth, investor pressures, increasing competition, changing market supply and demand fundamentals and increasing project scales. Market dynamism was further intensified by inclusion of the natural system as a factor. For oil companies like Suncor Energy, capturing reserves requires direct interaction with the earth and a reliance on the natural resource. The reservoir proved unpredictable increasing the dynamism of the context. In addition, the context was complicated by new technology for exploiting the resource, elevated public scrutiny and new, increasing and changing regulations with shorter lead times. Based on this finding, I propose extending the definition of a high velocity market to include the natural environment and develop the following proposition:

Proposition 1 (P1): Organizations that interact directly with natural resources and the natural environment contend with unpredictability that adds complexity to high velocity market dynamism.

4.5 Chapter Summary
In this chapter, I argue that Suncor was undergoing capability reconfiguration in a high velocity market. I use Eisenhardt and Martin’s (2000) criteria for defining a high velocity market and evaluate Suncor informant observations and secondary data to assess whether the oil sands industry, at the time, operated in a moderate or high velocity market. The data supports the conclusion that the market was high velocity with industry growth linked to a growing number of players, investor pressures and a rising oil price due to supply and demand dynamics. This market dynamism is intensified by an unpredictable and changing natural system defined by the
reservoir, local environment, technology, society and regulations connected with the natural resource. I extend Eisenhardt and Martin’s (2000) definition of market velocity to include the natural resource and environmental conditions.

In Chapter 5, I analyse data identifying direct causes of Suncor’s environmental and operational failure. Based on this detailed analysis of the external context and building on literature linking high velocity market dynamics with simple routines (Eisenhardt & Martin, 2000; Eisenhardt et al., 2010), I analyse Suncor routines with respect to the context.
CHAPTER 5: DIMENSIONS OF CAPABILITY RECONFIGURATION

“Routine is a ground to stand on, a wall to retreat to; we cannot draw on our boots without bracing ourselves against it.”
Henry David Thoreau

The initial conceptual model for the dissertation (Chapter 2, Figure 2) was founded upon Teece’s framework with variables defined as: routines, position and dominant logic. In this chapter, those variables are described and explicated to determine the dimensions of capability reconfiguration at Suncor and how execution occurred. In Chapter 6, a causal model is developed using data from these tables and data from Chapter 4 on context to explain why capability reconfiguration at Suncor led to compliance and operational challenges.

5.1 Reconfiguration Process at Suncor
Before evaluating dimensions of reconfiguration and their causal effects, as outlined in Chapter 3, it is important to define the process of reconfiguration at Suncor. Figure 7 presents a timeline of the reconfiguration process at Suncor. I find, in keeping with Teece's theory (2007, p. 1343), that sensing and seizing dynamic capabilities are antecedents to capability reconfiguration. Suncor's acquisition of land leases for in situ development of bitumen reserves before an exploitation technology existed demonstrates an early, entrepreneurial sensing of an opportunity. At the time Suncor purchased land leases in the Firebag area their oil sands business focused on mining techniques and extracting bitumen at the surface. A technology for extracting the bitumen far beneath the surface in that geographic area had not yet been developed. It was only through advancements in horizontal drilling that those deep reserves of bitumen could be accessed and developed using SAGD technology. The organization's subsequent piloting of
SAGD at Burnt Lake only a short time after the development of the technology further demonstrates an entrepreneurial seizing of the opportunity and a quick adaptation to market.

Teece (2007) defines the relationship of sensing and seizing as precursors to reconfiguration and acknowledges the scarcity of skill associated with these dynamic capabilities (p. 1343). However, the tension between sensing and seizing, and reconfiguring is not explicitly acknowledged. As shown in Figure 7, Suncor did exhibit sensing and seizing dynamic capabilities. The entrepreneurial dominant logic that existed at Suncor facilitated the identification and resourcing through investment of money, people and equipment of an opportunity for in situ oil sands development. That same entrepreneurial dominant logic was subsequently deficient in required structure and formalization for exploitation of the opportunity.

Proposition 2 (P2): Organizations that are entrepreneurial, and characterized by dynamic capabilities for sensing and seizing of opportunities, may experience reconfiguration challenges as they take advantage of those opportunities.
Figure 7: Reconfiguration Timeline at Suncor

- 1985 - Cold Lake CSS in situ
- mid 1990s - SAGD technology developed
- 1997 Burnt Lake Pilot Reservoir Research
- Decision to develop Firebag site 1996 and 1997
- Firebag Design 1999 to 2000
- Firebag Application Feb to April 2000
- Firebag Approval Jan 2002
- Firebag Construction 2000 to 2002
- 1997 - Suncor leases approach expiry
- Late 1990s - Suncor leases approach expiry
- Sensing Opportunity
- Seizing Opportunity
- Reconfiguring
5.2 Reconfiguration Mechanisms, Routines and Position
Cycling between the theoretical definition of reconfiguration and the data, I find that capability reconfiguration at Suncor occurs through transfer and sharing of capabilities from the existing oil sands mining business and through acquisition of capabilities via new personnel and outsourcing arrangements with EPC firms. The newness of the SAGD technology and lack of internal expertise necessitated Suncor going to the market to obtain certain capabilities externally. These reconfiguration mechanisms of transfer, sharing and acquisition are shown in Table 7. The mechanisms reveal how capabilities were redeployed from internal and external sources. In the dynamic capabilities framework the dimensions of capability reconfiguration were position, process and path (Teece & Pisano, 1994; Teece et al., 1997). Building on the conceptual model developed for this research study (Figure 2, Chapter 2), actual capabilities transferred, acquired or shared are categorized as routines, both tacit and explicit.

Position at Suncor is established by physical, financial and human resources (Teece & Pisano, 1994, Teece et al., 1997). As highlighted in Figure 7, Suncor had land leases as assets that required development. Financial data provided in Appendix M demonstrates that Suncor had the ability to finance development projects. The construct of ‘people’ is coded for in the data and identified in Table 7 as a conduit for capability transfer. An organization’s human resources are often critical to reconfiguration where tacit knowledge that cannot be codified resides in individuals (Teece & Pisano, 1994, p. 549; Teece et al., 1997, p. 525).

Table 7 uses data to show how tacit and explicit routines were reconfigured via mechanisms of transfer, sharing and acquisition. People are a necessary variable in that reconfiguration. The consequences of the transfer, sharing or acquisition of routines are identified and linked to the theoretical constructs of negative and non-transfer. Since the study is focused on negative
reconfiguration outcomes of noncompliance and operational challenges, the transfer, sharing and acquisition of routines is tied to the negative consequences of non-transfer and negative transfer.
Table 7: Reconfiguration Mechanisms and their Consequences

<table>
<thead>
<tr>
<th>Capability</th>
<th>Reconfiguration Mechanism</th>
<th>Conduit = People</th>
<th>Consequence</th>
<th>Theoretical Constructs</th>
<th>Representative Quote</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tacit Routines</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In situ Engineering and Design Knowledge</td>
<td>Acquisition and Transfer</td>
<td>Facilities Engineers - Amoco Wolfe Lake and EPC Firms</td>
<td>Transfer of CSS knowledge not applicable to SAGD</td>
<td>Negative Transfer</td>
<td>And so that’s been a key finding for. Equipment that fouls in one region fouls very differently where we are, so heavy oil is heavier, it’s stickier, it messes things up much more than you would see in an Imperial-Cold Lake-type facility. So it’s figuring out what’s the right instrumentation to measure certain things and then how you control that. That’s some of the stuff we’re working through right now.</td>
</tr>
<tr>
<td>Reservoir Knowledge</td>
<td>Transfer</td>
<td>Suncor Reservoir Engineers - Burnt Lake Pilot Plant and Natural Gas BU</td>
<td>Transfer of Cold Lake pilot experience not applicable given reservoir differences</td>
<td>Negative Transfer</td>
<td>UTF (experimental SAGD project) didn’t experience the levels of H2S that we ultimately saw in Firebag, and nobody had ever experienced that from the other projects to the south, like Esso’s Cold Lake or the Wolf Lake, the Amoco Wolf Lake project, AEC used to have a pilot called Primrose. ... Anyway when you look at all of that, nobody had encountered really really high H2S levels, and so it was a surprise when we started to produce that H2S. We didn’t even pilot for too much of a length of time. There was a pilot … more towards the Cold Lake region … on so that they had some history in the field, but I think it might have been cyclic steam simulation.</td>
</tr>
<tr>
<td>Regulatory Support</td>
<td>Transfer and Sharing</td>
<td>Oil Sands Mine Regulatory Team</td>
<td>Transfer and sharing of AENV regulatory knowledge, lack of knowledge that in situ regulated by AENV but also ERCB.</td>
<td>Negative Transfer</td>
<td>So we transferred that same thought process and knowledge to Firebag and none of us understood the role of the ERCB at that point in time in these in situ facilities. We were thinking of it is an Oil Sands facility, right, far as we’re concerned it is. ERCB looks at it very differently.</td>
</tr>
</tbody>
</table>

93
| Regulatory Knowledge | Acquisition and Sharing | Amoco Wolfe Lake Engineers and Suncor Reservoir Engineers | Application knowledge from other sites and from years ago, no longer applicable. | Negative Transfer | (We) were really surprised frankly at the amount of detail, and the amount of consultation, and the amount of work that had to go in ahead of time. And part of it is I think because of the scale of what you’re dealing with up there, it’s larger than a lot of other sites. And you know, we’re really familiar with regulatory approvals for batteries and they’re just so much smaller, it’s not nearly as involved as these very, very large applications. And the approvals that would have been received for Wolf Lake and Cold Lake would have gone back, the first approvals, decades. When those were done. Because Wolf Lake started up in, for sure in the 1980’s.

There is a strong Alberta Environment focus down at Base Plant and up here I believe we’re, we have a lot more ERCB requirements than they would have down at Oil Sands Plant or the Oil Sands Mine. And just that lack of knowledge to begin with up here previously, in the previous leadership of Firebag.

<table>
<thead>
<tr>
<th>Explicit Routines</th>
<th>Transfer</th>
<th>Oil Sands Mine Base Plant</th>
<th>Transfer of AENV regulatory focus when ERCB required.</th>
<th>Negative Transfer</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Regulatory Relations</td>
<td>Transfer</td>
<td>Oil Sands Mine Regulatory Team</td>
<td>Informal relationship with AENV at the mine could not easily be replicated with the ERCB and Firebag</td>
<td>Non Transfer</td>
<td>And so that was a key learning for us, how you report and what you report and the timeliness of that. The relationship with the ERCB Bonnyville Field Center was very different than the relationship with the Alberta Environment folks based in Fort McMurray that you know it had a long history with in terms of oil sands. So that was one very key learning.</td>
</tr>
<tr>
<td>Project Design</td>
<td>Acquisition</td>
<td>Outsourced EPC Firms</td>
<td>Loss of control and process ambiguity</td>
<td>Non Transfer</td>
<td>In this vintage of time, we didn’t have a formalized Suncor project implementation process. I mean, the EPC firms may have had something themselves, but we weren’t doing formalized gate reviews and things like that. It was no give us a turnkey.</td>
</tr>
<tr>
<td>Regulatory Processes</td>
<td>Transfer</td>
<td>Oil Sands Mine Regulatory Team</td>
<td>Lack of Codified or Formalized Processes</td>
<td>Non Transfer</td>
<td>See Table 8 for details</td>
</tr>
<tr>
<td>Firebag Operations</td>
<td>Transfer</td>
<td>Oil Sands Mine and Upstream Reservoir Individuals</td>
<td>Oil Sands Mine Operations knowledge was not applicable.</td>
<td>Negative Transfer</td>
<td>Not a lot of operating experience in SAGD, at least from a Suncor perspective. And a lot of the operating experience we had did come from our base plant.</td>
</tr>
</tbody>
</table>
| Reservoir knowledge focus does include downstream or above ground facilities. | Non Transfer | In situ is a blend of upstream and downstream and so (Firebag’s leader was) an upstream fellow and he knows the reservoir in a very detailed way.... he does fabulously well at it. He doesn’t have the downstream experience with big facilities to know what operating discipline looks like.  
Part of the trouble is that the leadership, so the upstream leadership that was in place in the upstream a lot of knowledge around the subsurface components but then in part I think that’s why you have control centers and downstream assets that are on the surface that are being run like cowboys. Like that was what occurred is there wasn’t a downstream kind of focus. |
5.3 Capability Transfer of Routines

In Chapter 2, I made a definitional distinction between tacit and explicit knowledge. That definition is extended in this chapter to apply to routines. Tacit routines are not easily codified and are more difficult to transfer while explicit routines are or, in Suncor’s case, have the potential to be codified. Just as tacit knowledge is more challenging to transfer, tacit routines rely heavily on individuals for successful transfer (Grant 1996a; Teece, 2007). Both tacit and informal explicit routines resemble heuristics in their lack of structure.

**Tacit Routines**

The tacit routines identified by informants and presented in Table 7 are activities that are not easily codified and, in many cases, are knowledge or “know how” (Grant, 1996a). The Firebag project required both subsurface and surface knowledge for execution. Surface knowledge includes engineering and design of surface facilities and processes required in the SAGD process. This expertise was acquired externally by hiring employees and using EPC firms with knowledge of cyclic steam simulation (CSS), a process used by Imperial Oil in the Cold Lake area since 1985 (Kelly, 2009). Initially, one EPC firm had been used to create the conceptual design. It was then determined that that the actual construction of the project would be too large for that firm and a second EPC firm was contracted. This firm transferred its project management approach to bring Firebag from concept through construction and to the point of hand over to Suncor for start-up and commissioning. Suncor also hired three engineers who were ex-Amoco employees and had worked with Firebag’s founding engineer and champion. That individual subsequently left the firm before Firebag became operational. Knowledge from *in situ*
CSS experience in the Cold Lake area was not applicable because of differences in the technology and the reservoir that were not identified in advance by Suncor.

Subsurface knowledge is of the reservoir. Given Suncor’s history in surface mining for bitumen extraction, reservoir knowledge required capability development. This was achieved internally through knowledge development, knowledge transfer from natural gas activity and project piloting. The Burnt Lake pilot, located in the Cold Lake area, provided much of the bitumen reservoir knowledge developed internally. Suncor did not anticipate differences between the Burnt Lake reservoir, which was located in the Cold Lake area, and the Firebag reservoir located in the Athabasca region. The consequence of applying knowledge from a different geographic area to the Firebag project was that the technical subsurface knowledge was actually not applicable and unanticipated and different responses occurred.

The oil and gas industry in Alberta is heavily regulated. Any project is impacted by provincial regulations for resource development. As a result, regulatory knowledge is vital to getting projects approved and executed. Regulatory knowledge for Firebag came from inside the firm through a transfer and sharing of knowledge from the oil sands mining business. In addition, ex-Amoco employees with in situ knowledge were able to draw on their application experience from the 1980s. This regulatory knowledge was shared and transferred to the Firebag regulatory team which was led by a reservoir engineer. In many cases, the oil sands mining regulatory support and knowledge were not applicable to the new in situ business.

The technical subsurface and surface as well as regulatory knowledge required for the design and planning of Firebag was not applicable. The consequence, in theoretical terms, was a negative transfer. To reiterate, as provided in Chapter 2, a negative transfer occurs when, “a prior event
inhibits subsequent performance” (Finkelstein & Haleblian, 2002, p. 36). Finkelstein and Haleblian (2002) assert that the inclination to negative transfer is particularly threatening when two activities share superficial similarities and significant underlying differences. Galunic and Rodan (1998) find that there is a tendency to evaluate situations based on a pre-existing mental model that may prevent you from detecting important distinctions between contexts. For Suncor, those underlying differences were literally underlying the earth. The difference in the reservoir was one aspect to the negative transfer; the other was the difference in regulation and regulatory regime.

*Explicit Routines*

While consequences of the missing VRU were not significant and resulted in no environmental harm, as indicated by the prosecuting attorney at the hearing, the omission signalled to the regulator deficiencies in the compliance processes and procedures in place at Suncor’s Firebag project. These assumed deficiencies were of enough concern to warrant the charge (see Appendices D and H).

Through analysis of the data for explicit routines, I found that critical routines were not transferred or what I term ‘non-transfer’, with negative consequences for Suncor. Regulatory relations, project design, regulatory processes and operations capabilities were reconfigured for development of the Firebag project. Attempts were made to transfer regulatory routines from the oil sands mine. In most cases these processes were not formalized and could not be effectively transferred resulting in a non-transfer of capabilities (see Table 7). In addition and unbeknownst to Suncor, *in situ* was regulated more heavily by the ERCB rather than Alberta Environment.
The consequence was that established informal relationships with the regulator were not applicable.

The overall project design process was acquired by the project from the outsourced EPC firm. Using an external source for this key process exposed Suncor to loss of control and to ambiguity around the underpinnings of the process. In effect, the process was not transferred but rather executed without Suncor actually adopting the process.

“I think it was a period of time in which we had tremendous reliance on EPC firms to be the owners of not just the engineering design standards, but of quality and of - even of cost management. So, you know, you are really going to a turnkey type model on a green fields project without having – we didn’t have our major projects division in place either back at that time so that was a period of time in which we were still having the operating business try and act as project manager, as well as operator… In this vintage of time, we didn’t have a formalized Suncor project implementation process. I mean, the EPC firms may have had something themselves, but we weren’t doing formalized gate reviews and things like that. It was no give us a turnkey.”  

Suncor Informant

Firebag operational processes were focused on the upstream or the reservoir because this was perceived to be where the differences and learning needed to occur. At the same time, routines for facilities operations were taken for granted because of Suncor’s facilities experience in conventional oil and gas as well as mining. As a result, formalized facilities operation routines were not transferred to Firebag from the base plant mining business.

The end result of a lack of formalized routines at Suncor was that important project design, operational and regulatory routines that functioned in either external or internal but alternate business areas were not effectively transferred to the Firebag project.
As shown in Table 7 and as expounded on above, in some cases negative consequences were a result of a required capability not being transferred to the new *in situ* business. I define this as a non-transfer. In other cases, a capability is transferred that is not applicable to the new business. This has been defined in the acquisitions literature as negative transfer by Finkelstein and Halebian (2002). The authors also describe incidents where positive transfer occurs when the capability transferred is applicable and leads to a positive outcome. I further conjecture that a positive non-transfer outcome occurs when capabilities that are not applicable are not transferred. For this to be identified as an event there must be effective deliberate assessment of the capability.

Since the research focused on identifying root causes of the near misses, analysis of capability transfer effects analogously confers on negative outcomes. Figure 8 presents a model of these transfer effects, highlighting negative and non-transfer of capabilities as important constructs in the analysis of this Suncor case study data. The challenges of reconfiguration at Suncor Energy can be explained by drawing on the acquisitions literature and the construct of negative transfer. In addition, the absence of formalized routines at Suncor results in the introduction of the construct of non-transfer leading to negative consequences. As shown in the knowledge transfer literature, it is difficult to transfer that which is not in codified form (Zander & Kogut, 1995; van Wijk, Jansen & Lyles, 2008). This challenge is intensified when developing a new business based on a new technology where pre-existing experience is limited and where the core business is growing and resources overall are constrained due to low munificence in the external market.
5.4 Informal, Explicit Routines
In evaluating reconfiguration mechanisms and dimensions and throughout data analysis it was clear that routines contributed to environmental noncompliance at Suncor. In Table 7 it was established that explicit routines were not transferred which I define by the construct ‘non-transfer’, and that tacit routines were negatively transferred. Table 8 describes patterns associated with these explicit routines that factored into capability reconfiguration at Suncor. Frequency values indicate that there was strong informant support for the assertion that key routines were not formalized at Suncor, leading to negative compliance and operational outcomes. Suncor informants state implicitly that certain routines were not ‘formalized’ (See Table 7). Other language from the data supporting the assessment of informal, explicit routines includes: “no signoff, manual process, lack of systems, lack of checks and balances, lack of defined integration, lack of defined accountability, assumptions, lack of standards”, as well as, “ad hoc, undocumented, not updated, missing parts”.

Figure 8: Capability Transfer Effects

<table>
<thead>
<tr>
<th>Capability Applicable</th>
<th>Capability Not Applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Transferred</strong></td>
<td><strong>Negative Transfer</strong></td>
</tr>
<tr>
<td>Positive Transfer</td>
<td></td>
</tr>
<tr>
<td>Non Transfer</td>
<td>Positive Non Transfer</td>
</tr>
<tr>
<td>Not Transferred</td>
<td></td>
</tr>
</tbody>
</table>
Informants most frequently cited informal regulatory approval review, regulatory application review and project integration processes as contributing to the environmental infractions. In the extant literature, explicit routines are equated with codifiable knowledge and codification is assumed in established, incumbent firms prior to reconfiguration (Lavie, 2006; Galunic & Rodan, 1998). The data in Table 8 demonstrates that explicit routines at Suncor, while amenable to codification, were informal.

