Achieving Sustained Competitive Advantage for Project-Based Organizations

Case Study on How Best to Prepare for the Future

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Achieving Sustained Competitive Advantage for Project-Based Organizations:

Case Study on How Best to Prepare for the Future

Master Thesis

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In Memoriam
Jan Drost (1952 - 2013)

‘There is no future to share anymore
Thank you for the wonderful memories’

Preface

This report is written to complete the part-time Master of Science Engineering & Policy Analysis at the faculty Technology, Policy and Management of the Delft University of Technology which I started long ago with much enthusiasm, which (despite the long duration) till today has not diminished.

As a trained Mechanical engineer I had worked for almost a decade in IT (which was booming when I started working in the late nineties) when I realized that I had limitations in expanding my perspectives with technological know-how alone. The part-time study Engineering & Policy Analysis at Delft University of Technology is found to be a study that fulfills my needs in business related science & practice. Its central focus is to analyze complex, interdisciplinary problem settings in order to assist decision-making.

Attending part-time studies requires will power, energy, discipline, flexibility, enthusiasm, but above all support from loved ones. As a husband, father, child, and friend I have asked for support and sacrifices in order to do this study. I'm therefore grateful to all of you, especially my dear Kim, Kevin and Ellen.

The research topic is deliberately chosen outside my comfort zone, in order to learn about different aspects of the organization I'm working for and to expand my knowledge and understanding in the realm of business exploration and innovation, subject matter that has always has intrigued me.

It is interesting to see how attending a part-time study in addition to family life, professional work, etc., shows similar dilemmas as with Contextual Vigilance activities (discussed in this research report) especially when it comes to distributing attention between every day's activities which yield a direct reward and that of future oriented activities like studying or preparing for change, which have much less direct and tangible returns. The act of thoughtful balancing between current and future responsibilities is applicable for many of us, which is symbolically illustrated on the cover page.

Last but not least I am grateful to my graduation committee: Bert Enserink, Patrick van der Duin and Jaco Quist for their constructive guidance and understanding.

Bart de Boer

Amersfoort 2014

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Abstract

This report is written to complete the part-time Master of Science Engineering & Policy Analysis (EPA) at the faculty Technology, Policy and Management of the Delft University of Technology. The research has been executed from March 2013 till July 2014.

Many renowned organizations have come and go in past decades because markets in which they once thrived changed. Many factors can play a role why established organizations are slow to understand and react on external changes that create paradigm shifts (also known as game changers). Few organizations managed to survive by adapting new business models and strategies. Even less organizations managed to maximize their opportunities in order to make leaps forward as a result of good response to external change.

Jacobs Nederland b.v., part of the American based Jacobs Engineering Group Inc., is currently not in such turbulent times. However Senior Management feels that the organization is vulnerable to external changes and wonders if this is true and, if so, how she can best prepare herself, hence the title of this research report: "*Achieving Sustained Competitive Advantage for Project-Based Organizations*: *Case Study on How Best to Prepare for the Future".*

At this point knowledge gaps exist at senior management of Jacobs Nederland b.v. (the problem owner) about what vulnerabilities exactly exist, and how to implement measures in the form of a *Contextual Vigilance policy* while attaining core organizational targets: growth, customer relations, and safety, whilst safeguarding a good relationship with shareholders, clients, and her employees.

The problem setting refers to undesired potential future states that may even not occur; it's currently not on the agenda of operational management (which is a good thing for dissertation projects). The problem setting addresses the exploratory skills of the organization to prepare itself ex ante (feed-forward), as illustrated in the example diagram below, whereas the typical modus operandi is to react on ex post (feed-back) outcomes, which inherently have less uncertainty, however also come late. Feed-forward adjusts input before disturbances and/or opportunities have time to affect the system which should yield a leap in competitive advantage compared to those that don't do this timely and/or adequately.

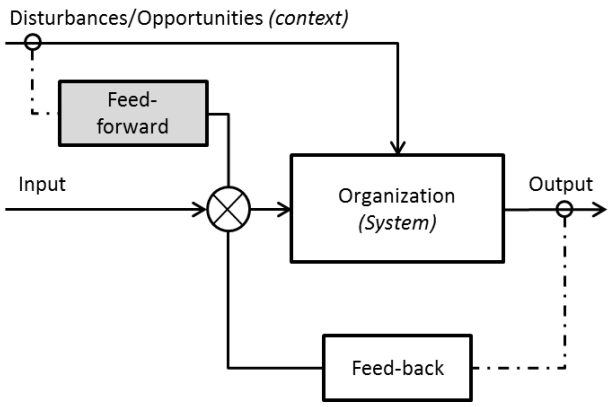

Figure 1, Feed forward and -backward control loop.

This is a universal concept; however organizations struggle in finding an optimum in distributing its resources between ex post and ex ante control. Both require different knowledge and competencies. Feed-forward control requires good system and contextual knowledge,

measurement of disturbances, and ditto decision-making (i.e. vision & leadership). Feed-back control requires good system knowledge, measurement of outputs, and optimization techniques (i.e. analysis & management).

Development of a feed-forward control system can help the problem owner in reducing her vulnerability to external changes, but directly raises the question what method, and scale would be appropriate such that such an undertaking is acceptable for both short term and long term organizational objectives. From an implementer's perspective it is interesting to learn why organizations may fail in appropriating this universal knowledge. What organizational factors are most determining in design & implementation? Is it the market, legislation, technology, organizational characteristics like culture, scale, competencies, history, decision-making, short-term goals, informal structures, uncertainty, stability, competition, partnerships, etc.?

This research elaborates on this problem setting and has used scientific literature, interviews with problem owner, -stakeholders, and -experts as input for analysis and design of policy options by utilizing Systems Analysis as a framework to capture, clarify and rationalize this complex problem setting. The validity of the research outcomes is not validated by organizational experiments or relevant empirical cases because this is considered undesirable and absent respectively. The outcomes have been reviewed with the problem owner, Vice President Operations of Jacobs Nederland b.v. This research is value, or norm based.

This report contributes to current understandings on achieving sustained competitive advantage by utilizing exploratory activities for project-based organizations like Jacobs Nederland b.v. Sustained competitive advantage is about being competitive now and in the future. For ensuring the latter, provisions can be made such that an organization can react to external changes in a timely manner; a process I coin *Contextual Vigilance* in this report. It focuses on achieving long term organizational survival, more specifically on how project-based organizations can define policies that allow preparation for an unknown future without taking too much away from short term operational objectives. It relates to the well-known parable of the goose that laid golden eggs discussed by Stephen Covey (Covey, 2004) where there is a delicate balance between maximizing profit (*Production*) now, versus assurance of tomorrow's profit (*Production Capability*).

This research provides a first insight in using explorative techniques and formats for the benefit of *Contextual Vigilance* at project-based organizations like Jacobs Nederland b.v., which external factors influence policymaking, which policy options are suggested by literature, and reflects current insights and opinions on how these policy options could perform in possible futures by using scenario analyses. Scenario Analysis is typically used to support decision-making on long term technical investments in the public domain using STEEP-related (Social, Technical, Economical, Environmental, and/or Political) policy influencing factors. This research introduces a case study wherein scenario analysis is applied to support organizational decision-making on strategy using organizational relations and -market as factors influencing

policymaking, which is believed to be a contribution to organizational sciences with respect to decision-making and strategy formulation and future oriented studies.

Analysis of interviews and observations revealed that Jacobs Nederland b.v. is vulnerable to contextual changes because of its following characteristics:

- Limited autonomy;
- Conservative industry;
- Few clients, many transactions;
- Labor intensive business model;
- Structured and formalized business activities;
- Discontinuous and separate business activities;
- Target (short term) oriented;
- Self-awareness
- Strong identity.