An internal Suncor review, external consultant review and regulator informant data all corroborate the finding that informal compliance processes were directly responsible for the environmental infractions. Details of the internal and external audit reports cannot be shared for confidentiality reasons, however both reports find informal compliance and operational processes as contributing to the infractions and operational issues. Data provided in Appendix H indicate that insufficient compliance assurance processes existed at Suncor and contributed to events leading to the infractions.

The Firebag regulatory team relied on transfer of routines from the oil sands mining business, Suncor’s core business. The regulatory application and approval review processes as well as the integration of functional areas in the design process were informal. That is, a formalized or codified process did not exist, but rather heuristics guided execution of these activities. The regulatory application review process involves a review of the regulatory application document by both the regulatory team and the design engineers to ensure that what is in the application is consistent with the design. This process is iterative and involves coordination of numerous revisions to the application. As explained by a Suncor informant,

“Oh so probably over the couple of months preceding this, hundreds. Because they would usually come back with… you know they’d review a
section, she’d get some comments back – this needs to change or whatever. And the changes literally were… she would send them usually an electronic version of that section and most often they would then email her back all the changes that they wanted, but not in the document”.

One such revision was a request by a design engineer to remove gas blankets from the application as they were not necessary for the design since sour gas was not anticipated. References to gas blankets were removed from the application; however, because of a lack of technical in situ experience on the Firebag regulatory team it was not clear that removal of gas blankets required removal of vapour recovery units (VRUs) as well. A gas blanket works in tandem with a VRU. The gas blanket contains the emissions from the tank, in this case a produced water tank. While the VRU recovers those vapours for processing. In the end, the regulatory application contained reference to VRUs that were no longer in the design of the Firebag facilities. There was no formal sign off process where the design engineers might have flagged the inconsistency. As a result, the application was submitted with the VRU while it was no longer part of the design and would not be part of the facility that was eventually constructed. This was one of the charges against Suncor (see Appendix D for the Court Statement of Facts charges).

Suncor informants assert that a management of change (MOC) process would have highlighted the inconsistency between design and regulatory application. At the time of Firebag development, that process was informal and often not implemented. With a MOC process, any change made by the design team would have been formalized through sign off. In this way, the change would have been more clearly communicated and captured.
<table>
<thead>
<tr>
<th>Process Name</th>
<th>Routine Pattern</th>
<th>Code, Informant Frequency</th>
<th>Consequence</th>
<th>Outcome</th>
<th>Representative Quote</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regulatory Application Review Process</td>
<td>Informal</td>
<td>14, 8</td>
<td>No formal signoff on final application document with engineers and regulatory approval team (pace as an issue). Manual process prone to error.</td>
<td>VRU removed from the design but remained in the application.</td>
<td>I don’t think that they formalized it enough. I think we’re doing a much better job of it because having been involved in a few since then I know that the guy I work with on Firebag kind of understands that he won’t submit anything until I say yes and give him back the information. You start feeding whatever you’ve got. So part of the problem that we have is that it’s not formalized enough. So it was quite a manual process. And the decision making process, like I say I don’t think there were proper checks and balances of sign off of management of change items. Well there is supposed to be a change management process by which the compliance team or the regulatory group is a part and they need to sign off but I haven’t seen that implemented yet. The baton passing wasn’t – the exchange never led to a good interaction between the various groups who own compliance assurance and it’s not one group...people don’t have a really good understanding of the integrated nature of some of these processes. Then also you know the engineering design standards may not make their way into the operational standards. Like I’m not sure how that process is closed and so it’s possible that you know we design it in a certain way but once we start operating we’re not aware. Absolutely, right. Yeah. So without those interfaces really being properly understood without clarity of accountabilities on end to end project execution, which includes ultimately the operations handing off these things a recipe for disaster.</td>
</tr>
<tr>
<td>Application Management of Change (MOC) Process</td>
<td>Informal</td>
<td>5, 5</td>
<td>VRU removed from the design but remained in the application.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project Integration: Between Regulatory, Design and Operations</td>
<td>Informal</td>
<td>14, 6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project Execution Process</td>
<td>Outsourced</td>
<td>9, 2</td>
<td>Lack of ownership by Suncor and lack of control of integration of compliance into process.</td>
<td>VRU removed from the design but remained in the application.</td>
<td>I think there were a lot of assumptions that – hey, you guys are the experts, you should know how to build plants that are regulatory compliant. But you know what; they didn’t have the systems to make sure that that was happening. So we’ve said – look, we need to take ownership of that. Yes or there’s just a black box, a black box cannot do this.</td>
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<td>--------------------------</td>
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<td>-----------------------------------------------------------------</td>
<td>-----------------------------------------------------------------</td>
</tr>
<tr>
<td>Regulatory Approval Review</td>
<td>Informal</td>
<td>22,10</td>
<td>No review of approval received from the regulator for the project against what was built.</td>
<td>Failure to disclose environmental noncompliance to regulator</td>
<td>I think that the most significant gap of this, or one of them, was – yup, got the approval, we all read it, and then it went into a filing cabinet somewhere and we went on our merry way. Don’t think we had to do any of that (approval review), really, on stage one. It wasn’t really clean up. So approvals, which used to be in Oilsands is now a corporate thing. And all the technical standards and a bunch of the technical things were bedded here, there and everywhere and the corporate things, so that’s only going to help us standardize.</td>
</tr>
<tr>
<td>EHS Corporate Audit 2003-2006</td>
<td>Suspended</td>
<td>5,4</td>
<td>Expectation that business units would conduct self-assessments.</td>
<td>Failure to disclose environmental noncompliance to regulator</td>
<td>There was another weakness I should put on the table here before I lose it too is we had this major corner – what we called initiative called cornerstone which was an SAP implementation. But a declaration was made as part of that initiative that we would not do EHS auditing. You know, it was a big draw on capacity in the company to do the design of this, to implement it, to do the change effort and EHS was caught in it too because we were doing a major implementation as one of the functional streams there and it was drawing on a lot of our EHS horsepower. So 2003 to 2006 you saw basically a disengagement on auditing, which in hindsight…</td>
</tr>
</tbody>
</table>
| Firebag Operation Processes | Informal | 8.6 | Operational issues. | Missed production targets and/or sour gas issues not managed. | When you get to that stage, you realize well something is seriously wrong with the process. And people aren’t following it through in a logical way.

So there was a real recognition that fundamental pieces were missing in terms of how you manage your operations. So if you were an operator and you needed to go and run a piece of equipment where would you go to get that procedure? Was it current, was it updated, if you could find it at all; drawings, site drawings, missing. And so, what came out of that was well I think ultimately a pretty significant management change. |
In the execution of any large scale project there is integration between various organizational functions. The project process is outlined in Figure 9. You will note that hand off occurs between design and regulatory as well as regulatory and construction and operations. The regulatory team should interface with each functional area to assure regulatory compliance. This integration at Suncor had been informal in the mining business. From its pioneering roots as a small organization, Suncor had developed informal communication approaches.

“A lot of the way we operated was because we all worked together. I knew (individual), he knew me. We chatted all the time about stuff. Fixes would be sort of ad hoc. Here why don’t you review the approval? Cause I know who you are and I know what you do, so I think it would be a good idea for you to review this.” *Suncor Informant*

This informal approach to project integration was challenging to redeploy to Firebag where new personnel from various parts of the organization and from outside the organization were pulled together for the project.
Figure 9: Reconfiguration Process at Suncor
Project integration would have been facilitated by a formal project execution process. The actual project execution process for Firebag was housed in the external EPC firm and, therefore, absent from Suncor’s control. Suncor assumed that the EPC firm had adequate systems in place.

The missing VRU might have been identified before charges were laid had Suncor implemented a formal approval review process. Once a regulatory application is approved by the regulator, an approval document is returned to the firm. In Suncor’s case that document was put in a filing cabinet and forgotten. The approval review process was informal and not standardized. Given this lack of formalization, execution of the process was contingent upon individuals. Suncor was charged with failure to disclose because the noncompliance in not building the VRU while it was in the design was not reported from the point of commercialization, December 2003, until July of 2006. See Appendix N for a timeline of events leading to the charges. As shown in Appendix H this indicated to the regulator that compliance assurance processes were not in place at Firebag. Also, shown in data Appendix H is the importance of self-disclosure. In the Alberta regulatory system, the regulator relies on a level of self-regulation. By Suncor not having a system in place to make that assessment they fell short on this self-regulation commitment and were charged accordingly.

Another avenue for identifying the noncompliance sooner might have been through corporate audit. A decision was made to suspend corporate audit to dedicate resources to SAP implementation. With that decision was an assumption that the business units would continue their self-assessments.
5.5 Dominant Logic
In analysing informant data, I identified a second cause of the environmental infractions and operational issues as the organizational mindset. The external review conducted by a third party consulting firm validates this finding citing culture as a root cause (CH2M Hill, 2008).

Informants describe a dominant mindset established by the mining business which was referred to as ‘Oil Sands’ given that this was the organization’s core business,

“We didn’t have strong, before in my opinion, corporate focus on stuff for consistency, it was Oil Sands. Everything was Oil Sands.” Suncor Informant

Suncor informants use colourful language to describe the Suncor mindset; adages like, “cowboy culture”, “pirate code”, “firefighters” and words reflecting a propensity for growth, action and informality. Informants exhibit a mixture of pride and pain as they describe an organization that values fast action and fluidity rather than extensive analysis leading to bureaucracy and paralysis.

“I like the fact that Suncor has been a nimble company that can adjust. But you know if you don’t adjust or when you do adjust if you don’t have the processes to correct yourself or to catch up you’re going to run into issues like we had. So yeah you know I don’t want to see, as an employee, I don’t want to see us get burdened down in bureaucracy.” Suncor Informant

The overriding dominant logic at Suncor came from the Oil Sands Mining Business (see Appendix O for Suncor’s organizational structure at the time). Evidence from the data (Table 7) indicates that operational approaches at the mining site were not applicable to the new SAGD technology and a negative transfer of capability occurred. The mining approach of “running it hard” (Table 10) should not have been redeployed at Firebag. That approach would result in operational issues at the site.
SAGD oil sands development was a new technology involving different technology processes than mining. Open pit mining, as executed in Suncor’s core business, involved crudely removing large amounts of overburden or topsoil with large trucks and shovels and then similarly extracting the bitumen to be taken to a processing plant. On the contrary, SAGD requires the use of steam and pressure as exogenous inputs to create a reaction in the reservoir that allows the thick bitumen to flow for extraction. The reaction of the reservoir is unpredictable and organizations must be prepared to adjust operations in response to that unpredictability. Applying the mining dominant logic resulted in failure to adjust as unforeseen circumstances evolved.

Suncor did, however, appreciate the significance of the reservoir to the Firebag operation. Individuals with reservoir experience from the natural gas business were transferred to Firebag and placed in key leadership positions. The Firebag project was defined in terms of upstream and downstream activity with upstream meaning anything beneath the ground and downstream being activities above the ground. The reservoir was upstream and plant facilities were downstream. As a result of that attention given the upstream, the facilities focus that permeated the various business units at Suncor including mining and conventional oil and gas production was not transferred to Firebag. Instead, the focus was on the reservoir given that this was the new and different project attribute in Suncor’s mind. Facilities considerations were effectively taken for granted to the detriment of the project.

Dominant Logic – Core Business (Suncor Oil Sands Mine)

The data, as presented in Table 9, describes the oil sands mine dominant logic as entrepreneurial characterized by flexibility and growth with a decentralized structure, fast thinking and fast pace. Informant statements use the terms mindset and culture to describe what I define as dominant
Table 9: Dominant Logic – Core Business (Suncor Oil Sands Mine)

<table>
<thead>
<tr>
<th>Theoretical Construct</th>
<th>Attributes</th>
<th>Representative Quote Supporting Attribute</th>
<th>Consequence</th>
<th>Representative Quote Supporting Consequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entrepreneurial</td>
<td>Flexible</td>
<td>Reliance on people. It would be this kind of entrepreneurial mentality that, gee, we are going to grow for one thing and we will respond to whatever comes along at the time of the day. We’re not very rigid and very formal. It’s a very informal organization. Standards were kind of treated more like the pirate code. They were more of a guideline than a standard.</td>
<td>Lack of formalized process.</td>
<td>So, and I think that’s where we have to get our mindset around is – and I truly believe senior management’s there. It’s just we need to really get down into the heart of the organization and get processes in place that make this a no-brainer, right.</td>
</tr>
<tr>
<td>Growth</td>
<td></td>
<td>Demand on people’s time at Oil Sands were greater than their capacity. Right. Cause there was so much growth, concurrent with the, you know, high operational expectations. People were being pulled, you know, to your point, in every direction. And I think lots of things just got slipped through the cracks.</td>
<td>Reactive - lack of upfront planning</td>
<td>The results of these audits and benchmarking is you guys need to be more planful, more diligent.</td>
</tr>
<tr>
<td>Fast Thinking</td>
<td>Action oriented with less emphasis on upfront analysis.</td>
<td>Cultures that are different. So the analogy is that Suncor is you know shoot, shoot, shoot aim...maybe not shoot, we have to get together and decide whether we're going to shoot. I think that is a broad generalization... but there is definitely parts of that that are true. Overall culture is a little bit different in Petro-Canada for sure. You know there’s more good for us project type guys because they’re definitely more planful, more let’s be diligent, you know let’s follow the process than probably we were in the past.</td>
<td>Lack of deliberate, upfront planning.</td>
<td>Being the hero and you know very good at putting out fires and not so good at preventing them. Yeah, I would suggest Suncor, part of its very good success is this get-it-done, right. But it’s also now becoming apparent it’s also part of the problem right…</td>
</tr>
<tr>
<td>Pace</td>
<td>Fast Paced</td>
<td>There’s no question we were moving quickly. But that is the way Suncor tends to do things - is to do things relatively quickly.</td>
<td>Fix problems later.</td>
<td>And if things need to be fixed afterwards, we’ll do that. The other model is you study it to death for years and years and generally still need to fix it at the end anyways. So, I’m not saying either model is perfect, by any means, but that’s generally the way we’ve done things. So, that’s a piece of it. I think that more is going on in processes.</td>
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<tr>
<td>Structure</td>
<td>Decentralized</td>
<td>And they’re not too keen on Calgary deciding how they’re going to do their thing ‘cause they’ve never had to listen to somebody else tell them or say you know or have solutions that are 80 percent what they think they need but it fits for the whole. But it’s part of the ops excellent mantra that was communicated.</td>
<td>Short pilot</td>
<td>We didn’t even pilot for too much of a length of time.</td>
</tr>
<tr>
<td>Priority</td>
<td>Cost and schedule</td>
<td>So if you’re at a work site where it’s the norm to do shortcuts and where production is more important than people’s safety chances are even if you’re a safe kind of guy you’re going to conform to whatever’s around you.</td>
<td>Tension</td>
<td>The frontline workers would be faced with a tough decision to make about do we cut things back or do we maintain our operation as it is knowing that we may be non-compliant and there wouldn’t be sufficient consequence after that, after a poor decision was made so that people took it as a signal that that was okay. So that’s clearly changed now and these examples are really powerful when we share them with people.</td>
</tr>
<tr>
<td>Compliance</td>
<td>Compliance Logic and Execution Tension</td>
<td>It’s primarily a compliance-driven organization in Suncor. That’s the mindset. And it’s more a maturity perspective, it’s just that’s where they’re at, the basics, right. And so they’re at where Petro-Canada was about eight, ten years ago in terms of leadership, maturity and mindset, maturity of processes and tools. And it’s not right or wrong it’s just</td>
<td>Need for compliance processes</td>
<td>So I think part of the issue with it is, a lot of people have never really operated in compliance. The way it’s worked here. So when I came here, and realized how much the company was struggling with compliance, that company being heritage Suncor, I said to</td>
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</table>
you got to go through it. You don’t get to jump steps, you have to go through that to get further along the curve. So, there’s equal right-mindedness and intent around doing the right...

...even though BP, or even Amoco, let’s go to Amoco, even though Amoco had this strong American mindset around we shall comply, they didn’t have a great system.

Because I would say the culture is one of… people think – oh yeah, we for sure have a culture where we follow the law. However, when it actually comes down to executing a project and making project decisions, people will say – oh, well we’ve never done it that way before. Or we’ve never had to design it that way before.

Compliance Intent but poor execution

There’s nobody in my time here, and nobody, I’d never seen anybody choose to be non-compliant. I mean, if people know what the rules are, they’ll do it.

They’re an expert in a certain area but not necessarily. That’s not the case in legacy Suncor. It is almost exclusively seen as EH&S’; performances EH&S needs to make happen versus the line actually owns it.
The dominant logic was innovative and entrepreneurial with a focus on growth, decentralization and a fast pace. The consequence of this entrepreneurial dominant logic was that challenges were taken on without extensive upfront planning and the inherent expectation that problems could be fixed after the fact. This led to a short pilot period at Firebag. In addition, there existed a fast thinking logic and few formalized processes. One executive used the words, “shoot, shoot, aim” as indicative, but not completely reflective of the dominant logic. As stated by Teece and Pisano (1994), “history matters” (p. 547). Suncor’s history as a pioneer in the oil sands industry provides the origins for the entrepreneurial dominant logic.

The dominant logic also included concern for compliance but with a tension between high level compliance mindset and lower level execution. At the ground level, goals of cost and schedule, at times, were given higher priority than compliance. In a sense, compliance was taken for granted because of the overriding sustainability and compliance mindset. The message from CEO, Rick George, was clear around environmental objectives and sustainability strategy. However, at the operational and execution stage compliance was not integrated into the business but rather viewed, as were other functions, as belonging to a certain group, in this case EH&S.

The decentralized or business unit (BU) focused mindset and the focus on cost and schedule seemed to supersede notions of compliance and sustainability.

*Firebag dominant logic*

Informant descriptions of the Firebag dominant logic are provided in Table 10. In keeping with the entrepreneurial dominant logic in the core business, informants described the dominant logic in the new business, Firebag, as explorative. The site operated with an R&D or pilot plant mindset commenting that the evolution of dominant logic from research to operations had not
occurred leading to lack of discipline as the project was commercialized. Based on informant data, I argue that Firebag’s initial dominant logic was carried over from its existence as an R&D site. As the facility moved into operations, that R&D mindset persisted and was augmented by aspects of the entrepreneurial mining mindset, as operational personnel from base plant were transferred to Firebag. In the estimation of informants, Firebag endured in an exploratory or R&D mindset due to the spatial and institutional distance of the project. Firebag was a long and often arduous two and a half hour drive from the mine site and an additional hour to Fort McMurray. The vice president responsible for Firebag was located in Calgary and visited the site approximately every three weeks. Similarly, the regulatory group responsible for Firebag was located in Calgary. Suncor employees outside Firebag viewed the site as a battery – a small scale operation separate from the core business – or an ‘orphan’ business unit. The term ‘battery’ is used in the oil and gas industry to denote a small, remote site where oil is processed from a small number of wells (CAPP, “Glossary”, n.d.). Firebag functioned autonomously and, presented with that separateness, lacked the controls expected of an operational facility. That logic might have had devastating consequences. As it was, observations of the site in early 2008 describe a control room with coffee cups strewn about, alarm lights flashing and the associated audio bells silenced. The R&D dominant logic that existed at Firebag is a consequence of the overriding entrepreneurial dominant logic of the organization.

The literature acknowledges the conflicting requirements of exploration and exploitation and offers four approaches: contextual, temporal, domain and organizational separation. Separation in each case allows each function to occur without impeding the other. A contextual separation has separation occurring while exploration and exploitation activities co-exist. Temporal separation has the activities separated by time; this is also referred to as sequencing. Domain
Organizational separation has exploration and exploitation occurring in distinct business units (Lavie et al., 2010). At Suncor, Firebag was organizationally separated and further differentiated by geographic distance. This augmented the reconfiguration challenges of being an R&D site moving to commercialization in an entrepreneurial organization.
### Table 10: Dominant Logic – New Business (Firebag)

<table>
<thead>
<tr>
<th>Theoretical Construct</th>
<th>Attribute</th>
<th>Representative Quote Supporting Attribute</th>
<th>Consequence</th>
<th>Representative Quote Supporting Consequence Informant Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Exploration – R&amp;D</strong></td>
<td>New SAGD Technology R&amp;D</td>
<td>Firebag evolved from an R &amp; D facility. You know, no one had ever done <em>in situ</em>. Firebag is one of the first out of the gate with this SAGD technology. And so there’s this culture and mentality of R&amp;D...So there’s not a lot of discipline in the approach. It’s more trial and error. You’ve got hypotheses you’re trying to prove and disprove and make it work.</td>
<td>Poor integration with operations</td>
<td>And that shift from an R&amp;D facility to an operating manufacturing plant had not really occurred very well at the time of stage one and two being really built and put into a true operating facility. A lot of the folks that were working there at the time were R&amp;D, you know they were still in that R&amp;D mode. Which is a lot different than a stable operating plant would be.</td>
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<tr>
<td><strong>Pilot Plant</strong></td>
<td>I think the other there was – there was and is a different culture. It felt like a pilot plant. I think and it had started as a pilot plant and in a pilot plant you operate in a certain way and it has less rigor and it has less operating discipline, but as time persists and as the site evolves and grows you need to actually emerge from that and have structure that’s very different.</td>
<td>Ineffective operational procedures</td>
<td>For closure, part of the problem was it was essentially a production facility still being treated as kind of a pilot plant. So they didn’t have all the things one would have expected should have been in place for an operating facility. They didn’t have configuration management on the facility in terms of up-to-date engineering dards, drawings and diagrams. They didn’t have robust operating manuals and procedures with safe operating limits, etc. And in fact, even now a couple years later, they are still operating the plant on manual although it has got a tremendous amount better.</td>
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<td></td>
<td>Loose controls</td>
<td>In the office, papers everywhere. People’s desks just, you know, there is just disorder. You go into the operating units and there would be, you know, stacks of chemicals and parts and tripping hazards and you would have icicles forming from steam everywhere. If something looks bad chances are it is running badly. The level of ownership isn’t there around equipment and just pride isn’t there in the facility. And so, an enforcement order comes in and it is the way of life right; whereas a facility with real pride and ownership you would never find that. If something happened like that people would be just appalled and looking to do what they could immediately to address it.</td>
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</table>
Reservoir Focus  | And so we were very concerned in doing a lot of work with reservoir engineering simulation and how big do you make the wells, and how far apart do you want to space them and all of those things were really unknowns, and when it came to the surface facilities we kind of said – hey this industry has been doing surface facilities for a very long time, water treatment is a bit of an art when you get to warmline softening. But that’s probably the greatest uncertain area from an operating perspective, but other than that you know we’ve built these before, we’ve operated them and we had operators from our Burnt Lake pilot project involved in the surface facility design. So that was … we were kind of comfortable with all of that part.  

Non Transfer  | The expertise really is about the underground. You know, it’s funny, when you look back on a project and what you were worried about and what you weren’t, and of course the unknown for us in all of this was the reservoir.

| Distance - Spatial Differentiation |
| Independence  | Firebag project was originally launched, it had nothing to do with Oil Sands. It was a stand alone orphan business unit. At that time. it reported through operations somewhere but it was a pilot project...It was almost like a research project...It wasn’t benched off. This was a full scale research project that was going on. It was not part of Oil Sands.  

Unaccountable  | So they did things their own way… They made some interesting decisions over that period of time. Meanwhile, it has some hard earned wisdom in it, but also it meant I think that they didn’t have a transparent culture for the Firebag organization. Like gee we're our own little silo here oh well we’ll figure it all out.  

| Autonomy  | There was a bit of a sentiment of this independence versus accountability that Firebag were going to have latitude to define what their managing systems and practices would be. They weren’t going to be burdened by legacy oil sands stuff  

Non (rather than loose) coupling  | I think in the early days of Firebag, they were a little bit, they were a free floating culture right. They weren’t, they hadn’t figured out what they were.  

| Institutional Distance  | Firebag, I think from my perspective at the base site because I was there when stage 1 was being built and stage 2 it was somewhat viewed as a battery, an oil battery that was in  

Hierarchical focus on core business  | And I think the logic there is after say 12 to 18 months of operations at 20 or 30 thousand barrels a day, they said well it’s real. It’s no longer research.
terms of scale very small. It was growing; it was increasing in importance in the corporation, but it was kind of off to its own.

And I think it was also symptomatic of the culture here at the time in the sense that Firebag was, it was an experimental pilot plant-type thing and in my opinion, it’s only in the last couple years that that mindset has really changed, that it was still operating as an experimental pilot plant-type thing for – and now it’s for real, right. And the organization, Suncor as an organization, is treating it as a for real organization. They’ve put strong leadership in place and they have very clear expectations of what in situ is to deliver and so definitely a different change of leadership and direction.

There is this conventional oil and gas view and then there is this oil sands view, which is really geared to mine extraction and so, in situ kind of falls in between and it has been more – it has been more stewarded around the conventional oil and gas, but there is real differences with conventional oil and gas, there are just parts of the regulation that and directives that are just geared for something different.

Negative Transfer

When a pump vibrates we tend to have them alarmed, right? So when a pump vibrates I want you to slow down, I want a reliability engineer to go out and figure out why it’s vibrating and fix it before the pieces fly across the room. And the mine believes that you just run it harder and so that did come over into Firebag I think
5.6 Chapter Summary
Informant data from Suncor identify informal routines and an entrepreneurial dominant logic as dimensions contributing to ineffective capability reconfiguration as operationalized by compliance and operational problems. The dynamic capabilities that existed at Suncor for sensing and seizing opportunities were inconsistent with the dynamic capability for reconfiguration. Specifically, innovative and flexible entrepreneurial dominant logic associated with informal explicit routines contributed to noncompliance. Explicit routines that were susceptible to codification were kept informal at Suncor, resembling simple routines or heuristics. Lack of codification led to non-transfer of explicit routines. In addition, tacit routines that existed in the core oil sands mining business but were not applicable to the SAGD project were transferred to Firebag culminating in negative transfer. Transfer challenges were heightened by the intended organizational distance of Firebag as well as its irrevocable geographic distance.

This chapter highlights the importance of formalized processes for both compliance and operations in organizations that interact with the natural environment. In the words of an industry representative who had lived through an environmental compliance failure with an energy company other than Suncor:

“And that was the phrase, operations integrity, and so management of change, the clarity of procedures, understanding when procedures have to be followed and just really getting down to a lot of making sure your processes are crystal clear, are well thought out, and are adhered to. And I still carry that today. When I look at an operation, whether you’re a big company or a small company, particularly small companies, you have to pay attention to that because if you screw up it’s a big problem”. Industry Informant
CHAPTER 6: CAUSAL MODEL

“Life is a perpetual instruction in cause and effect.”

Ralph Emerson Waldo

This is a variance study working backward from the outcome of environmental noncompliance at Suncor's Firebag project as mandated by the creative sentence. Beyond the scope of the creative sentence, I identify the operational challenges at Firebag as well. These negative outcomes occurred as capability reconfiguration from oil sands mining to SAGD oil sands development was unfolding at Suncor. The case, therefore, provides an opportunity to empirically explicate the micro foundations of a dynamic capability for reconfiguration. In this chapter, an explanatory model is developed to establish the relationships between antecedents and consequences of compliance and operational challenges at Firebag as studied through the phenomenon of capability reconfiguration.

6.1 Variables
As explained in Chapter 3, I analysed coded data, excluding codes that were beyond the boundaries of this study, moving from lower level codes to aggregated themes eventually resulting in the categorization of 11 clusters of codes (Miles & Huberman, 1994). These variables could further be identified as either antecedents or consequences within the phenomenon of capability reconfiguration. The codes "quote" and "statistics" are codes assisting in data organization. “Transfer” is an effect and the “outcome” code defines the environmental and operational challenges. The following seven variables are antecedents:

- context
- dominant logic
- people
- process or routine
- structure
• sustainability
• distance

Through data analysis to describe the dimensions of position, routines and dominant logic as determined by the conceptual model (Figure 2), I defined another grouping of variables.

Through review of the literature and data, I defined the variables of distance, structure and sustainability as attributes of dominant logic (see Tables 9 and 10). Sustainability was a mindset in the organization and structure in this dissertation, as determined by the literature, is an attribute of dominant logic (Prahalad & Bettis, 1995). Through analysis of the data and review of the literature, I establish distance as an attribute of the Firebag dominant logic with distance contributing to the exploratory mindset of the site (Table 10 and Section 5.5). This analysis leads to a refinement of the list of antecedents to:

• context
• dominant logic
• people
• process or routine

Causal Model Development

I adopt a process for constructing the causal model as laid out by Van de Ven (2007, p. 171).

1. I made a post it note (PIN) for each variable. I placed a PIN for the phenomenon being studied, capability reconfiguration, in the centre of a piece of flip chart paper. A heading for dependent variables or effects was written on the right hand side of the paper and a heading for independent or causal variables was written on the left hand side. Mediating variables were placed between the variables they mediate and moderators above or below the relationships they moderate.
2. Each antecedent was then linked to an outcome and the relationships between variables evaluated.

3. Antecedent variables are: routines and dominant logic. These variables are further specified as application review process, approval review process, MOC process, regulatory knowledge, regulatory relationships, project execution, facilities and reservoir knowledge (Table 8); and, oil sands mine dominant logic and Firebag dominant logic (Tables 9 and 10). Context is a moderator and people a mediating variable. Outcomes are: environmental noncompliance – failure to have VRU in place and failure to disclose; and operational challenges – H2S issues.

These relationships were derived from iterative analysis of the data as well as contemplation, reflection and revising of the causal model in tandem with literature reviews. The result of this explanatory analysis is the following table (Table 11) and the associated model (Figure 10). The model was validated in discussions with my supervisor and through feedback received at conferences.

**Table 11: Causal Model - Antecedents and Consequences**

<table>
<thead>
<tr>
<th>Antecedent</th>
<th>Attribute</th>
<th>Mediator</th>
<th>Mechanism</th>
<th>Moderator</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Routines</td>
<td>• Informal</td>
<td>People</td>
<td>Non Transfer</td>
<td>Market Velocity – Low Munificence</td>
<td>• VRU Missing</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Failure to Disclose</td>
</tr>
<tr>
<td>Entrepreneurial Dominant Logic</td>
<td>• Fast thinking</td>
<td></td>
<td>Negative Transfer</td>
<td>Market Velocity - Natural System - reservoir</td>
<td>• Informal routines</td>
</tr>
<tr>
<td></td>
<td>• Fast paced</td>
<td></td>
<td></td>
<td></td>
<td>• Short pilot – H2S</td>
</tr>
<tr>
<td></td>
<td>• Decentralized</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Exploration</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Figure 10: Capability Reconfiguration Causal Model

Antecedents

Market Dynamism –
**Moderator** – Low Munificence

Informal Foundational Routines (P3a, P3b, P5)

Entrepreneurial Dominant Logic (P2 and P5)

Fast paced thinking and growth (P4)

Mechanisms

People – **Mediator**

Non Transfer (P3a)

Negative Transfer (P4)

Outcome

Capability Reconfiguration

Reconfiguration Challenges (P2)

Market Dynamism –
**Moderator** – Growth and Natural Environment (P1)
**Capability Reconfiguration**

At the centre of the model is the phenomenon of capability reconfiguration. In capability reconfiguration the resources of the firm are changed. That change can occur through acquisition, transfer or sharing of resources (Karim & Mitchell, 2000; Teece 2007; Helfat & Peteraf, 2003). Applying the variance model approach and studying the phenomenon of capability reconfiguration, I work backward from negative outcomes of environmental infractions and operational issues. Reconfiguration required Suncor to transition from their core business of oil sands mining to *in situ* oil sands development. Data analysis revealed that identified routines were transferred from the core to the new business ineffectively. The theoretical constructs associated with these deficiencies were negative and non-transfer of capabilities (Table 7 in Chapter 5).

Additional explication of root causes describes explicit routines that might have been formalized not being transferred to Firebag because they existed as informal routines or heuristics (Bingham et al., 2007). This caused application and approval review processes to not be transferred, what I term non-transfer, leading to the VRU being included in the application when it was meant to be excluded and to the failure of Suncor to identify and self-report the missing equipment to the regulator. Tacit routines in the form of operational and regulatory knowledge were transferred to Firebag but again with negative consequences. The new business differed significantly from the core business in operations and applicable regulations. The result was a negative transfer of knowledge and ensuing failure to disclose to the proper regulator and operational issues connected to H2S issues on site.
6.2 Antecedents
In Table 8, the relationship between routine patterns and negative outcomes is shown, with informal explicit routines leading to both operational and environmental compliance challenges. In tables 9 and 10, dominant logic in the Suncor core business, mining, and at Firebag is described and found to be entrepreneurial. In the following sections, these antecedent variables and their causal relationships are considered at length with theory and actual data evaluated.

6.2.1 Routines
Routines are antecedents to capability reconfiguration. The establishment of a new business through related diversification depends, at least in part, on routines that are developed, acquired or transferred from an existing business to the new (Finkelstein & Halebian, 2002). This theoretical proposition is supported by the Suncor data as transfer of routines was identified by informants in describing the reconfiguration process (Table 7). Routine patterns were described by informants as informal, suspended or outsourced. Informants frequently cited informal regulatory application and approval review processes, and informal project integration as contributing directly to environmental non-compliance and operational challenges.

In Chapter 4, I argued that Suncor operated in a high velocity market as it made Firebag operational. I have also determined that routines at Suncor were either tacit or, where explicit and in existence, informal. These routines, then, meet the definition of heuristics. Table 12 provides criteria for assessing the effect of moderate and high market dynamism velocity on dynamic capabilities.
Table 12: Market Dynamism – Theory and Suncor – Routines

<table>
<thead>
<tr>
<th></th>
<th>Moderate</th>
<th>High Velocity</th>
<th>Suncor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reliance on Existing Knowledge (path)</td>
<td>Existing</td>
<td>Situation specific</td>
<td>Situation specific</td>
</tr>
<tr>
<td>Pattern of Dynamic Capabilities</td>
<td>Detailed, Ordered</td>
<td>Simple, Experiential</td>
<td>Simple, Experiential</td>
</tr>
<tr>
<td></td>
<td>Analytical, from</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>existing context</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Execution of Change</td>
<td>Frequent, Linear,</td>
<td>Non linear,</td>
<td>Non linear,</td>
</tr>
<tr>
<td></td>
<td>predictable</td>
<td>unpredictable</td>
<td>unpredictable</td>
</tr>
<tr>
<td>Dynamic Capabilities</td>
<td>Causally ambiguous</td>
<td>Causally ambiguous</td>
<td>Causally ambiguous</td>
</tr>
</tbody>
</table>

Applying Eisenhardt and Martin (2000)’s model, I find Suncor met the criteria for a pattern of dynamic capabilities that are simple and experiential given a high velocity market where reliance on existing knowledge is situation specific and execution of change is nonlinear and unpredictable. Obloj et al. (2010) identifies a need for flexibility where standardization and formalization are limited. A low level of codification occurs and predominantly for pragmatic reasons, for example, a change in the legal environment. Findings were based on quantitative analysis where companies with high performance did not develop as many routines and procedures over time. Obloj et al. (2010) argue that companies must, at some level formalize and standardize, though they do so to a lesser degree.

Eisenhardt and Martin (2000) acknowledge that a level of structure is necessary to prevent simple processes from disappearing when a high velocity market is characterized by high turnover and rapid growth. The high velocity of the market does not permit codification of processes. Companies are constantly responding to the external stimuli. This is what unfolded in reality at Suncor. However, I find reconfiguration challenges associated with that lack of
structure at Suncor. Informal, non-codified routines at Suncor were antecedents to negative outcomes (Table 8). Informal application review, management of change and project execution processes led to the VRU being included in the regulatory application and not in the design of the facility. Informal approval review and suspended audit resulted in a failure to disclose the oversight to the regulator. Finally, informal and absent Firebag operational processes contributed to operational issues. Where Obloj et al. (2010) suggest process formalization and standardization to a lesser degree, I find compliance does not allow for a less degree. Therefore, I see a connection between formalization and type of activity.

“I know we can build the system, but I struggle with the mindset piece. The cultural piece. Is how do we, many things we deliver on in a mediocre way. But with compliance, you need to be bang on. There is no mediocre in compliance. Either you’re compliant or …”

Suncor Manager

Activity Classes and Foundational Routines

I argue that certain activities, like compliance, should be deemed foundational and require codified routines. Regulations in the oil and gas industry must be considered from the very beginning of a project in the design and then throughout and into continuing operations (Appendix P, Encana’s project approach). Informal routines in Table 8 are associated with the activity classes of compliance and operations. Regulatory application and approval review, management of change, EHS audit and project execution including regulatory all involve compliance to varying degrees.

Verbeke (2010) suggests that, in acquisitions, certain functional activities should be imposed where others are transferred through mutual adjustment; for example, standardized accounting control, and ICT systems would be imposed. However, there are also those activities more amenable to mutual adjustment through community building versus development of codified
routines. Jaeger (1983) compared bureaucratic and cultural control systems in multinational corporations with more informal mechanisms facilitating cultural transfer. Verbeke (2010) found that R&D, because of its unique nature and connection to the entity of origin, is likely to be more easily transferred via mutual adjustment. Other activity classes related to finance and accounting functions, for example, are more tractable via routines. Multinationals may develop a common platform in certain management and control processes while also enabling local responsiveness (Grogaard, 2012, p. 405).

Capron et al. (1998) identified five types of resources for redeployment in acquisitions – R&D, manufacturing, marketing, managerial and financial. Redeployment for R&D and manufacturing may occur through equipment, product and process design, methods and staff. They argue that R&D, manufacturing and marketing resources are more prone to market failure because of the complexities involved in these activities. Managerial and financial resources may exist as codified or tacit routines and are less susceptible to market failure. In their findings, the authors expect that, in acquisitions, firms will redeploy R&D, manufacturing and marketing resources between acquirer and acquired and will redeploy managerial and financial systems from the acquirer to the acquired. Further, these routines will be transferred from the stronger to the weaker organization.

Penrose (1959) found managerial resources most important to organizations because any expansion requires planning that must be conducted by the firm’s managers and not via the external market. The growth of a firm is predicated by the ability of managers to plan and implement expansion; the ability of a firm to establish bases from which growth and profitability can occur even in the face of significant external change. Managerial services are those administrative activities that virtually every firm requires by virtue of their existence as
administrative entities. They set a boundary around expansion for the new entity which is reliant on the managerial services of the existing firm. Ability to share or transfer (absorb) and planning set these limits. A gradual process of integrating new personnel and of developing experience in existing personnel must be emphasized. Knowledge comes either through formal methods or through learning and personal experience. (Penrose, 1959)

This discussion of activity classes in the acquisitions literature has relevance for the internal expansion that occurred at Suncor. Standardization and codification of activities is also necessary in reconfiguration for ease of transfer to the new organization. There is a benefit to imposing routines. Certain activities by their nature, for example R&D, involve complexities and a level of tacit knowledge that make them difficult to codify (Verbeke, 20102; Capron et al., 1998; Penrose, 1959). Similarly, the importance of compliance for licence to operate and the complex regulatory requirements (Appendix H) of the oil and gas industry, make compliance an activity necessitating codification and transfer of standardized process from one entity to another within an organization.

“Now it’s very, very involved. And the number of commitments that are coming out are definitely non trivial. And as a result of that, if you started up and did not follow this process, I would say it’s almost impossible to be in compliance, which is what I said before”. Suncor Informant

“You thought your foundation was really solid and guess what it wasn’t and that is pretty unsettling too.” Suncor Informant

Proposition 3a (P3a): Informal foundational routines may lead to a non-transfer of capabilities and result in reconfiguration challenges, especially when expanding in high velocity markets.
Proposition 3b (P3b): Regulated organizations that have informal compliance routines are at greater risk of noncompliance.

6.2.2 Entrepreneurial Dominant Logic
Data analysis in Chapter 5 (Tables 9 and 10) indicate that the Suncor oil sands mining and SAGD businesses had an entrepreneurial dominant logic characterized by a focus on growth, flexibility, fast thinking and pace, decentralized structure and exploration. Given theoretical foundations linking dominant logic and organizational routines (Prahalad & Bettis, 1995; Obloj et al., 2010; Grant, 1988) and Suncor informant data connecting an entrepreneurial dominant logic to informal processes and lack of standards (see Table 8), I determine a causal relationship between entrepreneurial dominant logic and informal routines in the model.