Literature suggests that firms are vulnerable to change of the dynamic context wherein the firm is operating, when they fail in at least one of three activities: (1) detecting relevant threats and opportunities (sensing), (2) deciding on appropriate business strategy (seizing), and (3) implement change (reconfiguring). The illustration below depicts this chain of activities positioned alongside current operations in its context.

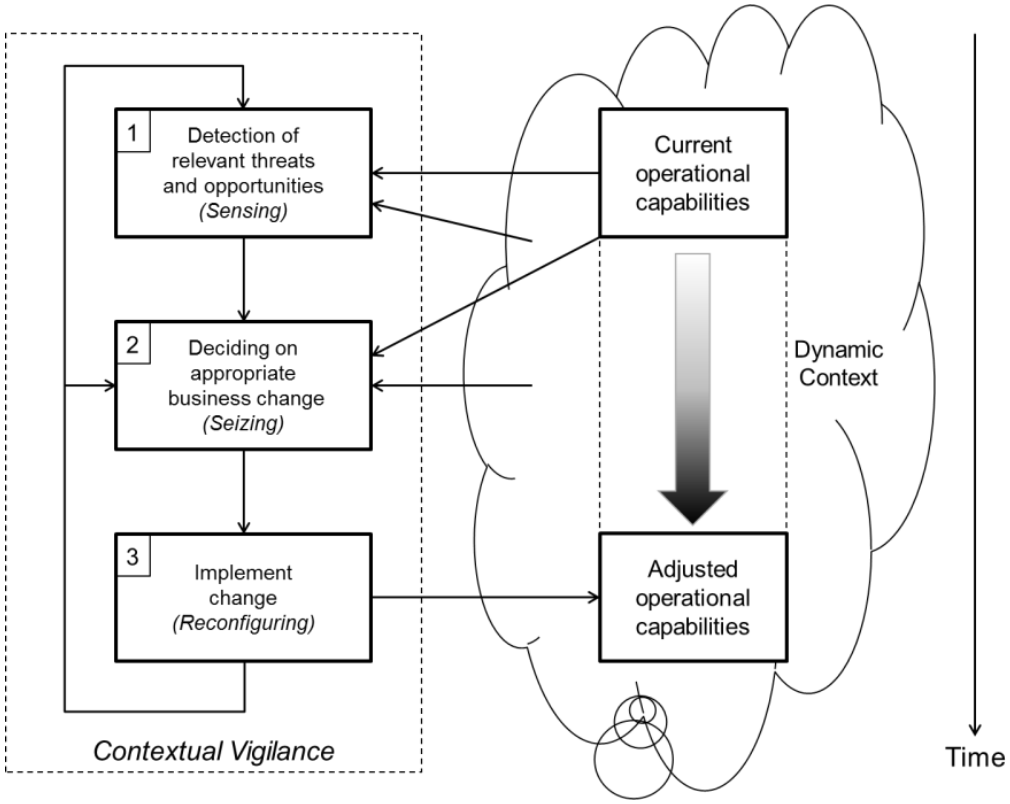

Figure 2, Adjusting operational capabilities in response of changing context, based upon detection, deciding and implementation activities.

To answer the desire to prevent the organization from surprises four candidate (high level) policy options have been compiled from literature research.

1. *Do Nothing*, minimize investments in exploratory activities, and wait for others to define and test answers in case of external game changers. This is the current policy.
2. *Structural Ambidexterity*, construct structurally independent units, each having its own processes, structures, and cultures, but is part of the same organization, i.e. diversification at organizational unit level.
3. *Sequential Ambidexterity*, tilt the organization to allow repositioning/realigning itself in changing context by redefining control mechanisms, -reward systems, and -market interfaces.
4. *Contextual Ambidexterity*, introduce in the existing organizational structure enough room for employees to explore, next to normal exploitation activities, i.e. diversification at individual (employee workplace) level.

The term *ambidexterity* is about being equally skilled in e.g. using both left- and right hands equally. In the context of organizations it refers to an organization's ability to be equally skilled in managing production processes (exploitation) and managing innovation and change (exploration) activities.

These four policy options have different levels of investments, characteristics, and consequences, which are difficult to disentangle and to compare. To support decision-making scenario analysis has been applied, using (1) market cooperation, and (2) control autonomy as influencing external factors to determine how they influence policy outcomes. This revealed mixed results because the four policy options flipped rankings almost per scenario, revealing their sensitivity to these external factors. Most robust policy option in terms of both short and long term criteria, without creating new path dependencies, is found to be *Contextual Ambidexterity*.

Contextual Ambidexterity is, because of its robust performance, low implementation cost, risk, and its complementary character to existing corporate initiatives, found to be the recommended policy option, especially where there is not enough support/certainty to invest in more organized options such as *Structural-* or *Sequential Ambidexterity* that have negative short term and uncertain future performance. *Contextual Ambidexterity* should however not be regarded as a single step and final solution. *Contextual Ambidexterity* does not provide full control for senior management. It merely engages awareness and engagement at workplace level such that the level of *sensing* is raised with relative low investments, not necessarily the level of *seizing* and *reconfiguring*.

Complementary to practicing *Contextual Ambidexterity*, it is recommended that senior management monitors the most influencing external factors *market cooperation* and *control autonomy* and consider switching to *Sequential-* or *Structural Ambidexterity* when external markets split up, depending on the level of control autonomy allowed by Jacobs Corporate.

With respect to implementation of a *Contextual Ambidexterity* policy, it is recommended to expand the curriculum of the existing Inclusion workshops with games that contain externally driven game changing cases and assignments in order to see how well *sensing*, *seizing*, and *reconfiguring* capabilities are available currently. This will provide a low cost first insight into actual state of current knowledge, attitudes and behavior.

The Contextual Vigilance case study learnt that organizational factors like organizational size and the nature of business activities in project-based firms in general have a negative influence on the efficiency of CV policymaking. These factors are however believed to be inherent characteristics that cannot be influenced in order to increase the efficiency of CV policymaking. The organization will continue to grow and continue executing projects as the main means of business activities.

As stated before, the validity of this research is based upon scientific literature and a limited set of interviews, not organizational experiments or empirical cases. This implicates that the research findings are vulnerable and further research is required in order to reduce the influence of opinions and move more towards fact-based research. It is however questionable whether fact-based research will be attainable without costly and risky organizational experiments (or entrepreneurship). As a first step, it is therefore recommended to organize workshops with current interviewees and their lower management to discuss and review the pictured scenarios and policy options in a game based setting in order to test and refine scores for better validation and broader engagement in the organization. A first step towards Contextual Ambidexterity!

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1 Introduction

This chapter elaborates on the background of the problem owner before arriving at her problem setting and the forthcoming research objectives.

1.1 Background

Jacobs Nederland b.v. (JNL) is a technical service provider for delivering Engineering, Procurement, and Construction (EPC) services in the Oil & Gas, Bio Pharma, Chemical, and Energy sector. JNL is a subsidiary of Jacobs Engineering Group Inc. which is one of the world's largest and most diverse providers of technical, professional, and construction services. Jacobs serves a broad range of companies and organizations, including industrial, commercial, and government clients across multiple markets and geographies. Global network includes more than 250 offices in more than 28 countries, with operations in North America, South America, Europe, the Middle East, China, India, Australia, Africa, and Asia. Jacobs was founded in 1947, and has its headquarters is in Pasadena, California USA. From the total of an excess of 60.000 employees worldwide, about 1.500 work for JNL. Work at JNL is predominantly executed for local subsidiaries of globally operating clients.