Supporting this assertion is Lavie’s (2006) argument that when including political and cultural influences, internal organizational processes and associated path dependence and inertia have more effect on technological change than the nature of the technology. Lavie (2006), in effect, states that cultural influences or dominant logic, as defined in this study, affect organizational processes which in turn impact the response to technological change. As shown in Tables 7 and 8, I find that internal processes or routines had a significant impact on the outcome of Suncor's response to technological change. Those processes, in turn, were shaped by the firm’s dominant logic. Evidence from Suncor, therefore supports Lavie's assertion that when expanding the model to included culture, internal processes play a key role. However, where Lavie (2006) identified path dependence and inertia as factors the corollary is observed in the case of Suncor.

In Chapter 4, I determined that Suncor was operating in a high velocity market that encouraged increased production at a fast pace. That external pressure was matched by Suncor’s internal
dominant logic to grow and to move quickly. As indicated in Table 9, “that is the way Suncor tends to do things.” Similarly, Perlow et al. (2002) find that the pressure for fast pace in organizations is not only determined by the external context but also by the organization’s internal reinforcement of speed over content. Principally, speed is viewed as a positive attribute of companies competing in turbulent contexts. That external context is typically found to be the exogenous variable spurring organizational speed. However, an early focus on speed can lead to its persistent reinforcement leading to what Perlow et al. (2002) call a ‘speed trap’. Organizations caught in the trap must continually make faster decisions. The opposite effect is a slow trap in which slow action is reinforced.

The focus on inertia in the reconfiguration literature ignores the effect of moving quickly. Lavie (2006) suggests companies subjected to path dependencies will be unmotivated to undertake capability reconfiguration, will be limited in the alternatives they consider and will delay execution. Suncor’s dominant logic for acting quickly runs contrary to this prediction. Suncor’s entrepreneurial dominant logic, which focused on growth combined with a compulsion to move quickly, as well as a lack of formalized processes encouraged the firm to move forward quickly with the SAGD technology in response to external industry growth spurred by rising oil prices.

I link the external context to the internal organization by evaluating Suncor’s response to industry growth (Russo & Minto, 2012). I find that high market velocity is linked to internal pressure to move quickly to capitalize on a rising commodity price and to satisfy investor expectations for achieving projected production targets. Suncor’s response was to double growth, to bring on new projects and to reconfigure capabilities to develop new SAGD technology at Firebag. Appendix Q shows key indicators of Suncor growth from 2000 to 2010.
Suncor was on a growth trajectory with key indicators like revenue, cash flow, earnings and reserves more than doubling. The early 2000s saw record production and cash flows for the organization (see Appendix M for Suncor financial data). Suncor’s aggressive expansion was rewarded by the investment community as share price increased from about C$2.50 in 1995 to a peak of almost C$55 in March 2008. Pace, growth and technology were variables frequently identified as complicating Suncor's ability to successfully reconfigure the business. In addition, the newness of the technology and the unpredictability of the natural environment, in particular the reaction of the reservoir, added an additional layer of complexity and dynamism to the high velocity market facing Suncor.

In the very early stages of Firebag’s development, oil prices were low, registering only US$15.97 per barrel in 2001; however, one year later the price had increased to $US26.68 per barrel (Statistics Canada, n.d.). As a result, in the final planning stages and as Firebag went commercial, oil prices were on a meteoric rise. The impact of this change, from low to high prices, is mirrored by the attention given the Firebag project. As production increased and the commodity price rose, Suncor’s management dedicated more resources to Firebag (Table 10):

Firebag was designed in six stages. The lead time on large capital projects in the oil sands or mega projects is significant (Jergeas, 2008). Most projects require years of project design, piloting, redesign or adjustment, regulatory approval and construction before becoming commercial. At the same time, investment markets are impatient to see returns. To keep pace with industry growth and to compensate for long regulatory lead times, stages were becoming operational as future stages were being designed and constructed. Prior to the development of Firebag, a pilot plant at Burnt Lake allowed for in-situ SAGD extraction research and development.
"We went into stage 1 and stage 2 basically because we hadn’t even got stage 1 in operation before the engineering was complete and we were beginning construction on stage 2. So you’ve got to remember we built stage 1 and stage 2 without ever having run a pilot up at that particular site and we had run a two well pier pilot down at Burnt Lake just north of Cold Lake. That’s where we thought we learned all our lessons and we went straight to two 35,000 barrel a day commercial schemes in stage 1 and stage 2 and guess what we got a lot of surprises we didn’t know were going to come to."

*Suncor Operator*

In comparison, Imperial Oil, while pioneering CSS technology, began research in the 1960s and commercialized the technology in 1985 (Kelly, 2009). This was a significantly longer research and piloting period then realized by Suncor and other SAGD companies at the time. Imperial delayed commercialization until oil prices reached a feasible level (Patton et al., 2006). It’s uncertain whether the pace of commercialization at Imperial Oil was a function of the commodity price or a prevailing mindset or dominant logic in how to proceed with new technologies. As one industry informant commented,

“And so what they did is they were committed to advancing the technology and I think that’s fundamentally driven by the size of the resource. You know there’s a massive resource and so it makes sense to have some patience and perseverance in trying to exploit that resource.”

In speaking of Imperial’s CSS project in Cold Lake, one industry informant with experience in SAGD with various companies made the following comment:

“There wasn’t the expectation in the public, in the market, that this was going to be a big cash grab so it was under the radar. So, all their conventional production, Exxon’s big enough that the amount of money spent at Cold Lake wasn’t a massive percentage of their revenues or anything. There was an ability to say look, this is a research project, it’s small relative to the rest of our business and just give us time. I think now, because there’s so much focus on the oil sands it’s an expectation that you’re going to make money on that quickly. And so it would be a lot harder for a company to invest in long term research today.”
This informant observation highlights the point that external industry pressure via shareholders is increasing pressure on organizations to move quickly. Companies like Suncor with an entrepreneurial dominant logic would be apt to take on the challenge. Suncor, rather than being restrained by path, was instead encouraged to move quickly and to “get-it-done”. While not addressed in the capability literature, this research shows inertia is not the only potential constraint to successful reconfiguration. A fast paced response can lead to negative outcomes or challenges when an organization moves too quickly.

The distinction between Imperial and Suncor’s approach was echoed by a senior executive at Suncor,

“They had patience in the Exxon realm of nothing needs to be built before its time and so they would take whatever time was needed to validate all the engineering assumptions and on whether it was water treatment, H2S recovery, you name it. Whereas in our case (Suncor) this confidence we had and this aggressiveness around growth was such that no we will figure all that out once we get up and running so there were some big unknowns about H2S and I think all the SAGD operators, to be honest, are now having a wakeup call around the amount of H2S that has to be collected and handled”.

Suncor’s Firebag timeline was accelerated. They were not alone as Encana went from pilot to commercial on Foster Creek in two years (Patton et al., 2006). The decision for projects to go commercial quickly was fueled by rising commodity prices but was ultimately the decision of management. The risks associated with this decision were intensified by the unpredictability of the natural environment.

“So the other thing is then maybe this might put some perspective on it; Firebag was ramping up in terms of production when the enforcement order came down. So the last year and a half we’ve been ramping up in production again and so we take this plant into places it’s never been before. You know the theoretical designs, the how will this process react to this much fluid coming back from the wells; we’re moving -
we’ve moved into territory that we just didn’t have experience at or benchmark data to work off of so some of that may explain why there’s so many people out there some of it’s got to do with just that. When you get up and stable, if you come from an operations background, you can tend to run a plant with much less staff because there aren’t things happening that are unexpected. We’re still getting to that stage. I think we’re pretty well there but that might reflect how past staff levels have been”. *Suncor Executive*

The dominant logic of moving quickly at Suncor resulted in a short pilot time that led to operational issues when unanticipated hydrogen sulphide was encountered. Suncor began piloting at Burnt Lake in 1997 (see Appendix N Firebag Timeline), designed Firebag from 1998 to 2000, began construction in 2000 and started operations in December 2003. Piloting at the Firebag location was virtually nonexistent and knowledge was dependent on learnings gained at Burnt Lake which was located in a different region, Cold Lake.

To improve the success of transition to commercialization, the pilot should be as close to actual conditions as possible (Pisano, 1994). As determined in Chapter 4, the natural environment is not always easily replicated. Significant changes in reservoir reaction even in fairly close geographic proximity can add a level of complexity to technology commercialization. Further, issues can arise as the project achieves greater scale. Even post commercialization there will be need to adjust as reservoir reactions are monitored (Halari & Jergeas, 2011).

Pisano (1994), in a study of the pharmaceutical industry, finds that when organizations lack clear knowledge defining cause and effect, then upfront planning may accomplish little and companies are better to learn by doing. Conversely, where scientific theory supports the technology, then companies are rewarded for upfront planning. In this case the lab experiment
will mirror closely commercialization. As noted, the unpredictability of the natural environment introduces another element complicating the pilot process. While scientific theory for SAGD technology existed, the reaction of the reservoir could not easily be forecast. For *in situ* oil sands development there is no factory per se; however, the process can be likened to a manufacturing process. The key difference is that rather than transferring production from a pilot facility to a factory built for similar conditions, Suncor increased scale at the same location with similar facilities (akin to a factory) but with the additional variable of an unpredictable natural environment as manifest in the reservoir. So, potential for the linear scale up that exists in pharmaceuticals cannot be assured with the same high level of predictability in oil sands development. This finding is corroborated by both Suncor and the regulator,

> “The facilities themselves are a big challenge, not even thinking about the reservoir which is you know even more mysterious”. *Regulator*

> “And I think those two dimensions about it being an upstream manufacturing mind set and then the other issue of the environmental complexities being much greater. That people find these operations a lot more challenging to manage. The compliances are far more challenging.” *Suncor Informant*

As production reached a certain threshold, aquathermolysis, a response where pressure changes from increased scale lead to the production of sour gas, occurred. This effect was not predicted in the pilot process. In retrospect, a longer piloting project to higher production levels might have allowed for more adjustments to occur under R&D rather than operational conditions. Especially at Suncor where, as established in Chapter 5, the operations mindset was, “run it hard”.
Given a high level of uncertainty, one should obtain as much information as possible about an upcoming event to reduce that uncertainty and make plans (Penrose, 1959). Slow thinking is defined as mental work that is, “deliberate, effortful and orderly” and fast thinking as operating, “automatically and quickly, with little or no effort and no sense of voluntary control” (Kahneman, 2011, p.20). Deliberate thinking is done to assess what are those processes that need to be transferred and how to do so. Without deliberate thinking, organizations might rely on judgment heuristics that lead to errors (Kahneman, 2011). Informants describe Suncor as moving quickly without planning (Table 9). I have shown a prevalence of informal routines (Table 8). Having established that a fast pilot period was the result of an entrepreneurial dominant logic and external pressure to grow quickly, I argue that Suncor relied on heuristics in their evaluation of production and compliance issues at Firebag.

Reliance on heuristics for judgement in uncertainty is subject to error because of the biases that can ensue. An heuristic may be based on representativeness, availability or adjustment and anchoring. An event is expected to be representative of a future one and a bias will ensue that the outcome of the prior event will be replicated though the probability exists that it won’t be (Kahneman, 2011). This construct is similar to the negative transfer illuminated in Chapter 5. The second judgemental heuristic of availability can lead to a bias when other instances are not available or when the chosen data set differs from the new one (Kahneman, 2011). I find a relationship between the negative transfer of capabilities and a lack of upfront planning characteristic of Suncor’s dominant entrepreneurial logic.

Adjustment and anchoring occurs when an initial estimate or anchor is made and subsequent adjustments from the anchor are made. Adjustment that is not deliberate or slow thinking is biased toward the initial values (Kahneman, 2011). At Suncor, initial pilot results were
anchored leading to no expectation of encountering hydrogen sulphide. Even as H2S was noticed through smell and results were running contrary to the initial estimation or expectation, there appeared to be a reluctance to adjust too far away from the anchor. Adjusting is a deliberate process that requires effort. Individuals who are depleted of mental resources adjust less. When adjustment does not occur, it is a reflection of a weak slow or deliberate thinking (Kahneman, 2011). Low munificence in the market reflected in constrained and inexperienced resources, moderated by the fast pace, and mediated by weak leadership led to an overtaxing of individuals at Firebag. In addition, focus on H2S issues caused compliance issues to be given lower priority. Kahneman (2011) purports that, “intense focusing on a task can make people effectively blind, even to stimuli that normally attract attention” (p. 23). Stretched employees and concurrent operational and compliance challenges created an inability to adjust adequately to deal with the H2S issue and to address compliance issues.

“We had a lot bigger fish to fry than the produced water tank at this point in time because we had this disposal water treatment where you’re actually talking about some safety concerns of the people having to work in the area….so this is not a fun period because the sky is kind of falling a little big, right”. *Suncor Informant*

Environmental noncompliance at Suncor is also connected to the judgmental heuristic of availability. When knowledge is not available, there is a tendency to rely on heuristics related to what you do know. This response, again is linked to fast thinking, and can lead to errors.

“I think for Firebag, for this instant in particular, I think nobody knew – I don’t know if anybody recognized the fact that we had to have a registration and that it was quite a serious matter. And if people did have an understanding they, I mean it’s a very complicated process so I think it was kind of a hot potato. Like they just kind of went aw I don’t want to do this so they kind of threw it you know half-heartedly to another group and then the group dropped it”. *Suncor Informant*
Proposition 4 (P4): An entrepreneurial dominant logic characterized by fast thinking and a propensity to move quickly may lead to a negative transfer of capabilities and result in reconfiguration challenges due to limited adjustment and deliberate thinking, especially in high velocity markets that are further complicated by an unpredictable natural environmental.

6.3 Mediator
In Table 7, redeployment of knowledge, routines and dominant logic are linked to consequences of negative and non-transfer of capabilities. Also in Table 7, the conduit for capability redeployment at Suncor is people - engineers, teams, outsourced groups. It is through people, and to a lesser degree processes, that capabilities were redeployed from the existing business to the new in Suncor. The subordinate role of processes, in Suncor's case, is a function of the lack of formalized process in the organization. Instead, the entrepreneurial dominant logic supported by management focused on people rather than processes. Suncor routines were informal requiring not only tacit but also explicit knowledge to exist in individuals. Suncor relied heavily on individuals. As recently retired CEO Rick George stated in his speech to accept the Distinguished Business Leaders’ Award (June 14, 2011),

“In the end, success – even (in a) business largely defined by resources and massive capital projects – all comes down to people. If you put the right people in the right positions, with good strategies, and with the right use of tools, chances are you’ll get the innovation, creativity, commitment – and the leadership – that you need to be successful in the long term”.

The following five observations are from four different Suncor informants:

- “Those are judgement calls all through the application process, which you have to rely heavily on your subject matter expert.”
- “It still relies on the judgment of the people on a project and the quality of their experience and their diligence. We haven’t created clones to do this.”
- “You need processes and you need people that can fit those processes.”
- “The actual competitive advantage I would say is more in the people.”
• “People dependencies of any kind in your processes – those risks become compounded in a big way.”

This evidence points to my decision to define people as a mediating variable in the causal model. People explain how independent variables of knowledge, process and dominant logic are effectively or ineffectively redeployed. Mediators indicate how or why the relationship between an independent and dependent variable exists. A variable can be defined as mediating if it, "accounts for the relation between the predictor and the criterion" (Baron & Kenny, 1986, p. 1176).

For a variable to function as a mediator it must meet certain criteria (Baron & Kenney, 1986). I use this criteria against the variable of people to confirm its role as mediator.

a) Variations in the independent variable, routines, affect the mediating variable, people. The more informal the process the greater is the reliance on the person to execute the activity or task. Criterion met.

b) Variations in the mediator, people, significantly account for variations in the dependent variable, environmental and operational challenges. The argument I make is that where informal routines exist, there is a reliance on people to execute activities. Suncor's focus was on hiring the right people and giving them latitude. Therefore, when people change or new people are hired who lack expertise and institutional knowledge, challenges may ensure. Criterion met.

c) Without the mediating variable, the relationship between independent and dependent variable is zero. Without people, clearly, the routines in question would not be executed. Criterion met.
The mediating effect of people at Suncor was accentuated by low market munificence as established in Chapter 4. At the time of capability reconfiguration in Suncor, market industry growth led to low munificence and associated shortages of experienced employees especially in the new SAGD technology as well as unprecedented attrition rates of 15% to 20% (Source: Suncor Informant).

6.4 Moderator
The variable of context as examined in Chapter 4, is a moderator in this study, with people mediating the relationship between antecedents and outcomes. This model is consistent with strategy literature on corporate change that focuses on the variables of context, cognition and routines (Teece & Pisano, 1994; Teece et al., 1997; Teece, 2007; Eisenhardt et al., 2010; Tripsas & Gavetti, 2000).

A moderating variable is one that, “affects the direction and/or strength of the relation between an independent or predictor variable and a dependent or criterion variable (such that)... the causal relationship between two variables changes as a function of the moderator variable” (Baron & Kenny, p. 1174). Hair et al. (2005) echo that definition adding that change is depended upon the value of the moderator.

The impact of a dominant logic and routines on reconfiguration changes in accordance with the context. Specifically, the higher the velocity of market dynamism due to growth and inclusion of an unpredictable natural environment, the greater the effect of an entrepreneurial dominant logic and informal routines on operational and compliance outcomes in reconfiguration. The organization's compulsion to move quickly coupled with a dominant logic that excludes deliberate learning and formal routines leads to reconfiguration challenges. In a lower velocity market characterized by slow growth and a predictable natural environment, the negative
consequences of a fast thinking dominant logic and informal processes could be tempered or neutralized by an exogenous context that didn't require haste to realize financial gain.

Prescott (1986) found that environment, as measured by market structures, moderated the strength of the relationship between strategy and performance. Russo and Fouts (1997) similarly considered industry context as a moderator in its impact on environmental performance. They hypothesized that, “the greater the industry growth, the greater the positive impact of environmental performance on firm profitability” (p. 541) They found evidence of support of their hypothesis suggesting that innovation is greater in high growth industries which facilitates finding solutions to environmental issues beyond regulatory satisficing. The Suncor case is an example of the opposite effect, with high growth resulting in low munificence and an entrepreneurial dominant logic leading to innovation but resulting in non-compliance.

I find that external pressure to move quickly resulting from high velocity market growth, coupled with the unpredictability of the reservoir as well as Suncor's dominant logic to act led to internal haste in reconfiguration execution. Companies that ignore the implication of this unpredictability do so to their peril. For Suncor, a lack of deliberate upfront planning let to unanticipated occurrences. Specifically, as production increased, hydrogen sulphide was found in the reservoir and was not anticipated. Suncor was left to react to this event and had not factored its potential into the design of the facility. The unpredictability of the reservoir coupled with a dominant logic that focused on execution rather than planning and a pressure to move quickly all converged to result in operational and environmental noncompliance.
6.5 Consequences and Outcomes
This research project focuses on root causes of the environmental infractions; as a result, data is linked to negative consequences - environmental and operational challenges. See Appendix D for a summary of the charges against Suncor. In addition, Suncor experienced operational issues leading to release of hydrogen sulphide (H2S) emissions to the atmosphere. This venting was not included in the Alberta Environment charges leading to the creative sentence but were part of an ERCB production constraint that was incurred by Suncor in September, 2007.

There is an opportunity in business and the natural environment research to study organizational failure for new insights (Bansal & Hoffman, 2012). More generally, in the business strategy literature failure is considered an opportunity to learn and improve (Tinsley et al., 2011, Gino & Pisano, 2011). In particular, near misses are not to be ignored but responded to in order to avoid catastrophe (Tinsley et al., 2011). Often, however, individuals in organizations are not inclined to acknowledge and adjust to near misses. The literature connects that response to over optimism (Ucbasaran et al., 2011), willful blindness (Heffernan, 2011) or cognitive biases of deviance normalization or outcome bias, where successful results are the focus rather than the processes that led to them (Tinsley et al., 2011).

These theoretical assertions are supported by the accounts of Suncor employees who did initially directly address the near miss,

“It was horrible to go through. But after having gone through it was great. Great experience…but not something I care to ever repeat again…So yeah, it was tough. It was tough professionally. And it was tough personally… So I think my mission is to make sure it never happens again.”
Suncor’s environmental infractions and operational problems connected to H2S venting can be deemed near misses. In fact, external informants confirm that the incidents did not cause significant environmental harm (Appendix H). Through the creative sentencing process, Suncor was obliged to revisit these near misses, reflect and consider areas for improvement. While beneficial to the organization, this was for some a painful process,

“It (the infraction) really shook me personally at a quite deep level.”
*Suncor Executive*

Reconfiguration challenges as manifest in environmental noncompliance charges and operational issues were the result of non-transfer and negative transfer of capabilities caused by antecedents of informal routines and an entrepreneurial dominant logic characterized by fast thinking and focused on growth. Internal growth was moderated by growth in the dynamic external context (see Figure 10).

Rising prices for oil made bitumen extraction economic. Industry reports in 2011 put the marginal cost to produce an oil sands barrel of oil at $75 and $95. When prices fall below the marginal cost, oil sands companies shut in production and put projects on hold (Ewart, 2012). Consequently, oil sands companies are compelled to capitalize on a rising commodity price and investors reward companies that increase production. One Suncor manager made the following observation,

“It’s a threat because of investor pressure and it is a...It just pays, right, it went from insane to hectic, yeah...Yeah, I think so and it was pretty hard to argue with success. I am like almost everybody else in the company who had been here 20 years became a millionaire because the stock went up 2 to 4000 percent, right, and maybe we were lucky on major incidents, our safety record was not...”
With accelerated growth and financial success came environmental compliance challenges. Suncor was demonstrating growing pains in noncompliance infractions (Appendix R). These infractions were a significant disappointment to Suncor; a firm that was viewed as focused on environmental sustainability. Suncor built a solid reputation as an industry leader on sustainability. The organization was lauded for its efforts in stakeholder relations, climate change, renewable energy and technology (Hall & Vredenburg, 2003).

In Suncor, despite strong intentions by senior management, the environment may be given lower priority when in conflict with other organizational goals like cost and schedule on projects (Table 9).

“So if you’re at a work site where it’s the norm to do shortcuts and where production is more important than people’s safety chances are even if you’re a safe kind of guy you’re going to conform to whatever’s around you”. Suncor Informant

There is a trade-off inherent in the goals of the organization. At Suncor, according to informants, this was further complicated by a corporate structure of silos and lack of integration.

“In the legacy of Suncor, the BUs were responsible for their own reporting and to ensure they’re in compliance”.

“Things are changing a little bit, but there are multiple handovers when a project’s done, so Regulatory Approvals gets the approval. Once they get it, that’s successful. And really that’s the end of their involvement. Now things are changing a little bit. But that was the case. Cause they’ve got another approval to get (and) another one after that”.

I find both conflicting goals and implementation tension as contributing to environmental noncompliance at Suncor. Suncor’s approach to implementation at the time was in conflict with the degree of policy commitment at the executive level. The siloed structure at Suncor
had Environment, Health and Safety (EH&S) reporting directly to the business units and indirectly to the Vice President of Sustainability. Having the management of sustainability, which is long term and outward looking, and EH&S, which is internal and short term responsive, in the same function is problematic.

“Because solid line to the business was really creating still a bit of an artefact of a siloed culture and some autonomy there that was not helpful.” Suncor Informant

With EH&S managers located in the business units, there is additional risk that their goals are not given greater weight than the operational goals of the unit.

For Suncor, growth and seizing of opportunities progressed quickly and, as determined by the data, foundational compliance processes were not formalized (Table 8). The quick response was due to the entrepreneurial dominant logic within the organization and a high velocity external market. Suncor informants describe tension between the compliance mindset that existed and the necessary processes to execute on those proactive environmental initiatives (Table 9). While an assumption of compliance processes may underlie the theoretical construct of proactive environmental strategy, its existence in reality may be called into question.

Companies with an entrepreneurial dominant logic may overpass foundation building. Rumelt (2011, p. 115) uses the analogy of rungs on a ladder to comment on those companies that lack skills in coordination because they have progressed up the ladder without having been firmly placed on lower level rungs. Rumelt identifies the need to master basics before moving up. Penrose (1959) similarly commented on the importance of coordination or managerial services and technological bases as important foundations from which to expand businesses.
In their framework, Winn and Angell (2000) define “unrealized greening” as a scenario where management professes the importance of the environment but there exists a lack of CEM systems. The authors find that, “while the importance of the environment is professed by top management, it does not appear to have priority over other organizational goals” (p. 1131). They cite three possible explanations for this: greening washing where actual implementation was never intended; the organization at an intermediate stage before ramping up to implementation; a disconnect between top and middle management and middle managers are also responding to other corporate goals that might take precedence.

In Suncor, as in other organizations, despite strong intentions by senior management, the environment may be given lower priority when in conflict with other organizational goals like cost and schedule on projects (see Table 8 in Chapter 5). There is a trade-off inherent in the goals of the organization. At Suncor, this was further complicated by a corporate structure of silos and lack of integration. I see both the trade-off in goals and the implementation challenge as contributing to environmental noncompliance at Suncor. Suncor’s approach to implementation at the time was in conflict with the degree of policy commitment at the executive level.

*Proposition 5 (P5): Entrepreneurial organizations having a proactive environmental strategy may have informal foundational compliance routines.*

This dichotomy between the imperative to develop capabilities quickly in times of turbulence and the risks associated with that haste when interacting with the natural environment is one that natural resource companies must balance. In addition, when compared with other industries, project lead times in the oil and gas industry are long due to scale and regulations.
Oil and gas companies contend with pressure from the investment community to move quickly and to demonstrate production.

6.6 Chapter Summary
In this chapter, I have shown that Suncor was not constrained by inertia in their reconfiguration of capabilities, but that their entrepreneurial dominant logic impeded success as Suncor acted quickly resulting in a short pilot time leading to unanticipated operational issues and to environmental compliance challenges. These challenges might have been mitigated by increased deliberate learning and assessment early in the project stages. An entrepreneurial dominant logic that according to informants (Table 9) was “less planful” coupled with a lack of formalized routines (Table 8) were antecedents to the negative outcomes. The causal relationship between antecedents and outcomes was moderated by a high velocity external context of high industry growth and an unpredictable natural environment (Table 6).

In high velocity environments companies will often grow to take advantage of opportunities. That growth may take the form of internal diversification or expansion requiring capability reconfiguration and transfer of capabilities from the existing to the new business (Penrose, 1959). In the causal model presented in this chapter and resulting from the qualitative in-depth case study of capability reconfiguration at Suncor Energy, I find that a high velocity dynamic market moderates the relationship between routines and reconfiguration outcome. In this study, a lack of formalized, codified, explicit routines and a predilection for heuristics or informal, ad hoc routines leads to both compliance and operational challenges where the firm moves quickly to take advantage of opportunities in the high velocity market. Transfer of tacit routines is negatively affected by an entrepreneurial dominant logic that excludes deliberate thinking and upfront planning. Consequently, a negative transfer of tacit routines occurs where
knowledge from the core business is transferred to the new business but is not applicable. That same entrepreneurial dominant logic is characterized by fast growth which leads to a short pilot phase and unanticipated operational issues. The effect of a reliance on tacit routines and informal explicit routines might be mediated by people in the right positions with the required knowledge and skills. However, in a market of low munificence where resources are constrained and where new technology expertise is limited, the mediating effect of people contributes to failure. The lack of formalized explicit routines for compliance did not support a proactive environmental strategy that was part of the dominant logic of the organization.
CHAPTER 7: DISCUSSION

“Festina Lente”
Latin for Make Haste Slowly

The causal model presented in Chapter 6 is the culmination of data analysis, refinement and careful consideration of the academic literature. Through a process of data reduction and categorization, I have identified the key variables leading to environmental compliance and operational challenges as Suncor Energy reconfigured capabilities to take advantage of a new technology opportunity. The interrelationships between these variables and their link to the dependent outcomes of failure to install a required piece of environmental equipment, to disclose the oversight and of releasing harmful hydrogen sulphide are defined. The resulting model (Figure 10) shows that an entrepreneurial dominant logic can lead to informal routines that are challenging to effectively transfer, leading to reconfiguration challenges. This relationship is moderated by an external context characterized by high market velocity due to industry growth and further complicated by an unpredictable natural environment. Industry growth compels Suncor, with its fast thinking and growth focused dominant logic, to respond quickly leading to operational and environmental compliance issues. A reliance on informal routines is associated with people in the organization mediating the effectiveness of those routines.

This research makes a number of contributions to the extant literature in organizational and environmental strategy. In general, there is an opportunity in the business and the natural environment literature to conduct failure and problem-based research to garner new insights (Bansal & Hoffman, 2012, Hoffman & Jennings, 2011). More generally, in the business strategy literature failure is considered an opportunity to learn and improve (Tinsley et al., 2011, Gino & Pisano, 2011). Further, the literature on dynamic capabilities can benefit from
empirical data that examines how dynamic capabilities are actually executed in firms (Peteraf, 2007; Ambrosini & Bowman, 2009). In this chapter, more detailed contributions and associated findings are outlined and occur on four levels: capability reconfiguration, market dynamism, formal routines and dominant logic. The central contributions of this research are:

Capability Reconfiguration:

- This dissertation research contributes to dynamic capabilities literature by using empirical evidence to take the framework from the conceptual to the concrete (Teece & Pisano, 1994; Teece et al., 1997). This in depth case study provides a method for responding to Teece’s (2007) call to connect the framework to the ‘real world’. Dynamic capabilities research to date has been predominantly conceptual with empirical evidence being limited (O’Reilly & Tushman, 2008). Ambrosini & Bowman (2009) assert that qualitative fieldwork to derive the origins of resource creation and reconfiguration through detailed investigation within small sample studies of organizations is needed. Determining the micro foundational processes and disciplines that underlie a dynamic capability for reconfiguration in an organization is made difficult by necessary elusiveness to prevent competitor imitation (Teece, 2007). It is therefore a contribution to the theory to obtain empirical evidence from within an organization as it reflects upon its reconfiguration and the associated challenges.

- In considering reconfiguration challenges in an organization, this study contributes to the extant literature. Existing literature focuses on reconfiguration challenges in incumbent firms of tacit routine transfer (Galunic & Rodan, 1998), sensing of opportunities (Lavie, 2006) and munificence (Sirmon et al., 2007). This study is unique in considering the implications of an entrepreneurial dominant logic in an incumbent firm on capability reconfiguration. The finding is that reconfiguration success is impeded by the non-transfer
of informal, foundational routines and by the negative transfer of tacit routines resulting from fast thinking combined with a high velocity external context.

- These challenges are linked to higher level tension between organizational capabilities associated with an entrepreneurial dominant logic that are necessary for sensing and seizing opportunities but that run contrary to a more deliberate and formalized approach required for reconfiguration. The study provides empirical support of literature defining a paradox in balancing efficiency and flexibility (Eisenhardt et al., 2010), exploitation and exploration (Raisch & Birkinshaw, 2008) or sensing, seizing and reconfiguration (Teece, 2007). However, contrary to previous assertions that suggest incumbent firms are impeded by established processes tending towards inertia (Leonard-Barton, 1992; Lavie, 2010), this study finds a need for formalized, explicit routines in foundational activities like compliance and operations. This finding holds for organizations with an entrepreneurial dominant logic that attempt reconfiguration when the external context is dynamic, characterized by low munificence, growth and further complicated by an unpredictable natural environment.

Market Dynamism:

- In this study, the preeminent definition of high velocity market dynamism (Eisenhardt & Martin, 2000) is extended to include the natural environment, specifically the natural resource itself. The finding is that organizations that interact directly with the natural environment – the natural resource as well as geographic location and weather – must adjust to unpredictability thereby increasing the velocity of an already highly dynamic context.
The effect of external market growth on environmental performance is not adequately addressed in the literature (Pogutz et al., 2011). Contrary to Russo and Fouts’ (1997) assertion that market growth supports an increased focus on environmental initiatives, the finding in this study is that industry growth, when reciprocated by fast paced internal growth, leads to challenges as an organization reconfigures for environmental improvement and economic gain.

Formal Routines:

- Current theory suggests that in high velocity markets, firms benefit from informal routines or heuristics that allow for faster response to changes in the external context (Eisenhardt & Martin, 2000; Bingham et al., 2007; Eisenhardt et al., 2010). Empirical data from this study of Suncor Energy show that informal routines consistent with an entrepreneurial dominant logic led to non-transfer of foundational capabilities and contributed to operational and compliance challenges in reconfiguration. The finding is that even in entrepreneurial firms operating in a high velocity market, foundational activities require formalized routines as an organization reconfigures. Formalization occurs through codification of explicit routines and compliance is deemed a foundational activity.

Dominant Logic:

- Entrepreneurial dominant logic at Suncor Energy, and consistent with theoretical definitions (Meyer & Heppard, 2000), was characterized by a propensity to move quickly, lack of formalization and a focus on growth. This logic is linked to informal processes and a lack of planful or deliberate thinking. Informal routines and fast thinking are subsequently linked to a non-transfer and negative transfer of capabilities leading to
reconfiguration challenges as the organization attempted capability reconfiguration in a high velocity market.

- The entrepreneurial dominant logic that existed at Suncor was reflected in a proactive environmental strategy. This link has been identified in the literature for innovative organizations (Russo & Fouts, 1997). In the same way that the entrepreneurial dominant logic was linked to informal routines, especially compliance and operational routines, I find a decoupling of compliance implementation from a proactive environmental strategy that prioritizes the environment. This finding contributes to the theoretical conversation considering environmental policy versus environmental management implementation (Winn & Angell, 2000).
### Table 13: Summary of Contributions

<table>
<thead>
<tr>
<th>Contribution</th>
<th>Literature</th>
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<tr>
<td><strong>Assumptions</strong></td>
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<tr>
<td>- Processes equated to routines</td>
<td>Teece &amp; Pisano (1994); Teece et al. (1997)</td>
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<tr>
<td>- Dominant logic as antecedent to level of formalization of routines</td>
<td>Prahalad &amp; Bettis (1995), Obloj (2010), Grant (1988)</td>
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<td>valuable theoretical insights</td>
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<td><strong>Findings</strong></td>
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<td><strong>Central Finding – tension between dynamic capabilities</strong></td>
<td>Teece (2007)</td>
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<tr>
<td>- Incumbent firms with an entrepreneurial dominant logic, while proficient</td>
<td>Lavie (2006)</td>
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<td>at sensing and seizing opportunities, may face reconfiguration challenges</td>
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<td>in a high velocity market due to a propensity to move quickly and a lack</td>
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<td>of formal routines in foundational activities that result in negative and</td>
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<td>non-transfer of capabilities.</td>
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<td><strong>Capability Reconfiguration</strong></td>
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<tr>
<td>- Alternative, in sustainability strategy, to creative destruction or</td>
<td>Hart &amp; Milstein (1999)</td>
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<td>incremental improvement.</td>
<td>Albino et al., (2009)</td>
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<td><strong>Market Dynamism:</strong></td>
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<td>- Interaction with the natural environment leads to increased</td>
<td>Eisenhardt &amp; Martin (2000)</td>
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<td>unpredictability and extends current definitions of high velocity market</td>
<td>Pogutz et al. (2011)</td>
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<td>dynamism.</td>
<td>Pisano (1994)</td>
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<td>- High growth and low munificence in the external market, when impacting</td>
<td>Russo &amp; Fouts (1997)</td>
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<td>a firm with an entrepreneurial dominant logic that focuses on growth,</td>
<td>Sirmon et al. (2007)</td>
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<td>fast thinking and informal routines, can lead to reconfiguration</td>
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<td>challenges.</td>
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<td><strong>Formal, Foundational Routines:</strong></td>
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<tr>
<td>- In entrepreneurial firms operating in a high velocity market,</td>
<td>Penrose (1959); Verbeke (2010)</td>
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<td>foundational activities require formalized routines as an organization</td>
<td>Rumelt (2011)</td>
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<td>reconfigures. Formalization occurs through codification of explicit</td>
<td>Eisenhardt &amp; Martin (2000)</td>
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<td>routines. Compliance is defined as foundational activity.</td>
<td>Bingham et al. (2007)</td>
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<td><strong>Dominant Logic:</strong></td>
<td>Galunic &amp; Rodan (1998)</td>
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<td>- Informal routines and fast thinking are subsequently linked to a non-</td>
<td>Kahneman (2011)</td>
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<td>transfer and negative transfer of capabilities leading to reconfiguration</td>
<td>Finkelstein &amp; Halebian (2002)</td>
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<td>challenges as the organization attempted capability reconfiguration in a</td>
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<td>high velocity market.</td>
<td>Sharma &amp; Vredenburg (1998)</td>
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<td>- Entrepreneurial dominant logic is connected to a proactive environmental</td>
<td>Winn &amp; Agnell (2000)</td>
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<td>strategy and underlying informal routines to challenges in compliance</td>
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<td>implementation.</td>
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<td><strong>Implications</strong></td>
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<td>- Management in entrepreneurial organizations embarking on capability</td>
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<td>reconfiguration should incorporate upfront, deliberate planning to</td>
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<td>assess synergies and ensure foundational activities are present as</td>
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<td>codified routines.</td>
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<td>- Managers in organizations interacting with the natural environmental must</td>
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<td>acknowledge the unpredictably of the natural system and must be</td>
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<td>vigilant in their treatment of compliance as a formal, foundational</td>
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7.1 Capability Reconfiguration

Dynamic capabilities are associated with a firm’s ability to reconfigure, redeploy, or otherwise change existing resources in order to respond to environmental change (Feldman & Pentland, 2003). This research study contributes to dynamic capabilities literature by using empirical evidence to support the dynamic capabilities framework, taking the construct of reconfiguration from the conceptual to the concrete (Teece, 2007; Teece & Pisano, 1994; Teece et al., 1997). I consider the relationship between sensing and seizing opportunities and effectively reconfiguring capabilities to capitalize on opportunities. Dynamic capability dimensions of process, position and path are operationalized as implicit and explicit routines, people and dominant logic. Throughout this in depth case study, I explicate dimensions of the dynamic capability for reconfiguration in response to calls to consider the reconfiguration of routines and the development of strategy (Salvato, 2003). Since the data was obtained through a creative sentence, informant observations are particularly candid and insightful. By linking dynamic capabilities literature to observed data in this in depth case study, definitional assumptions were made that may have application in other research contexts. Based on data analysis and review of the literature, I equated processes with routines, categorizing routines as tacit and explicit.

I find that organizations can respond to societal requirements and internal demands for increased environmental responsiveness or sustainability through capability reconfiguration rather than creative destruction or incremental change (Hart & Milstein, 1999; Albino et al., 2009). For Suncor, SAGD technology presented the firm with an opportunity to access new, untapped reserves of bitumen for economic gain. SAGD technology has a reduced
environmental footprint when compared with oil sands mining. As companies improve
technology there is the opportunity to reduce associated GHG emissions. Similar to oil sands
mining, SAGD is a technology for extracting bitumen from Alberta’s oil sands. Despite being
related on a number of levels, the technologies also differ in significant ways. Where
capability reconfiguration is related to the existing business of the firm, theory suggests success
is more likely because of the ability to leverage off of synergies between the entities (Penrose,
1959; Rumelt, 1982). Internal development of resources can provide companies with greater
control over reconfiguration (Capron et al., 1998; Sirmon et al., 2007). However, bounded
rationality, path dependence and core rigidity can inhibit internal development that extends
beyond the core business of the firm (Leonard Barton, 1992). In high velocity markets,
companies must act quickly to develop resources necessary for competitive advantage
(Eisenhardt & Martin, 2000). A faster option may exist in going to the external market for
those resources. In situ technology development had similarities to aspects of the
organization’s technological base and the product of the technology, bitumen, served the same
market. Given these synergies, the theoretical expectation would be for relative ease and
success in reconfiguration.

In reality, Suncor experienced negative operational and compliance outcomes as the
organization reconfigured capabilities from oil sands mining to in situ SAGD oil sands
development. Despite extracting bitumen from the same region in Alberta, Suncor
experienced failure associated with unexpected differences in regulations and the natural
environment. Much can be learned from Suncor’s experience, both academically and
practically.
I draw on current theorizing of capability reconfiguration (Lavie, 2006; Sirmon et al., 2007; Helfat & Peteraf, 2003; Galunic & Rodan, 1998; Teece 2007) to analyse actual reconfiguration at Suncor and to contribute to the extant literature. I identify the roles of dominant logic and routines in contributing to reconfiguration challenges. I use the case of environmental noncompliance and operational challenges to show the importance of formalized routines especially in key, foundational activities and the implications of an entrepreneurial dominant logic to fast thinking, haste and negative transfer.

Several theoretical models for capability reconfiguration describe the process as occurring in two phases. The first involves some level of upfront assessment of the existing capabilities and those required for reconfiguration. This step is facilitated by deliberate thinking. Theoretically, this part of the capability reconfiguration process is called cognitive absorption (Lavie, 2006), mobilization (Sirmon et al., 2007) and ex ante conceptualization (Galunic & Rodan, 1998). Challenging this assertion using the Suncor data, I find that an entrepreneurial dominant logic moderated by external market uncertainty, low munificence and growth result in a lack of deliberate or upfront planning.