Jacobs makes its revenue by selling and delivering added value to clients in terms of technical knowledge, -goods, and -management. Jacobs distinguishes itself in the global markets by focusing on both its technical & financial reputation and long-term customer relationships. Its technical reputation is strongly based upon qualified and knowledgeable personnel whereas its financial reputation relies on working under Cost-Plus-Fee (CPF) contract forms and maintaining low General and Administrative expenses (G&A). Jacobs Engineering Inc. is a publicly traded company (NYSE:JEC). It has a commitment towards her stockholders to generate a yearly 15% Earnings per Share (EPS). This commitment is, next to safety, Jacob's most important performance indicator.

1.1.1 History of Jacobs Nederland b.v.

The roots of Jacobs Nederland b.v. lie in multiple Dutch organizations and goes back as far as 1874 when it was started as Geveke, a trading firm in tools and materiel for railroads (Comprimo B.V., 1974). In 1904, as the result of a partnership, the name is changed to Technisch bureau Geveke & Co which by then had diversified operations to a number of markets, including cooling machinery, notably resulting in 1909 in the world first artificial ice skating ring in Berlin, Germany. Cooling was also used to extract benzene and toluene from petroleum which enforced the relationship with the refinery industry. This became a big market which, in 1924, resulted in a split-off of this department into a subsidiary N.V. Comprimo, a name which is derived from the Dutch word 'comprimeren' (which means '*to compress'*, an essential step in cooling processes) (Rooij & Homburg, 2002), The name is still present in today's industry through Jacobs Comprimo ® Sulfur solutions. Dutch firms Geveke and Werkspoor, and the German firms MAN, Linde, and Borsig were the shareholders. Till the

second world war considerable attention was devoted to the design and fabrication of units for the treatment of oil derivatives in accordance with the patented Edeleanu process (Brandt, 1930), which, through Borsig, Comprimo was licensed to use.

Contemporary history starts in the aftermath of world war two where the Dutch industry and in particular the petrochemical industry needed to be rebuild and expanded in order to play a role in the new oil-related global markets. Remaining German shareholders were bought off and the attention was directed at the Western international market. Because of the strategic location of the Rotterdam harbor with connection to major west European rivers, many international operating companies such as Shell, Esso, Aramco, NAM (Nederlandse Aardolie Maatschappij) were situated in the Netherlands who required services from engineering & contracting firms. Between 1946 and 1949, Comprimo worked for Shell together with the (then) American company Foster Wheeler, and later (1956-58) in a joint venture with the American company Badger. Partnerships with American engineering firms were needed because these firms had obtained the necessary experience in organizing and executing large scale projects which had not been seen before in the Netherlands.

After 1970, chemical companies, as a result of increasing economies of scale, were more-and-more forced to outsource the engineering and construction know-how to engineering & contracting firms and to have them assist in exploiting technical patents. The split-off enforced the role of two types of contract forms: *Lump Sum* and *Cost Plus Fee* (CPF). Trending in those days was *Lump Sum* which transfers all risk to the contractor, who in turn had to reorganize in order to cope with these risks.

In 1994 Stork N.V. (a divisionalized firm) became full owner of STORK Comprimo b.v., which till then was owned by Shell 36%, Ballast-Nedam 32%, and Stork 32%. In 1998 Dow Engineering's Rotterdam office was sold to STORK Comprimo b.v. This was all during the 'internet bubble' recession which evolved from 1997 through early 2000. In this period of time many investments were either withdrawn or postponed causing many firms to lay-off personnel. In 2000 STORK Comprimo b.v. was nearly bankrupt and was acquired by the American Jacobs Engineering group to form Jacobs Nederland b.v. Because of a change in management philosophy and stronger markets, the Dutch office has been growing fast ever since. Jacobs Engineering group has a long history in acquisitions as a means to diversify the know-how, clients and markets in order to be less vulnerable for specific market fluctuations.

Most notable recent acquisitions are Aker Solutions' Process and Construction (P&C) business in 2011 and Sinclair Knight Merz (SKM) late 2013, each expanding the Jacobs workforce with 4700 and 6900 employees respectively. Both these acquisitions strengthened the presence in the mining and metals market, and the geographical spread because of the location of both Aker's and SKM's offices around the globe.

1.1.2 Jacobs' business philosophy

Any divisionalized-, or reasonably sized, firm faces challenges on how to establish control mechanisms that work in favor of the company both on a corporate level as locally. In order to be less dependent on specific market fluctuations Jacobs is continuously looking for expanding its diversity by acquiring firms that operate in different promising markets. Because of this acquisition strategy in past decades many local subsidiaries have joined Jacobs. These local offices sometimes serve global markets, but the mixture of their repertoire is mostly the result of local history and –opportunities acquired before joining Jacobs. Each office therefore serves only specific markets, also known as Lines of Business, such as e.g. hospitals, infrastructure, defense, nuclear, oil & gas, refining, or mining, etc. The illustration below demonstrates the geographic spread of Jacobs offices, Jacobs is present in the dark colored countries.

Figure 3, Geographical presence per country of Jacobs's offices (www.Jacobs.com, 2013).

Because of the geographical spread of offices, as illustrated above, offices in different countries may work in the same industry, in order to serve the local market. A very similar picture can also be drawn for many of Jacobs' globally operating clients such as e.g. ExxonMobil, Shell, BP, Chevron, ConocoPhillips, Valero, Total, and Neste Oil from the refinery market. These clients also have local subsidiaries who demand local presence when it comes to services they require at their sites. Where possible, Jacobs will follow core clients to make sure that they can be served on all of their locations.

Fellow offices operating in the same markets could be seen as competitors, but because of the overall corporate financial interests and control, competition amongst fellow offices does not occur nor is stimulated because internal competition can have detrimental effects on long term client relationships.

Coordination mechanisms of activities are locally determined based upon the local output standards (either set by client, local standards, and normative environmental and safety regulations) and standardization of input skills (Mintzberg, 1983) by means of e.g. chartered engineers. This does not mean that each office has full autonomy. Many offices have joined through various acquisitions since the early 1970's, which brought the necessary diversity in markets, culture, but also norms and values. Both financially and ethically corporate standards are enforced upon local subsidiaries. These standards indirectly influence how business ethics, -behavior and -processes in general terms should be followed, whilst maintaining enough flexibility for local adjustment. See Appendix B, Jacobs' business philosophy how this publicly is formulated on the corporate website. The business philosophy underlines that local control is fostered, but local offices should adhere to the common interest and 'lend' its local expertise and resources to other locations when this is in benefit to overarching interests. In this it is equally necessary that any employee at any level shares the same set of common values. The three core values summarize the essence of Jacobs' goals (growth) and business model (by means of long term client relations and an excellent workforce).

1.2 Problem exploration

Many established organizations face challenges when it comes to finding an optimum between exploiting known pathways and exploring unknowns for potential threats/opportunities, with the risk of losing competitive advantage or opportunities to competitors (March J. , 1991), (Cohen, McClure, & Yu, 2007). Known examples in modern industry are: IBM lost the software business to Microsoft, Microsoft the internet to Google, Eastman Kodak lost its edge in the camera business, and General Motors in car production, Shell increased its competitive position during the 1970's and 80's oil crises (to end with a positive note). It goes without saying that losing business as a market leader, for the first of the abovementioned group of companies, has not been intentional; however the shift upwards of Shell certainly was (Ramirez, Roodhart, & Manders, 2011).

It is common understanding that competitive organizations tend to optimize operations in order to safeguard and/or increase their profit margin. This can e.g. be achieved by applying economies of scale (Schumpeter, 1950), lean execution principles (Womack, Jones, & Roos, 1990), (Jones, Medlen, Merlo, Robertson, & Shepherdson, 1999), etc. which generally result in a fine tuned arrangement that performs well within certain limits. It is also common understanding that organization's responsiveness to change may diminish when organizations grow bigger, specialize and/or optimize their operational portfolio (Lawler & Galbraith, 1994). Well established organizations perhaps fail to recognize important changes, perhaps rely too long on trusted pathways, and/or face difficulties in finding appropriate solutions in times of dire need (Wright, Van der Heijden, Burt, Bradfield, & Cairns, 2008).

The following paragraphs elaborate on what types of change are relevant, and what is specific about project-based organizations, before discussing the central problem statement.

1.2.1 Relevant types/sources of change

Change in this context should be defined as fundamental change (e.g. social, technical, economic, environmental, political, etc. (collectively also known as STEEP)) which is trend based or even disruptive and typically affects multiple firms in industry with regards to their business reasoning/strategy, and not as change within normal variation limits, in terms of e.g. more or less orders which affects day to day operations of particular firms.

Dealing with fundamental change exists in the realm of CEO's and senior management and has an entrepreneurial, or directional, nature whereas the latter notion of change exists in the realm of line managers who are responsible for assuring the profitability of business (units) which has a more managerial, or quantitative, nature.

Fundamental changes are changes that are uncontrollable by the organization self, hence fundamental changes are often qualified as 'Exogenous' or 'External Change' to underline its source of origin, or 'Game changers' (Ramirez, Roodhart, & Manders, 2011) to underline its impact. Roubelat (Roubelat, 2000) adds, next to general and competitive sources of external change, a third source, namely the company itself. It is perhaps debatable whether change from within the enterprise can be labeled 'externally', however such changes are certainly not controlled, and in divisionalized organizations perhaps indeed external.

Table 1, Overview of types of change and their source.

	Types of change	
	Fundamental Change	**Operational variance**
Sources of change:	*General environment:* - STEEP *Competitive environment:* - Coalitions, - Patents *Organization:* - Reorganizations, - Mergers, - Acquisitions	- Client/market demands - Personnel - Inputs - Resources

1.2.2 Project-based organizations

EPC firms, like Jacobs Nederland b.v., are project-based firms that carry out projects directly on behalf of clients, delivering unique one-off solutions that require design activities (Hobday, 1998), (Gann & Salter, 2000). Project-based firms in the power, oil, gas and petrochemical infrastructure, buildings, railways, and defense equipment are considered to be the most prominent and longstanding project-based firms. In addition, this industry is, in general,

considered to be conservative and risk avoiding (Keegan & Turner, 2002), (Chinowsky, Hallowell, Strzepek, & Toole, 2011).

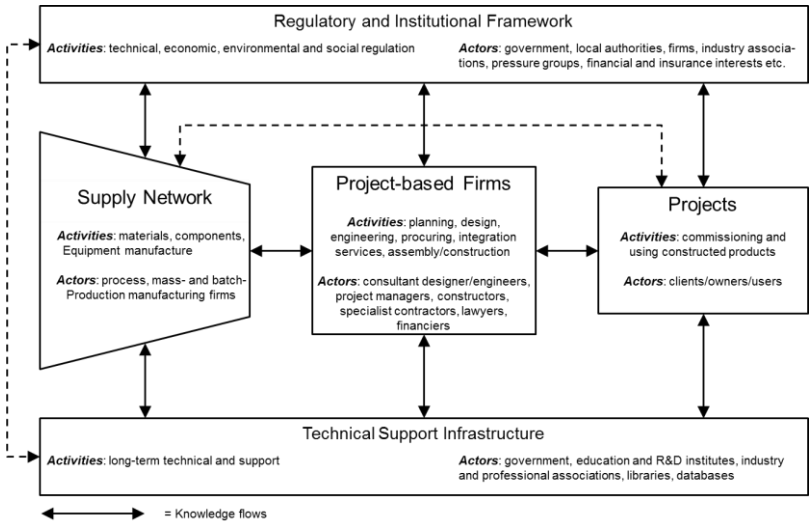

Figure 4, Knowledge, information flows and actors in project-based processes, (Gann & Salter, 2000).

The illustration above depicts the position of a project-based firm in the supplier-customer chain (Gann & Salter, 2000). Project-based firms potentially operate in different coalitions per project, which requires a formalized set of procedures and product standards provided by the techno structure alongside the supplier-customer chain and the network of actors self.

Executing EPC projects is knowledge (labor) intensive and subjected to safety, health, technology standards and regulations and strict budgetary control, resulting in (project) organizations that can be qualified as Professional Bureaucracies (Mintzberg, 1983). The engineering workforce is large and comprises a substantial number of different technical specialists with authority within their technical profession and/or client standards, which are not easily transferrable. Clients request for specific person's skills and competencies for their projects, resulting in exclusive project team or task force groups forming a Project Matrix (Hobday, 2000) organizational form as illustrated in figure 5 below.

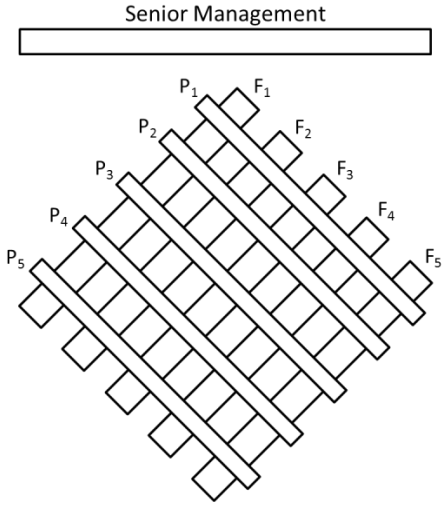

Figure 5, Project Matrix structure, (Hobday, 2000).

Figure 5 visualizes the existence of various functional departments (e.g. finance, engineering, procurement, construction) by bars named F1 to F5 and projects, named P1 to P5, which are situated perpendicular on top of the functional groups illustrating their cross-functional needs from F1 to F5 for execution. The perpendicularity between Projects and Functions symbolizes their opposing objectives (client needs versus organizational needs). The matrix is rotated to visualize the balance of the status of Project Managers (P_n) and Functional Managers (F_n) towards Senior Management. This rotation may vary from a pure functional organization (all functions are vertically placed and closest to Senior Management) to a pure project-based organization (all projects are situated vertical). In a pure functional organization, functional groups have a better position to innovate in order to optimize functioning. Knowledge spillovers between and within functional groups will reduce when the matrix is tilted.

Knowledge exchange between functional peers from other projects is low because of (1) inherent client secrecy clauses, (2) project phase differences, and (3) the absence of a potent functional organization (Blindenbach-Driessen & Van den Ende, 2006). The needs of projects outweigh the functional influence on decision-making which result in a diversified organization, lacking the facilitation of companywide development (Hobday, 2000) or vigilance because of the division of labor inherent for matrix organizations.

Exploration/Exploitation studies have focused mainly on various manufacturing industries, rather than project-based industries (Eriksson, 2013). Manufacturing firms typically produce goods in significant quantities that can be sold with profit to customers. Their investment (and thus vulnerability) is located in areas such as production-, distribution-, and product innovation capabilities which (apart from seasonal products) have a relative continuous character.

Project-based firms have more discontinuous characteristics in relation to duration, location, repetition, required expertise, partnerships, risk, control mechanisms, workflows, etc. which involves mutual interdependencies with other industry actors, specific constraints and capabilities. These specificities probably explain the lack of applicable/comparable studies for project-based organizations and underline the need for detailed analysis.