The second stage of the reconfiguration process has the firm executing reconfiguration by making the necessary changes to existing capabilities to capitalize on the new opportunity. This is defined as operational cognition (Lavie, 2006) and leverage (Sirmon et al., 2007). Data from Firebag determines formalized routines in compliance and operations as necessary for capability transfer. This finding supports theorizing that codified, explicit routines are more effectively transferred at less cost to the organization (Galunic & Rodan, 1998; Sirmon et al., 2007; Zollo & Singh, 2004).
This dissertation considers the micro foundations of this capability reconfiguration to identify variables, their interrelationships and propositions for negative outcome avoidance. Among other suggestions, Hoffman and Bansal (2012) identify the study of organizational failure as a possible avenue to overcoming biases in Business and the Natural Environment (B&NE) research. In studying failure, or the negative environmental and operational outcomes, my focus is on what went wrong in reconfiguration at Suncor Energy. Through this analysis, further development of the theoretical construct of the dynamic capability for reconfiguration can be achieved. Also, managers can identify how to improve reconfiguration performance, notably in the oil sands industry but also for other natural resource industries concerned with environmental impact. The benefits of studying failure are clear both for theory and practice. However, overall, Suncor’s performance related to Firebag has been improving on both economic and environmental metrics.

Despite Suncor’s early challenges and disappointing outcomes, the facility has since garnered success and accolades for Suncor. This success can be attributed to the entrepreneurial dominant logic that propelled Suncor to sense and seize an opportunity in SAGD technology but that fell short on same facets of capability reconfiguration. Investment analysts attribute Suncor’s Firebag project with making a significant contribution to the record levels of production of bitumen in Alberta (Healing, 2011). The Firebag facility was rated as the top in situ facility for environmental performance by The Pembina Institute, an energy industry NGO, receiving a score of 60% to the average survey score of 44% (Moorhouse et al., 2010). Environmental infractions on site have decreased and Firebag is now leading the way to operational discipline within Suncor demonstrating an important level of resilience.
“You know it’s interesting; we had an ERCB inspection yesterday at Firebag. The inspector was on the site for two hours. They had one issue … But her comment was at the end was, ‘I’ve never actually been at an in situ site where I haven’t had a long list’.” A Suncor Informant commenting on a 2011 inspection.

7.2 Market Dynamism and the Natural Environment
I define the oil sands industry as turbulent and meeting the criteria for high velocity markets. Environmental and sustainability strategy literature has largely ignored market growth and size as well as ecosystem complexity (Pogutz et al., 2011). One exception is the Russo and Fouts (1997) paper which found that the positive relationship between environmental and economic performance became stronger in higher-growth industries. Market growth was identified as a moderating variable with higher growth industries realizing higher returns and having more access to resources to be dedicated to environmental initiatives. The Suncor case data demonstrates the corollary. For Suncor, a high growth industry resulted in low munificence and challenges in acquiring expertise from the market. Growth in the external context encouraged Suncor, with its entrepreneurial dominant logic, to move quickly to capitalize on rising commodity prices and to respond to investor pressures to achieve production targets.

In considering organizational capabilities, Russo and Fouts (1997) draw a connection between innovative internal corporate context and prevention efforts associated with ‘beyond compliance’ efforts. The authors link organic structures with proactive environmental strategies because of a loosening of organizational structures and norms. The Suncor case demonstrates that there can be no loosening of compliance and that it should not be a taken for granted capability even in organization’s with proactive sustainability strategies. This finding is substantiated by recent examples in the media such as the BP Horizon oil spill and various pipeline leaks.
Pogutz et al. (2011) consider ecosystem complexity and the firm’s ability to manage its impact on the environment. In chapter 4, I established that the oil and gas industry meets criteria for high velocity dynamic market with the added complexity of interaction with an unpredictable natural environment. I extend the Eisenhardt and Martin (2000) definition of market velocity to include the natural system as a dimension, underscoring the unpredictability associated with the reservoir and the complexity associated with changing regulations and new technology. In the Suncor case, the unpredictability of the reservoir led to increased and unanticipated impact on the environment vis a vis release of hydrogen sulphide into the atmosphere.

The type of market dynamism at play may determine the level of flexibility required. Two dimensions for market dynamism are identified as ambiguity and unpredictability (Eisenhardt et al., 2010). If the external market is characterized by ambiguity due to, for instance, new markets or products, then, it is argued, flexibility may not be necessary. However, if the external market is unpredictable then flexibility will be required. Flexibility is coupled with simple routines and heuristics in the literature while formalized routines are a facet of efficiency (Eisenhardt & Martin, 2000; Bingham et al., 2007; Grant, 1996b).

7.3 An Argument for Formalized Routines
In keeping with Zollo and Winter’s (2006) work, an important yet sometimes underestimated factor in the development of a firm’s dynamic capabilities is the importance of codified knowledge or formalized processes. Formalized routines facilitate an appropriate response to novel situations for organizations that struggle with improvisation (Nelson & Winter, 1982). Formalized routines can increase efficiency and avoid costs in communication and knowledge transfer (Grant, 1996b). Formalized routines can also lead to core rigidities, inertia and stifled innovation (Benner & Tushman, 2003).
When the external context is turbulent, formalized routines can inhibit organization response and adaptability (Eisenhardt et al., 2010). The added uncertainty of the natural environment should further support the well supported Eisenhardt and Martin (2000) argument for “simple (not complicated), experiential (not analytic), and iterative (not linear) processes” (p. 1113) in high velocity markets. Instead, I find challenges resulting from informal routines (Table 8) as Suncor integrated a new technology (SAGD) that required natural environment interaction in a high velocity market. The argument is, therefore, made for formalized, deliberate processes. There is value in foundational, codified processes that are transferrable and provide a basis for responding in high velocity markets (Penrose, 1959). Eisenhardt and Martin (2000) allow for “pockets of detailed routines where existing knowledge is relevant” (p. 1117) but they do not expound on this. So, while the black box of routines is opened for simple routines that are effective in high velocity markets, we know little of those routines that require formalization despite a dynamic external context. In this work, I consider the need for formalized routines in certain activities and extend the literature on simple routine and high velocity markets to suggest a need for formalization of foundational routines in certain activities, like compliance, and especially when the firm expands into new businesses and must transfer existing routines. I argue that precisely because of the high velocity market dynamism, organizations should formalize what they can to provide a foundational level of stability as both external and internal contexts change and organizations are required to adjust. Heuristics bring structure to entrepreneurial firms but are not structured enough for growing organizations faced with low munificence in the external context characterized by resource constraints, specifically employee turnover and inexperience; a dominant logic for moving quickly; and, an unpredictable natural system.
Evidence from this study challenges conclusions of the Bingham et al. (2007) study that heuristics are easily and quickly transferrable because they are behavioral and cognitive actions. That study also contends that the semi-structure of heuristics allows for improvisation. In the case of Suncor, I find challenges in transferring informal routines or heuristics and find that compliance and operational failure outcomes might have been mitigated through transfer of formal routines. In addition, a reliance on informal routines or tacit knowledge requires individuals or people in the organization to be skilled and available.

The negative implications of structure have been established in the literature as path dependency, inertia and lack of innovation (Leonard-Barton, 1992; Lavie, 2010). One step to achieving balance between efficiency and flexibility is to define those activities that should be formalized as foundational routines through deliberate learning (Martin & Eisenhardt, 2010). I argue that compliance was taken for granted in Suncor and not established as a foundational capability. This is attributed to the prevailing dominant logic which included a high level sustainability or proactive environmental strategy. I build on the foundational work of Sharma and Vredenburg (1998) linking proactive environmental strategy and competitive capabilities. I find that the very legal nature of compliance infers formality and absence of improvisation. Compliance cannot be loosely coupled to sustainably strategy (Benner & Tushman, 2003, Lavie, 2010).

“We talk all these great things about you know BP rebranded their whole company; Suncor builds renewable energy and ethanol plants and whatnot…And I think we focus so much on presenting ourselves as this greener and greener company that we haven’t really put in the processes and whatnot to manage our growth… so you know you definitely need a method of managing the compliance and the growth and whatnot. And so in that regard I’m more leaning, I would rather if Suncor concentrated on the compliance …” Suncor Informant
7.4 Dominant Logic
The tension between the imperative to develop capabilities quickly in times of turbulence and the risks associated with that haste when interacting with the natural environment is one that natural resource companies must balance. This tension is affected by the dominant logic of the organization. Organizations that approach opportunities slowly and with deliberate thinking may be late in capitalizing on the opportunity, but may ultimately achieve greater success or avoid failure. Companies like Suncor, with a dominant logic of acting quickly, will be better positioned to realize the opportunity but may risk operating and compliance near misses.

Research in dominant logics, has not been as highly impactful as it might have been (Manikutty, 2010). From 1995 to 2007, just 225 papers were published in management journals with 40 of the most influential in 14 journals (DeStefano et al., 2010). This may be attributed to difficulty in measuring the concept and, possibly, to managers’ conviction that they are able to recognize and manage differences in businesses (Manikutty, 2010).

As determined in Table 9 and argued in Chapter 5, the dominant logic of Suncor's oil sands mining business was entrepreneurial characterized by a decentralized structure, growth focus and fast thinking and pace. This entrepreneurial dominant logic spurred Suncor to sense and seize an opportunity for in situ oil sands development; however, the lack of structure and informal routines connected to that dominant logic proved problematic in capability reconfiguration. Teece (2007) contends that sensing and seizing are precursors to a dynamic capability for reconfiguration. I extend this work by highlighting the paradoxical micro foundations associated with sensing and seizing dynamic capabilities and reconfiguration. This finding is akin to the exploration and exploitation tension identified in the ambidexterity
literature (Benner & Tushman, 2003; Lavie et al., 2010; Raisch & Birkinshaw, 2008). The flexibility and lack of structure associated with an entrepreneurial dominant logic promotes innovation and sensing and seizing but informal routines introduce complexity to the transfer of capabilities necessitated by reconfiguration. I support the assertion that tacit routine transfer can be more costly (Galunic & Rodan, 1998). I further contend that informal routines can result in a non-transfer of capabilities as a firm reconfigures. The prevalence of informal routines at Suncor translates to a reliance on people as a mediating variable in effective reconfiguration. The criticalness of people is challenged by low munificence in the market causing high turnover and constrained resources as well as inexperience with the new SAGD technology.

The pre-existing dominant logic at Suncor was fast thinking and fast paced. Preference was given to acting quickly and fixing problems later rather than upfront planning. This lack of deliberate learning is connected to a negative transfer of capabilities, where capabilities that are not applicable to the SAGD business are transferred with negative consequences. The theoretical construct of ‘negative transfer’ is adopted from Finkelstein and Haleblian (2002) in their consideration of acquisitions and applied here to internal expansion and capability reconfiguration.

Findings in this study contribute to the emerging literature on entrepreneurial dominant logic as coined by Meyer and Heppard (2000). First, I contend that Suncor was deficient in deliberate thinking which impeded the organization from assessing tacit routines for transfer to Firebag. In addition, they failed to ascertain the need to codify explicit routines that were informal. The need to plan upfront and think deliberately may run counter intuitive to the mindset of entrepreneurial companies that want to proceed at fast pace to seize opportunities. It is also
counter to new technology development in situations of uncertainty where adjustments and learn by doing are preferred to upfront deliberate planning (Pisano, 1994). I argue that in formalizing foundational activities, slack is created for inevitable adjustments associated with the development of new technology. At Suncor, pace was achieved with a ‘do it and fix it later’ dominant logic attribute.

The fast pace of Suncor’s growth was a function of both its internal dominant logic and the growth that was occurring in the external market. This observation supports contributions in the literature asserting that speed in organizations becomes self-reinforcing (Perlow et al., 2002). I show that entrepreneurial dominant logic can internally motivate pace beyond the exogenous pressure from market growth. This propensity for fast pace is contrary to inertia. Core rigidity or path dependence in entrepreneurial organizations may be associated with haste rather than inertia. This haste without deliberate planning can translate to organizational failure or near misses.

In natural resource industries pace is further complicated by the unpredictability of the natural environment. Suncor executed a short pilot phase in order to capitalize on rising commodity prices and in response to investor pressure to achieve production targets. Observations connected to this decision and its outcome highlight the difference in technology development in natural resource industries compared with manufacturing in other industries. I extend Pisano’s (1994) evaluation of technology development by pointing to key differences affecting companies that must interact with the natural environment. First, the location of the resource dictates the location of the pilot and operations plant. Suncor piloted at a different location than where operations took place. Differences in the reservoir resulted in unanticipated
operational issues. In other industries, pilot conditions are more easily replicated. Interaction with the natural environment requires both adjustment and upfront planning.

A key finding from the data is that once processes are established as foundations they are more easily transferred into new businesses (Penrose 1959; Rumelt 2011). This challenges some of the assumptions of scholars who call for simple routines in dynamic environments (Eisenhardt & Martin, 2000; Bingham et al., 2007; Obloj et al., 2010)

7.5 Implications for Managers
As conventional oil and gas resources dwindle and as environmental legislation and societal pressure intensify, North American oil and gas companies must have the dynamic capability to reconfigure and transform existing processes to meet the needs of the changing business environment. This in-depth case study of Suncor Energy provides important insights for organizations contemplating reconfiguration. Suncor is to be commended for participating in the creative sentence process and making transparent their challenges with reconfiguration. This action and the initiatives they have undertaken since the infractions and operational issues demonstrate Suncor’s resilience.

Organizations can learn from Suncor’s experience and dedicate time and effort to an evaluation of their culture and routines before proceeding with new technology piloting and commercialization. Upfront, deliberate assessments and gap analysis can lead to identification of synergies and differences in order to circumvent negative transfer and facilitate integration when moving from research to operations. Organizations that rely on simple, experiential, learn by doing approaches are cautioned to consider how those capabilities can be transferred. Finally, organizations that interconnect with the natural environment are urged to be assured of their compliance routines even as they pursue higher level proactive and innovative environmental initiatives.
To reduce the risks associated with technology commercialization in a dynamic natural environment, Suncor might have added a stage to the reconfiguration process between piloting and production where scale could have been increased but still in a “learn by doing” manner. This would allow for adjustments. Appendix P presents Encana’s project process as an example of one that includes an interim stage between pilot R&D and production. This step should also allow for feedback between the Design and an Operations group, which was a problem at Suncor (see Table 8). In the pharmaceutical industry, this phase is called commercial start up and Pisano (1994) notes that this is the phase where, “unanticipated problems often can and do arise” (p. 91).

Such assessment might have determined the need for formalization of certain routines in advance. At Suncor, pace was achieved with a “do it and fix it later” dominant logic, but once processes are established they become foundations for moves into any variety of new businesses. In addition, the negative transfer that unfolded at Suncor might have been prevented by a gap assessment of the capabilities that existed in various parts of the business and the capabilities required for the new SAGD business at Firebag. Cognitive absorptive capacity in reconfiguration is affected by uncertainty and complexity and the ability of managers to cognitively define the gap and how to reduce it. This cognition aspect makes reconfiguration a time consuming process but less so than evolution with its trial and error basis (Lavie, 2006).

An awareness of the pre-existing dominant logic and its implications to diversification could have been considered up front. However, as Prahalad and Bettis (1986) have commented, “few organizational events are approached by these managers (or any managers) as being totally unique and requiring systematic study” (p. 489). Also, an upfront systematic study was
challenged by the growth occurring not only in the firm but in the industry at the time. Companies that act in haste to capitalize on record oil prices and to appease the investment community may face unanticipated challenges.

7.6 Limitations and Future Research

The capability reconfiguration studied in this dissertation is bound by the confines of the creative sentence research project. All data is connected to the negative outcomes of non-compliance and operational issues at Firebag. Given this boundary some important insights and findings regarding capability reconfiguration may not be addressed.

There are well known limitations to qualitative research. It is worth reiterating that this study generalizes to theory and not to population; however, there are recent examples in the media of companies struggling with compliance implementation despite having reputations for proactive environmental or sustainability strategies.

A number of future studies are identified:

1. What might encourage companies to refrain from growing rapidly in tandem with the external market? How can organizations insulate themselves from commodity price increases and investor pressure? Is Suncor's internal response to external industry growth entrained? Is this a necessary condition for organizations? Can companies slow down even if they have an entrepreneurial dominant logic?

2. There exists the potential to extend this research study to a longitudinal process study by going back to Suncor and determining how new processes and logic initiatives around operational excellence have been executed and what the associated impact is in
the organization. Research might focus on how Suncor integrated operations into project execution, formalized compliance processes and encouraged a new operational excellence dominant logic to emerge. In this way, contributions could also be made to the literature on learning from failure and resilience.

3. Is there an increasing incidence of entrepreneurial firms growing quickly and embarking on reconfiguration before formalized processes and deliberate thinking are established? A quantitative study of organizational growth, share price and environmental noncompliance may provide insights to answering this question.

4. There is an opportunity to return to the data for dominant logic in this study and to chart the evolution of Firebag’s dominant logic in detail. Contributions to the extant dominant logic theory regarding the transfer of dominant logic in internal diversification could be made.

Several propositions are tabled in the dissertation that could be addressed in future studies:

*Proposition 1 (P1): Organizations that interact directly with natural resources and the natural environment contend with unpredictability that adds complexity to high velocity market dynamism.*

*Proposition 2 (P2): Organizations that are entrepreneurial, and characterized by dynamic capabilities for sensing and seizing opportunities, may experience reconfiguration challenges as they take advantage of those opportunities.*

*Proposition 3a (P3a): Informal foundational routines may lead to a non-transfer of capabilities and result in reconfiguration challenges, especially when expanding in high velocity markets.*
Proposition 3b (P3b): Regulated organizations that have informal compliance routines are at greater risk of noncompliance.

Proposition 4 (P4): An entrepreneurial dominant logic characterized by fast thinking and a propensity to move quickly may lead to a negative transfer of capabilities and result in reconfiguration challenges due to limited adjustment and deliberate thinking, especially in high velocity markets that are further complicated by an unpredictable natural environmental.

Proposition 5 (P5): Entrepreneurial organizations having a proactive environmental strategy may have informal foundational compliance routines.

7.7 Conclusion

An argument is made in the extant literature for simple, experiential routines supporting organizational success in high velocity markets (Eisenhardt 2000; Bingham et al., 2010, Obloj et al., 2010). This research study offers a contrary perspective. In this case study, a lack of formalized, explicit routines is directly related to reconfiguration challenges at Suncor Energy. The link between informal processes and noncompliance advances the theoretical assertion that formal processes are required for certain foundational activity classes like compliance. The tension between an entrepreneurial dominant logic that supports dynamic capabilities for sensing and seizing is at odds with the formalized processes required for effective reconfiguration. This tension transcends to sustainably strategy where a proactive environmental strategy at Suncor is decoupled from compliance implementation. In this study, a proactive environmental strategy does not guarantee compliance and formalized routines are required to support the strategy. This finding is particularly compelling given recent environmental failures connected to pipelines and offshore drilling.
At Suncor Energy, market growth coupled with a prevailing entrepreneurial dominant logic translated to an internal propensity to move quickly to capitalize on positive market dynamics. Suncor is not alone. Investor pressures emphasize accelerated growth for energy firms. Added to that, is an unpredictable and uncertain natural resource and environment. These external pressures encourage organizations to adapt through flexible structures and informal processes. However, as this case demonstrates, there is a need for the formalization of certain foundational routines before extensive and fast growth can successfully materialize. This study supports the argument for sustained growth – for both environmental and economic performance.
APPENDICES

Appendix A: Creative Sentence Project Details
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Appendix C: CFREB Documents
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Appendix I: Alberta Oil Sands Map
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Appendix O: Suncor Organizational Chart
Appendix P: Encana Corporation’s Project Methodology
Appendix Q: Growth Indicators 2000 to 2010
Appendix R: Suncor Regulatory Contraventions
Appendix A: Creative Sentence Project Details

Suncor data was made available via a research project through the International Resource Industries and Sustainability Centre (IRIS) at the Haskayne School of Business, University of Calgary. In response to two environmental infractions at its Firebag *in situ* project, Suncor was fined a record $675,000 (Edmonton Journal, April 1, 2009). Rather than simply pay the fine, a creative sentence was established which included funding the IRIS research study of why the infractions occurred and what industry could learn from Suncor’s experience. The punitive dimension of the practice is the result of increased costs as well as potential reputational effects. However, a legal informant in this study noted that sometimes there is a reputational benefit for organizations that commit to learning from their mistakes or failures.