1.2.3 Problem statement

Jacobs Nederland b.v. may very well be vulnerable to external change. The organization is operating successfully in a competitive global market and, despite this positive situation, senior management worries that the organization's position and planned growth might be vulnerable for unexpected, fundamental, external changes that may jeopardize organizational goals if not properly detected and addressed. The organization is growing significantly since the year 2000, applies long established standard operating procedures, and is operating in a market that has not seen many paradigm shifts since the late 1940's. Protection however costs resources and has a high variation in the distribution of returns. Defining an optimal balance between explorative and exploitation efforts is a classical dilemma for established entrepreneurs in competitive markets. The two most diverse ways of dealing with such a problem is (1) do nothing with the risk that one falls behind should fundamental change occur, and (2) protect

yourself with the risk of losing profitability because of losing opportunities to protection costs for things that may never happen. Clearly senior management is not comfortable with both ends of this projected spectrum and desires to know what would be the optimum point by which profitability and long-term security are maximized, or at least at acceptable levels. Recognizing that acceptability may vary for the stake holders: shareholders, clients, and employees (see Appendix B, Jacobs' business philosophy). This is reformulated to the following problem statement:

> How can one best prepare (both effectively and efficiently) Jacobs Nederland b.v. for relevant possible futures whilst assuring that both short- and long term goals can be achieved in the interest of the shareholders, clients, and employees?

The problem setting refers to undesired potential future states that may even not occur. So it is questionable whether something can be done upfront. On the other end when events unfold, these events will not be exclusive for Jacobs Nederland b.v., but also for the direct and perhaps indirect (new) competitors. This indicates that in order to gain from such elusive events Jacobs Nederland b.v. must be able to detect and formulate a suitable reaction quicker than competition otherwise the organization will fall behind. This can be reformulated as a need to be vigilant for relevant changes in the organization's context, or (coined shorter) *Contextual Vigilance* (CV).

Organizations have the tendency to react only when it is clear that a gap exists between actual and desired performance. The conclusion is often based upon (financial) reports which are compiled from collected performance data. This is a difficult moment: there is a limited amount of time and money available to assess the situation and to formulate an answer which is subjected to constraints such as the organization's intrinsic capabilities, time, and available funding. Next to this 'reaction time' also considerable amount of time and resources might need to be spent on the implementation of the solution. This all adds up and determines the organization's total reaction time.

Complemented with the relative high average age of workers (Feuth, 2010), the industry/client standards and habitual ways of working is creating a strong path dependency, or lock-in (Sydow, Schreyögg, & Koch, 2009), which, given the size of some companies, increases the sensitiveness to external changes. A well-known analogy for this characteristic is the motor boat versus supertanker tactic. A motor boat (small and maneuverable) can change direction easily in case of need, but cannot transport (produce) high volumes. The supertanker being the opposite, can deliver high volumes on a limited set of predefined pathways.

In microeconomics, path dependencies are often not recognized (Teece, Pisano, & Shuen, 1997). Where a firm can go is a function of its current position and the possible paths ahead. Its current position is shaped by the path it has traveled thus far. All the investments done (developing standard operating practices, templates, know-how, skills, etc.) during the travelling are buried, making them invisible in the financial administration. Reviewing and modifying these proven assets is discouraged since it would increase operational risk doing so. The consequence of a long history and a reasonably sized firm is that satisfying (Simon, 1957)

behavior will prevail over optimization. The error of commissioning is much more severely punished than the error of omission (Ackoff, 2006) resulting in a conservative administrative structure with a high interest to defend incumbent practices & procedures instead of optimizing them, or introducing new ones, ultimately resulting in a corporate dinosaur (Lawler & Galbraith, 1994).

Path dependencies, how the organization is integrated in the supplier-customer chain with various interdependencies, and the prominent position of projects indicate that possible solutions have to be created using the current situation as a point of departure, rather than creating radically new approaches which are dangerous to implement.

1.2.4 Analogous example from traffic

An (perhaps interesting) analogy is the situation of a car driver who suddenly needs to stop because of danger on the road. The total stopping distance is the sum of (a) *the perception distance* (the distance covered while processing information and it is concluded to break or deviate), (b) *the reaction distance* (the distance covered while the brakes need to be applied), and (c) *the braking distance* (the travelled distance while breaking). All sorts of factors may influence the perception distance e.g. weather conditions (visibility), other traffic, driver's physical state, passengers, etc. and for the braking distance e.g. weather conditions (wet/icy road), car's mass, -technical state, driving speed, etc.

The analogy also makes it understandable that vigilance and the ability to maneuver (deviate, brake, or accelerate) are all attributes which drivers, and thus (following the analogy), organizations possess in different qualities. Not all drivers are equally experienced, -alert, or have the same cars (and thus capabilities). Another understanding which is important is that road users, just like organizations, also react on fellow road users who are confronted with the same threat. They can also block or open up options, or even form an additional threat as a result of their reaction to change.

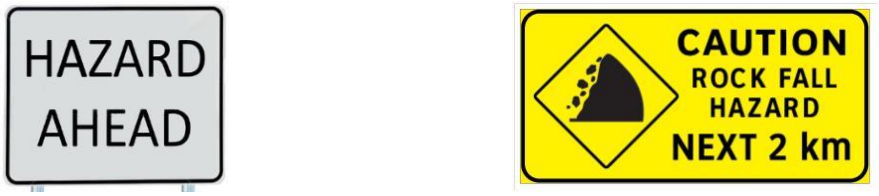

Figure 6, Example warning signs to road users for potential hazards.

Salient exceptions to this analogy are that all road users are exposed to the same warning signs about potential danger ahead, see e.g. the signs above, where organizations aren't, and that organizations may have multiple drivers, whereas road vehicles (although sometimes disputed) haven't, and that organizations display tactical (offensive/defensive) behavior where road users generally display defensive behavior.

1.3 Contextual Vigilance for businesses

This paragraph elaborates on the notion *Contextual Vigilance*, a term introduced in this research, which I use in relationship with business strategy formulation.

Scientific literature defines an array of notions or methodologies such as *scenario planning, strategic planning/foresight*, *forward looking*, *leading indicators*, etc. that can aid in dealing with external change. The commonality of these methods is that they are executed intentionally in advantage in order to optimize from external change when it occurs. To avoid being too specific at the start, I decided to group these concepts into a more overarching term: *Contextual Vigilance (CV)*, which emphasizes two important aspects of this setting: (1) its scope, being external, hence "Contextual", and (2) an activity or process that underlines the role or value to the organization, hence "Vigilance".

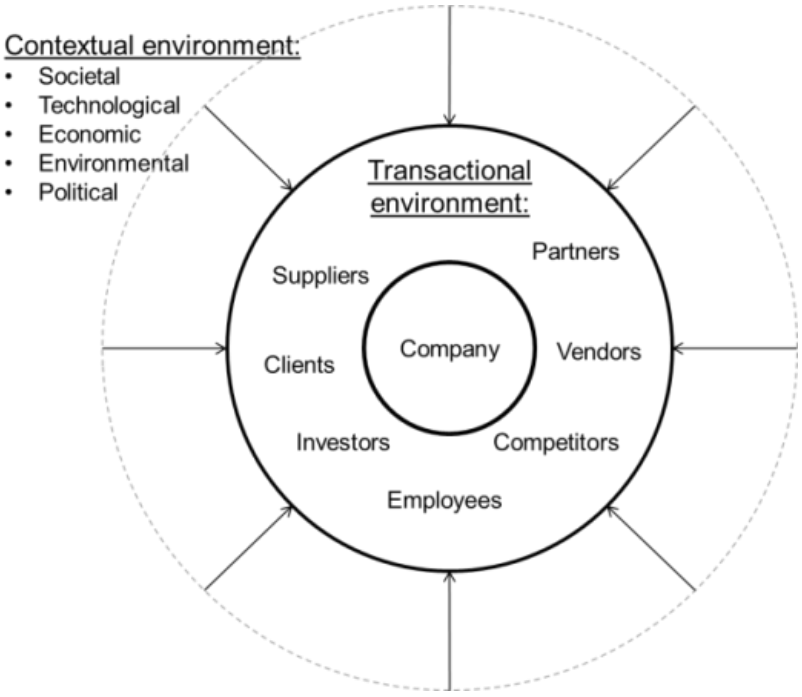

Figure 7, Contextual and transactional business environment (Heijden, 1996).

Kees van der Heijden (Heijden, 1996) uses the diagram above to delineate the difference between the contextual environment and the transactional environment wherein businesses operate. The most inner circle symbolizes the company who, perhaps with partners, compete with competitors for client contracts but also for required resources, services, and goods in order to be able to fulfill the client contracts. A more common term for this notion is *markets* as used in business economics. Transactions (or the absence of it) are influenced by strategic behavior of investors and clients as a reaction to the market(s) they are operating in, and the availability of options in the company's market. With products, but especially in services, the client- and company businesses must have an overlap in respectively required- and offered activities, as illustrated in figure 8 below. The absence of vertical integration makes that clients

want to outsource these activities to offering companies. This is mostly done with services that are not permanently needed, specialized, or expensive to maintain for the client organization.

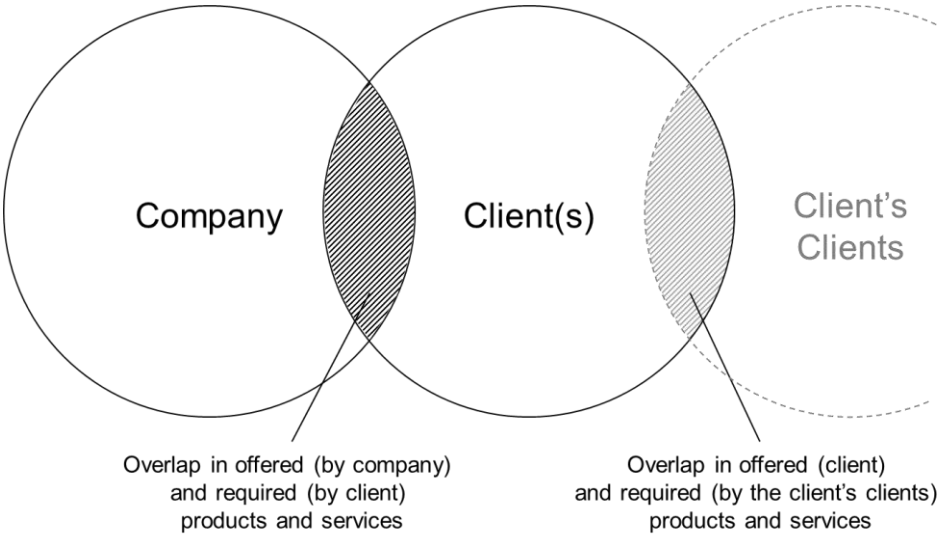

Figure 8, Overlap in company and client business, derived from (Heijden, 1996).

It is important to emphasize that the client's market (e.g. refining) is a different one than the company's market (e.g. engineering, service & maintenance). The contextual environment may affect all actors in the company's market, but more importantly it may also influence actors operating in client markets. Contextual change may thus have a direct, but (via client markets) also indirect impact, for which the latter situation it is perhaps is more difficult to understand, detect, and to find answers for. Consequences of contextual change may be that the business overlaps with clients change because clients change in size or simply move.

Contextual Vigilance policies are sets of principles and protocols that have the objective to introduce, maintain and/or increase the level of Contextual Vigilance in an organization, such that it is capable to deal with fundamental external changes at reasonable costs and risks.

1.4 Research objective & questions

Ideally research should aim to assist in optimizing between cost (design and implementation, of increasing the level of Contextual Vigilance), and benefits (e.g. the increase of competitive advantage, and/or level of security) of Contextual Vigilance policies, ceteris paribus. How much investment in preparations is acceptable in order to yield a reasonable chance on returns later on? This type of knowledge will be more lasting to the problem-owner as compared to the development of a single specific policy design, since (once operational) CV policies generally need regular evaluation and adjustment in order to assimilate new knowledge about the organization, its context, and policy performance. It is unrealistic to include benefits and implementation costs (other than perhaps expert estimates) in this research because there is neither relevant empirical evidence available nor the time and resources to develop sample data for these.

The scope of research will therefore be limited to the cost component of the design of Contextual Vigilance policies, more specifically aimed at determining what organizational characteristics are most determining in the design process of Contextual Vigilance policies in large project-based firms that supply technical services in competitive markets. This results in the central research question:

1 *What organizational characteristics are most determining in the design process of Contextual Vigilance policies?*

With this question answered, it must be doable to design a Contextual Vigilance policy that is both efficient and effective. However the central question is still formulated too broad and cannot be answered directly. Where does the organization stand now? What is, outside the organization, already known in literature? What knowledge and possibilities can be appropriated in what manner? To answer the central research question it is unraveled into the following three sub-questions:

1.1 *What current scientific state-of-art knowledge is available to support the design of Contextual Vigilance policies?*

Knowledge acquired from scientific literature can be appropriated in the subsequent research activities. Similar like research and/or theoretical discussions can aid in assessing which methods and what emphases could be applied as well as what relevant organizational characteristics may exist. The scientific literature will serve as a frame of reference for the discussion of the findings. This question will be answered by literature research.

1.2 *What is the effectiveness of system analysis and scenario analysis method's in the design of Contextual Vigilance policies?*

The research question aims to determine to what level or degree analysis must be executed in order to be able to design beneficial CV policies. This question will be answered by empirical research. The researcher will facilitate the execution of a case study at Jacobs Nederland b.v., which comprises the analysis and design of a Contextual Vigilance policy using Engineering Policy Analysis' (EPA) system analysis and scenario analysis in order to comply with the EPA program curriculum. Planned activities are: (1) analysis of current CV policy, (2) objective analysis, (3) system analysis, (4) policy development, (5) CV scenario analysis, and (6) impact analysis & ranking. All activities are assumed to create interrelated deliverables, which implicates that one cannot skip an activity but may vary in the scope and/or the level of detail. What scope and level of detail is acceptable will be decided by the problem owner, or indirectly determined by unsurpassable knowledge gaps. This is something that would have to occur as well in normal practice. The effectiveness of the Contextual Vigilance policy itself is regarded as immeasurable during research.

1.3 *What is the efficiency of the design processes of Contextual Vigilance policies, and how is this influenced by the organization?*

This question will be answered by empirical research. The facilitated process under 1.2 will used to observe and analyze what organizational factors contribute most in the efficiency of the planned activities. Main results of this observation are (1) an indication of efficiency, and (2) a chart which demonstrates which organizational characteristics have the most impact in the realization of the activities executed under 1.2.

1.5 Research method

The sub questions 1.1, 1.2, and 1.3 from the previous paragraph need to be answered respectively in order to be able to answer the main research question. For this the following research approach is formulated:

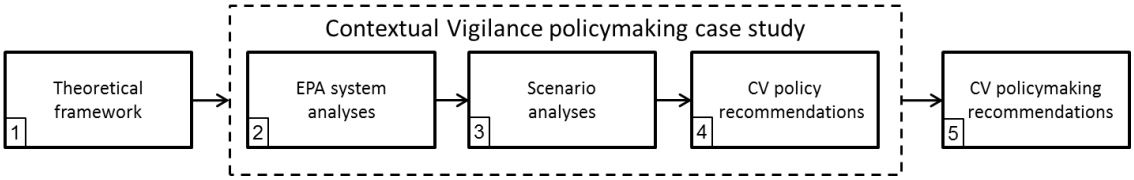

Figure 9, Research approach.