Our research project was led by Dr. Frances Bowen who, at the time, was an Associate Professor at the University of Calgary and the Director of IRIS. She was joined by her PhD student, Jessica Dillabough, in conducting interviews with informants external to Suncor from government, the Crown, the legal sector and other stakeholders including NGOs. Dr. Stephanie Bertels, Assistant Professor in Technology and Operations Management at Simon Fraser University, and I conducted interviews inside the Suncor organization. Our mandate for interviews conducted within Suncor was to determine the root causes of the infractions as well as the initiatives undertaken by Suncor to improve performance and remedy problems defined through their internal assessment of the infractions.

As a group, our deliverables included a teaching case, a two day Knowledge Forum for industry to be held in downtown Calgary, two dissertations and a number of academic papers. The two day Knowledge Forum was held on March 21*st* and 22*nd* 2011 at the Calgary Chamber of Commerce. Approximately one hundred industry representatives attended the first day to
hear about the root causes of the infractions, associated learnings and interaction between industry and the regulator. On the second day, a workshop with representatives from industry and government was held to delve further into some of the environmental compliance themes raised on day one. The teaching case was written by Dr. Bowen, Dr. Bertels and myself and is currently with the Suncor legal team.
Appendix B: Interview Guide

Semi-Structured Interview Guide:
1) Please tell me about your role in the organization.
2) Please tell me about how your role relates to environmental compliance generally within the organization.
3) Please think of a particular compliance issue and describe your role in dealing with that issue.
4) Who do you talk to about compliance issues?
5) Who comes to see you regarding compliance issues?
6) What are your impressions of the attitude of Suncor’s senior management regarding environmental compliance?
7) What are your impressions of the attitude of Suncor’s employees regarding environmental compliance?
8) What do I need to know to understand how environmental compliance is handled on an everyday basis in this organization?
9) Who else should I be talking to understand environmental compliance in this organization?
Appendix C: CFREB Documents

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<td><strong>Appendix C:</strong> CFREB Documents</td>
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<td>Frances E Bowen</td>
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<td><strong>Department/Faculty Haskayne School of Business</strong></td>
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<td><strong>E-mail Address</strong></td>
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<tr>
<td><a href="mailto:fbowen@ucalgary.ca">fbowen@ucalgary.ca</a></td>
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If you are a student, include your supervisor's name and email address here.

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<th>2. <strong>Other Participants:</strong> If another person is involved in the project, please provide their name, department or other details as required to identify them. Use an attachment, if necessary</th>
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<td>Stephanie Bertels, Simon Fraser University</td>
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<td>Regulatory Compliance Project</td>
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<td>3.2 Have you commenced this research? [ ] Yes When did it commence? Date: September 2009</td>
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<td>[ ] No If no, why not (attach)</td>
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<td>3.3 Is the study completely closed to all research activity? [ ] Yes When was it closed? Date:</td>
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<td>3.7 Have there been any complaints about the research [ ] Yes [ ] No, if yes, please attach information with details.</td>
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Signature of Applicant: [Signature]

Thank you for submitting your report on the above protocol.

As Chair of the Conjoint Faculties Research Ethics Board, I am pleased to advise you that ethical approval for this proposal has been extended to: __________. Please note that this approval is contingent upon strict adherence to the original protocol. Prior permission must be obtained from the Board for any contemplated modification(s) to the original protocol. An annual progress/final report concerning this study will be required by __________.

Please accept the Board's best wishes for continued success in your research.

Kathleen Oberle, Ph.D.,
Chair, Conjoint Faculties Research Ethics Board

Date: __________
Regulatory Compliance Project Consent to Participate in Research Form

Researchers:
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Haskayne School of Business, University of Calgary

The University of Calgary Conjoint Faculties Research Ethics Board and the Simon Fraser University Office of Research Ethics have approved this research study. Both universities and the members of this research team subscribe to the ethical conduct of research and to the protection at all times of the interests, comfort, and safety of participants. Should you wish to obtain information about your rights as a participant in research, or about the responsibilities of researchers, or if you have any questions, concerns or complaints about the manner in which you were treated in this study, please contact:
At the University of Calgary: At Simon Fraser University:
Russell Burrows, Ethics Resource Officer Dr. Hal Weinberg, Director
Research Services Office Office of Research Ethics
rburrows@ucalgary.ca hal_weinberg@sfu.ca
(403) 220-3782 (778) 782-6593

Your signature on this form or your reply to our email invitation by agreeing or participate will signify that you have received a document which describes the procedures, whether there are possible risks, and benefits of this research study, that you have received an adequate opportunity to consider the information in the documents describing the study, and that you voluntarily agree to participate in the study.

Title of Project: Regulatory Compliance Project
Purpose of the Study:
The goal of this study is to develop insight into the formal and informal aspects of a culture of compliance with environmental regulations. In particular, we will be studying the conditions that led to two environmental infractions at Suncor Energy Inc. On April 2, 2009, Suncor Energy Inc. („Suncor”) was convicted of two offences under Alberta’s Environmental Protection and Enhancement Act. The Crown and Defence Counsel made a joint submission to the Court for a creative sentence to fund this research project on regulatory compliance. This study consists of a set of research, teaching and outreach activities designed to develop organizational learning from the Suncor environmental violations including: (1) understanding the formal and informal processes at Suncor which led to the environmental violations in this case, and (2) informing senior decision-makers in industry and government on best practices and future trends in developing organizational reliability and compliance. We wish to interview participants in order to gain an understanding of the everyday practices designed to support environmental compliance at Suncor and whether adjustments to these practices are needed. Our study participants will include current and past employees of Suncor Energy, representatives from government, non-government organizations (NGO’s), other oil companies, and consultants as appropriate. You have been identified as a person familiar with the case in question or with issues of environmental compliance more generally, and so are invited to participate in this study. The results of the study will be shared with you upon completion, should you so desire.
What Will I be asked to do? You will be asked to participate in a semi-structured interview lasting approximately one hour in length, as well as answer any follow-up clarifications or questions (possibly through phone or email). The interview will be audio recorded and transcribed. We will have some specific questions, but we are generally interested in your views about your role in ensuring environmental compliance. Your participation is voluntary and your choice to participate or not is confidential. You may refuse to participate in the entire study or to answer any follow-up questions. You may also withdraw from the interview at any time, at the time of withdrawal, you will be asked whether the data provided up to that point may still be used in the study. If you complete the introductory interview, we will make use of your data from that interview, however, you have the right to refuse any follow-up questions.

What Type of Personal Information Will Be Collected?
While this project stems from environmental infractions at Suncor, the research is not intended to be punitive nor will we be trying to assign blame. The goal of the research is to learn from the infractions and to develop best practices to prevent future infractions. In presenting our findings, Suncor will be named as an organization, however, individual’s names and any personal identifying information will be kept confidential. We will not refer to individuals by name, however, we may make reference to a general role within the organization. Participation will also be kept confidential from Suncor personnel. However, please note that while we will make our best effort to ensure your confidentiality, complete confidentiality cannot be guaranteed. Once transcribed, all participants will be provided with the opportunity to review their own transcripts for accuracy. The period of review will be limited to two weeks.

Are there Risks or Benefits if I Participate?
As noted previously, we will not refer to individuals by name; however, we may make reference to a general role within the organization. Based on this, there is a risk that someone may attribute comments back to you or to people within your role. The overall risk of the project has been deemed minimal. This project is a rare opportunity for society to learn from an organizational failure. We will use this learning to develop best practices for ensuring future environmental compliance, and widely communicate our findings to the public through the following set of outputs:
1. A two-day Knowledge Forum in Calgary to engage managers, regulators and NGOs in a conversation about learning from this and other violations, and global best practices for environmental compliance;
2. Public Seminars held in Calgary and Fort McMurray, briefings on the International Resource Industries and Sustainability Centre (IRIS) website at the Haskayne School of Business at the University of Calgary and a press release to inform the Albertan public both about our project’s findings and the creative sentencing process;
3. A teaching case for use in university business school programs both in Calgary and beyond to educate future industry employees on the organizational dimensions of compliance;
4. Publicly available research papers and PhD theses contributing our learning from this case in Alberta to the global academic community.

What Happens to the Information I Provide?
Only the research team assigned to this project will be allowed to see or hear any of the answers to the questions or the interview tape. The transcripts and recordings will be stored on a password protected computer and any proprietary data will be kept in a locked cabinet in the IRIS office at the University of Calgary, accessible only by the research team. All electronic data will be stored on a password protected site hosted by the Faculty of Business at Simon Fraser University. Access to both the hard-copy or electronic files will be restricted to members of the immediate research team. We will not publish identifiable records or use them for teaching or any other purposes. These records will be retained for 3 years. At that time, we will remove or “black-out” the names and identifying information regarding all of the participants, though the principle investigators will continue to keep the records until we have no further scholarly interest in the topic. These files will continue to be stored in a locked cabinet or, in the
case of electronic data, in password protected files until they are unnecessary for future analysis. At that time, they will be destroyed.
You will also be given two weeks to review the information you have provided before inclusion in the study. We will include any of your revisions in our research. If no revisions are received within the two week time period the information provided will be taken as approved.

Questions/Concerns:
If you wish to obtain copies of the results of this study, upon its completion or you have any further questions or want clarification regarding this research and/or your participation, please contact:

Dr. Frances Bowen,
Strategy and Global Management, Haskayne School of Business
403-220-6723, frances.bowen@haskayne.ucalgary.ca
If you have any concerns about the way you’ve been treated as a participant, please contact:
At the University of Calgary: At Simon Fraser University:
Russell Burrows, Ethics Resource Officer Dr. Hal Weinberg, Director
Research Services Office Office of Research Ethics
rburrows@ucalgary.ca hal_weinberg@sfu.ca
(403) 220-3782 (778) 782-6593

A copy of this consent form has been given to you to keep for your records and reference. Having been asked to participate in the research study named above, I understand the risks and contributions of my participation in this study and agree to participate. In lieu of a signature, you may also send an email indicating that you have read the consent form and agree to participate in the study.

Signature:_____________________________________________ Date: _______________
Appendix D: Court Excerpts

From: Provincial Court of Alberta, Criminal Division, Agreed Statement of Facts, April 2009

A. Summary of Charges
1. Suncor Energy Inc. ("Suncor") stands charged that:
   Count 2: On or between the 1st day of December, 2003, and the 20th day of July, 2006, both dates inclusive, at or near Fort McMurray in the Province of Alberta did contravene a term or condition of an approval: to wit Approval No. 80105-00-01, section 4.2.6 which states: The approval holder shall ensure that all produced water tanks are connected to the vapour recovery system and did commit an offence contrary to section 227(e) of the Environmental Protection and Enhancement Act, evidence of the offence having first time come to the attention of the Director on July 20, 2006.
   Count 4: On or between the 7th day of July, 2005, and the 24th day of August, 2005, both dates inclusive, at or near Fort McMurray in the Province of Alberta did fail to provide information required under the Act: to wit that produced water tanks were not connected to the vapour recovery system and did thereby commit an offence contrary to s. 227(c) of the Environmental Protection Enhancement Act evidence of the offence having first time come to the attention of the Director on July 20, 2006.

Excerpt From: Proceedings (Sentence Hearing) Provincial Court of Alberta; Her Majesty the Queen v. Suncor Energy Inc., No. 080153158P103048 – 090, Official Transcript

Crown: We’re not here before you today because these particular contraventions caused a tremendous amount of environmental harm. Indeed, there is no evidence that there was any discernible environmental harm connected to these contraventions. The reasons we are here is because these are the kinds of contraventions that undermine our system of environmental regulation….

In this particular case, you’ve got a proponent who had no specific system to make sure that the – what was in the application matched what was built, and the – what was in the approval matched what was actually constructed. So, the regulator relies on the proponent, but if the proponent has no system to make sure they do what they’re required to do, in – in our submission it tend to -- to undermine that system….

The research project involves researching the organizational processes that led to this contravention by Suncor. And we know that there – that there was no specific system in place to prevent this contravention, but I’m not sure that we’ve got a good answer as to why organizationally this happened.

Suncor: Even though this started as an innocent omission, it did point to a flaw in the system; that it wasn’t captured….

The problem that resulted in the charges before the court was essentially a corporation decision making and communication issue.
Appendix E: Coding Categorization

Table I: Code Categorization Rationale

<table>
<thead>
<tr>
<th>Atlas.ti Codes (number)</th>
<th>Description</th>
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<tbody>
<tr>
<td>152</td>
<td>Level 1 codes</td>
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<tr>
<td>12</td>
<td>Out of Scope</td>
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<tr>
<td>140</td>
<td>Codes in Scope</td>
</tr>
<tr>
<td>55</td>
<td>Low Frequency and Unrelated to Conceptual Model</td>
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<tr>
<td>85</td>
<td>Codes in Scope and Relevant and Linked to 13 Categories</td>
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</table>

Table II: Code Categorization Rationale

<table>
<thead>
<tr>
<th>13 Initial Categories</th>
<th>Category Reconciliation</th>
<th>10 Adjusted/Reduced Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Context</td>
<td>Context</td>
<td>Context</td>
</tr>
<tr>
<td>2. Dominant Logic (DL)</td>
<td>Distance, Dominant Logic</td>
<td>Dominant Logic</td>
</tr>
<tr>
<td>3. Misc</td>
<td>Statistics and Quote</td>
<td>Statistics and Quote</td>
</tr>
<tr>
<td>4. Outcome</td>
<td>Outcome</td>
<td>Outcome</td>
</tr>
<tr>
<td>5. Pace</td>
<td>Context</td>
<td>Context</td>
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<tr>
<td>6. People</td>
<td>People</td>
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</tr>
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<td>7. Process</td>
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<td>13. Transfer</td>
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</table>

Note about Distance: Initially, distance was maintained as a Level 1 code but through further analysis was found to be an attribute of Firebag dominant logic.
Table III: The link between lower level Atlas.ti codes and Data Tables 4, 7, 8, 9 and 10 in Chapter 5

<table>
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<tr>
<th>Dissertation Table Variables</th>
<th>Associated Atlas.ti Data Analysis Code(s)</th>
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<tr>
<td><strong>Table 4 Context</strong></td>
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<td>Dynamic</td>
<td>Context: Investors</td>
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<tr>
<td>Increasing Number of Players</td>
<td>Context: Industry</td>
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<td>Investor Pressure</td>
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<tr>
<td>Aggressive Growth</td>
<td>Context: Pace</td>
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<tr>
<td><em>Pace</em></td>
<td>Context: Scale, Size</td>
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<tr>
<td>Fast</td>
<td>Context: Reservoir, Complexity</td>
</tr>
<tr>
<td>Low Munificence</td>
<td>Context: Technology</td>
</tr>
<tr>
<td>Lack of process</td>
<td>Context: Society</td>
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<tr>
<td><em>Scale</em></td>
<td>Context: Regulations, Regulator, Complexity</td>
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<td>Lack of Experience</td>
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<td><em>Natural Environment</em></td>
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<td>Unpredictable Reservoir</td>
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<tr>
<td>Risk</td>
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<td>Complexity</td>
<td></td>
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<tr>
<td><em>Technology</em></td>
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<td>Associated quotes used to inform the study overall</td>
<td>Context: Reconfiguration</td>
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</table>

| **Table 7 – Tacit Routines** |                                        |
| Engineering and Design Knowledge | Transfer: Negative Transfer       |
| Reservoir Knowledge            | Transfer: Negative Transfer       |
| Regulatory Support             | Transfer: Negative Transfer       |
| Regulatory Knowledge           | Transfer: Negative Transfer       |
| People                         | People                             |
| Negative Transfer              | Transfer: Negative Transfer       |

| **Table 7 – Explicit Routines** |                                        |
| Regulatory Relationship        | Process: Processes, Management Processes |
| Project Design                 | Transfer: Non Transfer             |
| Regulatory processes           | Transfer: Non Transfer             |
| Firebag Operations             | Transfer: Non Transfer             |
| People                         | Process: Operational, Safety      |
| People                         | People                             |
Non Transfer | Transfer: Non Transfer
---|---
**Table 8 – Routine Patterns**
- Regulatory Application Review Process
- MOC Process
- Project Integration
- Project Execution
- Regulatory Approval Review
- Audit
- Firebag Operations
- Pattern – informal, outsourced, suspended

<table>
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<tr>
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<tr>
<td>Process:</td>
<td>Consistency, Execution, Formalization, In Person,</td>
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</table>

**Outcome**

**Table 9 – Suncor Oil Sands Mine Dominant Logic**
- Entrepreneurial - flexible, growth
- Fast Thinking
- Fast Paced
- Structure - Decentralized
- Priority – Cost and Schedule
- Compliance

| DL: | Culture, discipline, DL Suncor, dominant logic, Oil Sands Focus, don’t know what don’t know |
| DL: | silos, bureaucracy; Structure |
| DL: | Cost schedule compliance; Process: Priorities |
| Process: | compliance processes, reporting; Sustainability |

**Table 10 – Firebag Dominant Logic**
- Exploration R&D
- Distance
- Oil Sands Mining

| DL: | DL Firebag, dominant logic, learn by doing, |
| Process: | Piloting |
| Distance | |
| Oil Sands Focus | |
The following is raw coding data from Excel that supports the above Tables:

Total number of directed open codes: 152
Out of scope: 12
Low frequency: 55
Codes used in Data Analysis: 85

**Categories**

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IRIS Executive Briefing

Lessons for Environmental Regulatory Compliance

Suncor’s Creative Sentence – The Firebag Case

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Jessica Dillabough
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Briefing # 11-01

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The Project

In April of 2009, Alberta’s Provincial Court fined Suncor Energy Inc $675,000 for two infractions at their Firebag in-situ facility. The company had failed to install pollution control equipment promised in the application for approval, and failed to bring the missing equipment to the attention of Alberta Environment (AENV) in a timely manner. The penalty included a creative sentence to fund and cooperate with a research project on regulatory compliance at the Haskayne School of Business, the University of Calgary and in collaboration with the Beedie School of Business, Simon Fraser University. The facts of the case had already been presented to the court. The project focused instead on research, teaching and outreach activities designed to engage industry, regulators and non-government organizations in a conversation about learning from these infractions. The project presented an unusual opportunity to improve regulatory compliance in the oil and gas industry in general.

The project team reviewed documents and conducted close to 70 interviews with Suncor personnel, regulators and industry participants. More than 40 interviews took place inside the Suncor organization. In parallel, the team conducted a major systematic review of the academic and practitioner knowledge on developing organizational cultures to support compliance and sustainability.

This briefing reviews the infractions, outlines our findings regarding the root causes and identifies potential issues for ensuring compliance across the industry. These issues will be discussed in more detail in a working session between industry and regulators.

The Infractions

The infractions occurred at Suncor’s Firebag facility, which uses steam assisted gravity drainage (SAGD) technology to recover bitumen. Suncor had first applied SAGD technology at a pilot plant in Burnt Lake in 1997. In 1999, Suncor began work on the design of the Firebag project. At the time, there were no other commercial SAGD operations in the Athabasca area.

In 2000, Suncor made an application for approval of the Firebag in-situ project to AENV and the former Alberta Energy and Utilities Board (EUB)—now the Energy Resources and Conservation Board (ERCB). The original design for the project included vapour recovery units (VRUs) for the produced water tanks to capture hydrocarbon and other air emissions. As the design progressed, these particular pieces of emissions control equipment were removed from the design drawings, having been deemed unnecessary for the produced water tanks. The plant at Burnt Lake did not experience issues with respect to hydrogen sulphide emissions and did not make use of vapour recovery units (VRUs) to capture emissions on its produced water tanks.

However, these design changes were not effectively communicated to those in the organization responsible for obtaining regulatory approvals and the application for approval was prepared based on the original design. A formalized review process was not executed by Suncor prior to submission, with the end result that the equipment was a requirement in the application but was not built into the asset.

Operations began in 2003, but during the handover of the asset at project completion Suncor did not conduct a compliance audit to ensure that the project as-built met the conditions of the approval. About two years after the December 2003 startup, Suncor started experiencing odour problems as a result of hydrogen sulphide
emissions. Suncor undertook site monitoring, including monitoring of the produced water tanks. Yet, according to the statement of facts, they did not appreciate that the produced water tanks were obliged to have VRUs installed pursuant to the approval.

On July 7, 2005, AENV conducted a periodic inspection, which included a tour of the facility and review of a number of specific provisions of the approval. Among other things, the site inspection report stated that all produced water tanks were connected to VRUs as required in the approval. Suncor acknowledged receipt of the report but failed to advise the inspector that the VRUs were not in place.