Based upon a theoretical framework, a Contextual Vigilance policymaking case study will be executed which results in Contextual Vigilance policymaking recommendations. This research approach forms the outline of this report; each activity will be discussed in the following paragraphs.

1.5.1 Theoretical framework

The theoretical framework will be constructed by desk research by exploring literature in the form of books and peer reviewed journal articles. Initially key articles in the realm of organizational science, long range/strategic planning, organizational decision-making will need to be identified, and assessed. In successive rounds the scope can be expanded via often sited articles, and authors or specific topics. This is not really an activity with a formal begin and end as being part of a chain of successive activities. All activities can trigger the need to further study topics; this is inherent for exploratory research.

Literature research should provide insight in how organizations can be vulnerable for external changes, how organizations deal with long term uncertainty in decision-making and available policy options and their characteristics. Results of this activity are discussed in chapter 2, *Theoretical framework & Methodology*.

1.5.2 Contextual Vigilance policy-making case study

This activity aims to develop a Contextual Vigilance policy using inputs from within the organization, complemented with scientific sources where required. Method of research will be executing qualitative and exploratory interviews with key persons from within the organization. These interviews will also be used to introduce this research topic to the broader audience and to see what other resources can be used that may contribute to the research. Verification of

inputs is expected to be based upon peer reviews, either implicitly by similar interview outcomes or explicitly by validating outcomes with the problem owner and/or experts.

Interviews are planned with persons from technology, human resources, sales, and operations. The interview questions will be formulated broadly and open to allow various kinds of inputs, which can be discussed in detail. The collected inputs will be used for the analysis and design of a Contextual Vigilance policy using EPA system analysis. This methodology is not common practice for Jacobs Nederland b.v. This 'exercise' will provide insight how capable the organization is to utilize such methods, or whether the method is suitable to fulfill the need. Input and evaluation will be done via interviews, continuing with the interviewee's from the preceding activity. It is likely that additional experts need to be interviewed since it is expected that the information need will be more in depth compared to the previous interview round.

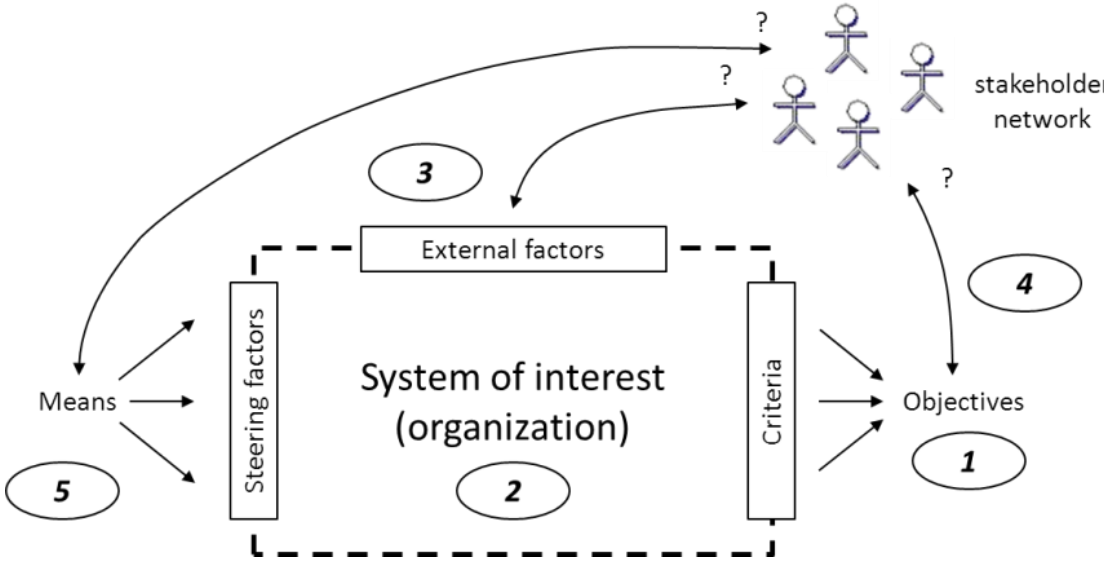

Figure 10, EPA system analysis overview.

The illustration above illustrates the system of interest (in this case an organization) surrounded by a dashed rectangle. Stakeholders have interests in aspects of the system's performance which will be analyzed via objective analysis (1), what system internals contribute to these criteria will be analyzed via system analysis (2), what and how external influences affect the system (3) and its performance (4) will be analyzed by means of scenario analysis, CV policy development will target the means of control (5) such that the system's performance can be optimized given a changing environment.

The anticipated lack of ambidexterity makes research risk prone because much input is required from various experts and stakeholders from within the organization. Main risk-contributing factors are believed to be lack of attention and insufficient common frame of reference. Lack of attention is difficult to counter; this is mainly determined by every day's operational dynamics which cannot be influenced. The lack of a common frame of reference can be reduced by making the subject tangible. It is assumed that the practicality of an integral case will help making the problem setting and theoretical constructs more tangible to those involved.

It may also contribute to reduce lack of attention since the developed case will be a short-term deliverable.

All activities are assumed to create interrelated deliverables, which implicates that one cannot skip an activity but may vary in the scope and/or the level of detail. What scope and level of detail is acceptable will be decided by the problem owner, or indirectly determined by unsurpassable knowledge gaps. This is something that would have to occur as well in normal practice. The effectiveness of the Contextual Vigilance policy itself is regarded as immeasurable during research. The case study's results are discussed in chapter 3*, CV policymaking case study part I: System Analysis* and chapter 4, *CV policymaking case study part II: Scenario Analysis*.

1.5.3 Contextual Vigilance policy recommendations

This activity aims to deliver Contextual Vigilance policy recommendations based upon the outcomes of the previous two analysis activities. Since this research is explorative based (i.e. it's not based on tangible, imminent threats or opportunities) multiple plausible futures need to be included by using scenario analysis, wherein the performance of policy options is forecasted, resulting into score tables per potential future. Scenario Analysis is thus not about predicting the future, but being able to select robust policies that score acceptable, following Simon's (Simon, 1957) reasoning of satisfactory decision-making.

Results of this activity are discussed in paragraph 4.4, *Conclusions*.

1.5.4 Contextual Vigilance policymaking recommendations

This activity aims to deliver Contextual Vigilance policymaking recommendations based upon the observations of the previous activity *Contextual Vigilance policy-making case study* and *Contextual Vigilance policy recommendations*. The development process (not the outcomes) from the preceding activities will be analyzed and, based upon the analysis outcomes, different strategies can be designed that are expected to have differences in outcome quality (effectiveness) and resources spend (efficiency) in Contextual Policy development.

Results of this activity are discussed in paragraph 5.3, *Efficiency of Contextual Vigilance policymaking*.

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2 Theoretical framework & Methodology

The research objective stated in the previous chapter is too broad to answer directly. The problem owner refers to unspecified future situations that, if they occur, are expected to compromise stakeholder's interests for which it (because of uncertainties) is difficult to develop realistic hedging or mitigating policies such that the cost of protection, the likelihood of (and/or) negative consequences are low.