In June of 2006, a new Environment, Health and Safety Manager was appointed to the Firebag facility. On July 20, 2006 in the course of reviewing the approval requirements, the missing equipment was noted. In a letter dated July 27, 2006, the non-compliance was reported to AENV. Suncor then undertook both internal and independent reviews of its environmental management systems and initiated engineering work to address the missing equipment.

**Root Cause Identification**

The root causes underlying these infractions at Suncor are briefly outlined below:

- There were weak controls over the management of change process during the design phase; in particular, there was a lack of communication with the regulatory approvals group.
- Suncor failed to adequately track the extent and detail of their regulatory commitments. There were weak controls and documentation around the commitments outlined in the approval and a lack of verification at the handover of the asset at project completion – there was no full audit conducted to ensure that the project as-built met the conditions of the approval.
- There was a weak culture of compliance at the facility and to some extent, throughout Suncor. Suncor was an entrepreneurial firm with few standardized processes. There was a “learn by doing” culture that rewarded firefighting rather than planning and prevention. This culture created signals that production was paramount, and de-emphasized incentives for thorough regulatory compliance within the company. A commitment to operational discipline and compliance was lacking as the project became operational.
- There was a lack of expertise. Constraints on the availability of qualified personnel coupled with the remoteness of Firebag’s location made hiring and retaining experienced and competent personnel a challenge. The facility was initially staffed by transferring individuals from mining operations, hiring individuals with SAGD experience from other companies, and using third party contractors. Because of the uniqueness of each in-situ project, the capabilities and experiences of some employees were not as transferrable as anticipated.
- The facility was isolated structurally within the organization. When Firebag was still in its research and development phase, it was structurally organized under Suncor’s Natural Gas business. This made sense in that the new technology could innovatively be pursued without being constrained by the logic of the oil sands business. However, in the transition from R&D to commercialization there was now a requirement for operational capabilities. The result was a pilot project mentality at the site.

Finally, there were two other contextual factors affecting Suncor as well as other industry players at the time.

*New Technology:* SAGD technology was new to Suncor and was relatively new to the industry. Regulations were being developed and there was a lack of information sharing or collaboration between industry players. Any company reconfiguring into new technologies is faced with similar challenges regarding unknown
or unanticipated issues. However, Suncor’s challenges were exacerbated by a drive to take the project commercial quickly.

_The Pace of Industry and Corporate Growth:_ As this project moved through the design-build phase, oil prices were beginning their meteoric rise. Pressure to go commercial was intense. Up front project planning was compressed by Suncor because of a need to move quickly to capitalize on the perceived opportunities. This haste contributed to a lack of operational discipline and, by extension, the absence of a culture of compliance.

**Questions Raised by the Case**

It’s important to remember that companies operating with new technologies in high growth industries are often in innovation mode, which may not be conducive to compliance. Compliance needs predictability, codification, verification, and attention to detail. Yet, the pace of growth and the desire to both reduce the environmental footprint and improve the efficiency of extraction creates a dynamic environment. A core issue for Suncor was that despite having an external reputation for sustainability, they needed stronger capabilities for compliance—including both business processes and a culture that supported compliance. These findings lead to the following questions for the industry as a whole:

- How do you determine whether a company has the capability to comply?
- How can you support companies that need to develop these capabilities?
- How do you keep companies focused on compliance?

**Useful Resources**


For more on creating a culture of compliance visit: www.nbs.net/knowledge/culture

**About IRIS:**

Established in 1994, IRIS: The International Resource Industries and Sustainability Centre, brings together expertise from the Haskayne School of Business and the Institute for Sustainable Energy, Environment and Economy (ISEEE) at the University of Calgary on sustainable resource development.
<table>
<thead>
<tr>
<th>Conference Name</th>
<th>Conference Date &amp; Location</th>
<th>Paper Presented</th>
</tr>
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<tr>
<td>International Association for Business and Society</td>
<td>March 22, 2010 Banff, Alberta</td>
<td>Suncor and its Firebag project: A case for sustained growth</td>
</tr>
<tr>
<td>Society of Petroleum Engineers</td>
<td>October, 2010 Calgary, Alberta</td>
<td>Lessons for Environmental Compliance from One Company’s Creative Sentencing Case</td>
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<tr>
<td>Knowledge Forum – Developing a Culture of Compliance: Lessons for Environmental Regulatory Compliance from the Suncor Firebag case</td>
<td>March 21, 2011 Calgary Chamber of Commerce</td>
<td>Root Causes of the Suncor Firebag Case</td>
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<tr>
<td>International Sustainable Development Research Conference</td>
<td>May 6 – 8, 2011 New York, NY</td>
<td>Reconfiguring for Sustainability: Challenges at Suncor Energy</td>
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<tr>
<td>SMS CK Prahalad Special Conference</td>
<td>June 10 – 12, 2011 San Diego, California</td>
<td>Dominant Logic and Failure in Related Diversification: The Suncor Story</td>
</tr>
<tr>
<td>Global Energy Master of Business Administration</td>
<td>April 26, 2012 Fort McMurray, Alberta</td>
<td>Delivering on Operational Excellence: Developing a Culture of Environmental Compliance at Suncor Energy’s Firebag Facility</td>
</tr>
</tbody>
</table>
## Appendix H: External to Suncor Interviews – Validity of Outcomes

<table>
<thead>
<tr>
<th>Code</th>
<th>Frequency</th>
<th>Representative Quote</th>
<th>Construct</th>
</tr>
</thead>
<tbody>
<tr>
<td>Root Cause</td>
<td>16</td>
<td>• There’s no evidence of any particular environmental harms in this case, but the issue was integrity of the regulatory system. So if you promise to do something you’ve got to do it.</td>
<td>Integrity of the regulatory system.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• So that I think is, that’s really the root cause is that this corporation didn’t view what this, you know, this process as anything of significance or importance. And so, not surprisingly, if you talk to anybody, when something changes over here, it doesn’t get caught over there. I seem to recall that Suncor delegated by way of sub-contract a certain procedure and Suncor was at fault because it didn’t oversee or didn’t have a mechanism in place to check it.</td>
<td>Compliance Procedures</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• I think the companies are largely pretty good corporate citizens. They’re huge companies though and they have huge areas that they can be non-compliant in and often non-compliance issues are down at some foo-foo valve level where the corporate structure of Suncor or Syncrude or any of those big giant companies wouldn’t have any knowledge of right? So it’s a matter of improving those processes within their own company reporting lines to make sure that things are done properly. The people that were operating the facility out there they didn’t have a compliance assurance to ensure that they were in fact meeting the requirements.</td>
<td>Compliance Processes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• That to me was the core root of why things went off the rail for Suncor at Firebag is the lack of a proper compliance assurance you know program to make sure that they were meeting the requirements that they needed to meet.</td>
<td>Scale of organization and expectation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• It appears they didn’t have proper compliance assurance in place.</td>
<td>Unintended noncompliance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• We had enough evidence to support the hypothesis that they should have done better, they should have known.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• You’re a major oil company; you have a responsibility to do a better job on your diligence than that.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Suncor is a big, sophisticated company. They’ve got to have in place you know compliance assurance things, programs. And you know my opinion they dropped the ball on that</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• I truly believe that. Like these people live there, they work there. They want to pollute the air, they want to pollute the water on purpose, say hell with that I’m just doing this? Not very often.</td>
<td></td>
</tr>
<tr>
<td>Non Disclosure</td>
<td>11, 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------</td>
<td>------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• I don’t know what’s the words I’m looking for; the environment departments of the major companies have to have more jazz within the company.</td>
<td>Organizational Structure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• So Alberta Environment doesn’t babysit your application process. What we do is if you tell us you’re going to do this and you’re going to build a plant based on these specifications we will approve it based on those specifications, approve your plan, right, and your plant.</td>
<td>Self Regulation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• You know I think related to that too is what we see is this reliance on sort of self-reporting and self-monitoring.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Our practice in the province is that largely regulated industry reports themselves, self-reporting and you report all of your incidence that are in the reportable category, which is a pretty broad, pretty broad web there and the regulators decide on the severity of the incident whether it then goes to the next step.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• If you’re in non-compliance on something and you know that come and tell us and work with us in terms of a solution. Don’t let us find out on our own. We found out that Suncor was having problems largely on our own.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H2S</td>
<td>5,4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• When Suncor said we’ll do zero we said are you sure? Now I’m being, you know I can’t tell you the meeting, I can’t tell you – but you know we did have discussions around here you know when this all happened and we told Suncor, by the way, you know you guys put that in your application, we challenged you on whether you really wanted that to be your threshold and they said yes</td>
<td>Upfront Planning (Suncor)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Well you know the H2S there I don’t think was of any manner you know lethal or anything like that but it sure in hell stinks right?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sustainability Dominant Logic</td>
<td>16, 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Interviewer: Suncor would be viewed as more sort of environmentally progressive and Imperial is more… Informant: Not in my books but okay. Interesting.</td>
<td>Tension between Sustainability Strategy and Compliance Implementation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• It drives me nuts when I read you know the full page ads from Canadian Association of Petroleum Producers and about you know all the great things we’re doing. And I’m going you guys aren’t living up to – somehow could you have a corporate culture that said we’re going to meet this you know?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
• If you were to get inside the heads of all these towers over here you’d probably find different attitudes within them too just to – but I think a lot of it does come to the bottom line.

• I mean companies have to be proactive, we need to be proactive and you know we can’t have a cop on every corner right.

• Focus is a production/output so EMS goes to corner of desk

---

<table>
<thead>
<tr>
<th>Compliance</th>
<th>18, 12</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Compliance costs money.</td>
<td></td>
</tr>
<tr>
<td>• Better technologies and they can’t say well, we’re not going to adopt this new technology even though it’s much better you know, much lower risk to the environment or to people or whatever.</td>
<td></td>
</tr>
<tr>
<td>• You will be penalized for what might have happened not just what did happen. The whole purpose of regulatory offenses is to prevent the larger calamity. The fact that you offended the regulation, company, and only created a wee calamity doesn’t mean you’re not going to be penalized for having put us at risk for the large calamity</td>
<td></td>
</tr>
<tr>
<td>• My message would be live up to your commitments because I think that’s what, where the fall-down is because they know what’s in those ERCB approvals as well.</td>
<td></td>
</tr>
<tr>
<td>• And then from the industry side I think it’s about having some very clear documentation about how you’re going to address those things, to have contingency plans built in so you can take care of problems as they arise, to do a lot of the things that they already have in place.</td>
<td></td>
</tr>
<tr>
<td>• Your objective isn't just to get into compliance with whatever the standard is, but - but your objective would be to do the best that you can and to make the world a better place.</td>
<td></td>
</tr>
<tr>
<td>• Companies should be proactive about compliance.</td>
<td></td>
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<table>
<thead>
<tr>
<th>Suncor Complexity</th>
<th>5,2</th>
</tr>
</thead>
<tbody>
<tr>
<td>• So there may be more non-compliance again because of the complexity and size of the operations and because of the time they’ve been there.</td>
<td></td>
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---

<table>
<thead>
<tr>
<th>Economic priority</th>
<th>Proactive Environmental Strategy</th>
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<tbody>
<tr>
<td>Cost of Compliance</td>
<td>Failure</td>
</tr>
<tr>
<td>Compliance Execution Failure</td>
<td>Adjustment</td>
</tr>
<tr>
<td>Proactive</td>
<td></td>
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| Organizational size and complexity |
|---|---|
So process-wise it’s not simple. From the design and construction process it wasn’t simple. Even sometimes interaction between the different regulatory bodies wasn’t simple.

So back in the ’70s there was few hard rules and few, if any, resources to follow up and do the whole – it was more like let’s just all work together kind of thing and we’ll get there right?
Appendix I: Alberta Oil Sands Map

Source: ags.gov.ab.ca 2011
Appendix J: Pictures of Oil Sands Mining Equipment
Appendix K: SAGD Oil Sands Operation

Source: www.Suncor.com 2010
Appendix L: Map of Alberta Oil Sands Projects 2008 and 2011
Appendix M: Suncor Financials

Suncor (SU.TO) Historical Share Price
(CAD close price adjusted for dividends and splits)

Currency in CAD

Produced from yahoofinance.com data
FINANCIAL HIGHLIGHTS

Production (thousands of barrels of oil equivalent per day)

<table>
<thead>
<tr>
<th>Year</th>
<th>Natural Gas</th>
<th>Oil Sands</th>
<th>Total</th>
</tr>
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<tbody>
<tr>
<td>04</td>
<td>36.8</td>
<td>226.5</td>
<td>263.3</td>
</tr>
<tr>
<td>05</td>
<td>34.8</td>
<td>171.3</td>
<td>206.1</td>
</tr>
<tr>
<td>06</td>
<td>34.8</td>
<td>260.0</td>
<td>294.8</td>
</tr>
<tr>
<td>07</td>
<td>35.8</td>
<td>235.6</td>
<td>271.4</td>
</tr>
<tr>
<td>08</td>
<td>36.7</td>
<td>228.0</td>
<td>264.7</td>
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</table>

Cash Flow from Operations(1)/Net Debt ($ millions)

<table>
<thead>
<tr>
<th>Year</th>
<th>Cash Flow from Operations</th>
<th>Net Debt</th>
</tr>
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<tbody>
<tr>
<td>04</td>
<td>2 055</td>
<td>2 109</td>
</tr>
<tr>
<td>05</td>
<td>2 627</td>
<td>2 868</td>
</tr>
<tr>
<td>06</td>
<td>4 524</td>
<td>1 849</td>
</tr>
<tr>
<td>07</td>
<td>4 009</td>
<td>3 248</td>
</tr>
<tr>
<td>08</td>
<td>4 463</td>
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Net Earnings ($ millions)

<table>
<thead>
<tr>
<th>Year</th>
<th>04</th>
<th>05</th>
<th>06</th>
<th>07</th>
<th>08</th>
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<tbody>
<tr>
<td></td>
<td>1 104</td>
<td>1 254</td>
<td>2 969</td>
<td>2 983</td>
<td>2 137</td>
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</table>

Return on Capital Employed (per cent)

<table>
<thead>
<tr>
<th>Year</th>
<th>ROCE(1)</th>
<th>ROCE(2)</th>
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<tr>
<td>04</td>
<td>16.4</td>
<td>19.4</td>
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<tr>
<td>05</td>
<td>15.4</td>
<td>21.2</td>
</tr>
<tr>
<td>06</td>
<td>30.1</td>
<td>40.0</td>
</tr>
<tr>
<td>07</td>
<td>21.5</td>
<td>29.3</td>
</tr>
<tr>
<td>08</td>
<td>16.3</td>
<td>22.5</td>
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Other Key Indicators

Year Ended December 31 ($ millions)

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<tbody>
<tr>
<td>Revenues</td>
<td>30 089</td>
<td>18 565</td>
<td>16 546</td>
<td>11 781</td>
<td>9 027</td>
</tr>
<tr>
<td>Capital and Exploration expenditures</td>
<td>7 590</td>
<td>5 415</td>
<td>3 613</td>
<td>3 153</td>
<td>18 47</td>
</tr>
<tr>
<td>Total assets</td>
<td>32 528</td>
<td>24 509</td>
<td>18 959</td>
<td>15 335</td>
<td>11 807</td>
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</table>

Dollars per common share

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</thead>
<tbody>
<tr>
<td>Net Earnings attributable to common shareholder – basic</td>
<td>2.29</td>
<td>3.23</td>
<td>3.23</td>
<td>1.37</td>
<td>1.22</td>
</tr>
<tr>
<td>Net Earnings attributable to common shareholders – diluted</td>
<td>2.26</td>
<td>3.17</td>
<td>3.16</td>
<td>1.35</td>
<td>1.20</td>
</tr>
<tr>
<td>Cash flow from operations</td>
<td>4.79</td>
<td>4.35</td>
<td>4.93</td>
<td>2.88</td>
<td>2.27</td>
</tr>
<tr>
<td>Cash Dividends</td>
<td>0.20</td>
<td>0.19</td>
<td>0.15</td>
<td>0.12</td>
<td>0.115</td>
</tr>
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</table>

Market Price of common stock at December 31 (closing)

<table>
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</tr>
</thead>
<tbody>
<tr>
<td>Toronto Stock Exchange (Cdn$)</td>
<td>23.72</td>
<td>53.96</td>
<td>45.90</td>
<td>36.66</td>
<td>21.20</td>
</tr>
<tr>
<td>New York Stock Exchange (US$)</td>
<td>19.50</td>
<td>54.37</td>
<td>39.46</td>
<td>31.57</td>
<td>17.70</td>
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Key ratios

<table>
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</thead>
<tbody>
<tr>
<td>Total debt to total debt plus shareholder’s equity (%)</td>
<td>35.2</td>
<td>24.3</td>
<td>20.7</td>
<td>33.1</td>
<td>30.9</td>
</tr>
<tr>
<td>Net debt to cash flow from operations (times)</td>
<td>1.6</td>
<td>0.8</td>
<td>0.4</td>
<td>1.1</td>
<td>1.0</td>
</tr>
<tr>
<td>Return on shareholder’s equity (%)</td>
<td>16.2</td>
<td>28.4</td>
<td>39</td>
<td>22.7</td>
<td>25.1</td>
</tr>
</tbody>
</table>

(1) Non-GAAP measures. See page 40.
(2) Includes capitalized costs related to major projects in progress.
(3) Excludes capitalized costs related to major projects in progress.

Appendix N: Firebag Timeline

In Situ Timeline - Background

VRU Infraction Timeline - Background
Appendix O: Suncor Organizational Chart

CEO

COO

SVP Major Projects

Other SVPs

EVP Oil Sands

VP Firebag Operations

Other VPs: Mining, Extraction and Upgrading

SVP Natural Gas

VP Reservoir and Technology

Other VPs
Appendix P: Encana Corporation’s Project Methodology

Leading N.A. Resource Play Company
Encana Resource Play Execution Methodology

Portfolio changes supported by demonstrated methodology for developing resource plays from the ground up

Resource Play Methodology

- Exploration
- Assemble Land Base
- Pilot
- Understand Technical
- Commercial Demonstration
- Crack Technical Nut
- Commercial Development
- Manufacturing Style
- Play Optimization
- Lookbacks & Learnings

Work With Governments – Engage Stakeholders
Address Infrastructure

“execution excellence & low-cost focus”

Source: www.Encana.com
## Appendix Q: Growth Indicators 2000 to 2010

<table>
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<th></th>
<th>2000</th>
<th>2005</th>
<th>2010</th>
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<tr>
<td><strong>Businesses</strong></td>
<td>4</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td><strong>Number of Employees</strong></td>
<td>3043</td>
<td>5152</td>
<td>12076</td>
</tr>
<tr>
<td><strong>Oil Sands Production (kbpd)</strong></td>
<td>113.9</td>
<td>171</td>
<td>283</td>
</tr>
<tr>
<td><strong>Revenue from Oil Sands ($million)</strong></td>
<td>1336</td>
<td>3965</td>
<td>9423</td>
</tr>
<tr>
<td><strong>Total Revenue ($million)</strong></td>
<td>3388</td>
<td>11086</td>
<td>35220</td>
</tr>
<tr>
<td><strong>Avg Sale Price ($/bbl)</strong></td>
<td>41.29</td>
<td>62.68</td>
<td>71.69</td>
</tr>
<tr>
<td><strong>Cash Flow ($million)</strong></td>
<td>958</td>
<td>2476</td>
<td>6656</td>
</tr>
<tr>
<td><strong>Earnings from Oil Sands Operations ($million)</strong></td>
<td>315</td>
<td>1073</td>
<td>1492</td>
</tr>
<tr>
<td><strong>Total Net Earnings from Operations ($million)</strong></td>
<td>427</td>
<td>1245</td>
<td>2732</td>
</tr>
<tr>
<td><strong>Bitumen Reserves (proved and probable – MMbbls)</strong></td>
<td>2456</td>
<td>5122</td>
<td>2284</td>
</tr>
<tr>
<td><strong>Undeveloped land holdings (million acres)</strong></td>
<td>1.4</td>
<td>0.6</td>
<td>na</td>
</tr>
<tr>
<td><strong>TSX Share Price ($)</strong></td>
<td>38.30</td>
<td>73.32</td>
<td>38.28</td>
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(www.sedar.com)
Appendix R: Suncor Regulatory Contraventions

<table>
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<th>07</th>
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Reproduced from Suncor Energy Inc. Website
2011
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