The research objective reveals a sense of vulnerability. This vulnerability can perhaps be explained by looking at conclusions of Cohen & Gooch in their book *Military Misfortunes* (Cohen & Gooch, 1990) in which they suggest three kinds of organizational failure with respect to external change:

- failure to learn;
- failure to anticipate; and
- failure to adapt.

Cohen & Gooch contend that it is damaging having only one failure, having two of such failures together creates a serious situation, and all three together almost always produce catastrophe. This suggests that vulnerability stems from three possible sources: not knowing what to expect or to watch out for (failure to learn), not knowing what to do (failure to anticipate) when you do detect change, or not knowing how to implement organizational change (failure to adapt). This implicates that organizations are to be prohibited to use external change as a single root cause of failure, however instead should question its own capabilities in handling external change through dedicated business activities (if operational).

Teece, (Teece D. , 2007), provides a framework of activities (*sensing*, *seizing*, and *reconfiguring*) that is contended to be an appropriate framework for Contextual Vigilance for businesses. Each source of failure defined by Cohen & Gooch can be mapped to activities that cope with external change as defined by Teece.

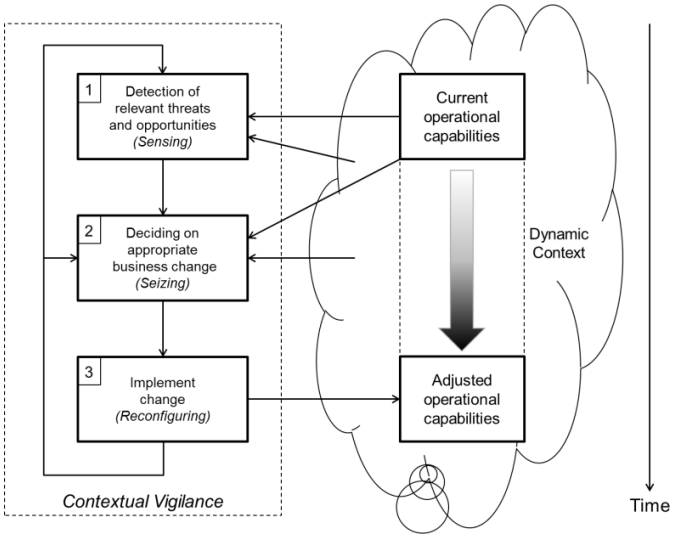

Figure 11, Adjusting operational capabilities in response of changing context by Contextual Vigilance.

Contextual Vigilance (depicted by a dashed box on the left-hand side in the illustration above) is operationalized by a permanent implementation of a loop of (1) *Sensing*-, (2) *Seizing*-, and (3) *Reconfiguring* activities that coexist alongside current operations that operate in a dynamic context, depicted by the cloud-like shape at the right-hand side. The Contextual Vigilance activities listed can be described as follows:

Sensing, or detection of relevant threats and opportunities, is the first activity in Contextual Vigilance. This activity involves detecting, evaluating and assessing any signals or trends that may have an effect on the performance of the company.

From the three Contextual Vigilance activities listed, this activity deserves the most attention because of (1) its permanent observing nature, (2) it's initiating role in the loop of activities and (3) the fact that this activity cannot be outsourced because of its strategic value and -knowledge. This sensing activity must be able to observe a broad range of inputs and assess whether these form a threat or opportunity with regards to the design of current or future operations respectively. It forms an important filter for subsequent activities and must therefore have good knowledge of the organization, its objectives, capabilities, constraints, environment, (potential) clients, and their environments. Sensing is considered successful when the appropriate information sources are monitored, and that as early as possible correct assessments are made, and to prepare and inform subsequent decision-making. Sensing is considered to be a high frequency activity.

Seizing, or deciding on alternative, or new strategies, is the second activity in contextual vigilance. This activity involves deciding whether or not to change, and if so, how, such that the company will have a better chance in obtaining its objectives in both the short and long term. Seizing is considered successful when the appropriate decisions to change or not are made such that maximal sustained advantage is achieved. Seizing is considered to be a moderate frequency activity.

Reconfiguring, or implement change, is the final activity in Contextual Vigilance loop. This activity involves implementing the proposed changes such that the company can be adjusted to the changed/changing environment in order to maximize objectives under new circumstances. Change may involve change in SOP's, business lines, business integration, client service models, etc. Reconfiguring is considered successful when proposed changes are implemented in an effective and efficient manner. Reconfiguring is considered to be a low frequency activity.

The framework, defined by Teece, is defined at the correct level (a set of activities alongside or observing operations) and comprises tangible and recognizable elements for business implementation, which makes it applicable for structuring this research.

It does however not foresee in a complete recipe with respect to implementation. Main elements of research concern the *Sensing* and *Seizing* components, and to a lesser extend *Reconfiguration* because (1) this component only becomes relevant when the first two are addressed properly, (2) it involves actually implementing organizational change wherein little

room exists for experimentation, and (3) this is the domain of senior management who did not include reconfiguring aspects in the problem statement.

The subsequent paragraphs discuss the contemporary scientific literature with respect to concepts, mechanisms, and schools of thought that are of relevance with respect to Sensing and Seizing.

2.1 Sensing: What could possibly happen?

> *"[T]here are known knowns; there are things we know we know.*
> *We also know there are known unknowns; that is to say we know there are some things we do not know.*
> *But there are also unknown unknowns – there are things we do not know we don't know."*
> —United States Secretary of Defense, Donald Rumsfeld on February 12, 2002

Today's predictions tell us to expect changes in markets. For instance the International Energy Agency forecasts (IEA, 2011) a global $38 trillion investment in global energy supply infrastructure over the period 2011 to 2035. The dynamics of the energy markets are expected to be increasingly determined by countries outside the OECD[1]. IEA also forecasts that the non-OECD countries will account for 90% of population growth, 70% of the increase in economic output and 90% of energy demand growth in the same period.

This all sounds like good news because the increase in energy demand needs to be accommodated by infrastructure and facilities that will have to be designed, built, operated, and maintained. However in the last decades we have seen political instability in some parts of the world (i.e. Kuwait, Iraq, Afghanistan, Libya, more recently Syria, and Ukraine) causing short-term shifts in markets. Next to political instabilities also social/technical instabilities may exist. The recent Fukushima disaster in 2010 put the nuclear energy debate on the agenda again since the aftermath of Chernobyl, questioning the technical abilities to exploit nuclear power plants (Thomas, 2012). Public opinion always has been divided regarding nuclear energy (Corner, et al., 2011) and received enough leverage because of the recent developments to halt many initiatives world-wide.

Such type of events, including the implications for Jacobs and more specific JNL are however difficult to predict as well as their consequences. Effects can be direct and negative when e.g. projects are stopped because clients need to postpone, or seize their activities in locations because of unrest or political/social demand. Alternatively clients may relocate activities to more stable regions or technologies, creating new opportunities in local and/or proven technology markets.

[1] OECD, Organization for Economic Cooperation and Development: a group of rich countries that work together to increase world trade

In addition to the demand limits (Porter M. E., 1980) discussed above, also supply limits are likely to play a significant role, developments on the labor market may impose a constraint on the capitalization of any market opportunities. A Dutch human resources survey (Feuth, 2010) forecasts that a 10 to 25% turnover of personnel is expected due to ageing at Dutch EPC firms. Actual figures about recent graduates of local technical schools show a gap between total supply and demand of skilled labor in this sector. This suggests that even if client markets are favorable, JNL (but also its competitors) could be confronted with a shortage of qualified personnel resulting in reputation damage. Contrary to these statements, another recent Dutch survey (NLIngenieurs, 2011) under 112 engineering firms shows (cautious) optimism because 64% of the respondents expect growth in the near future.

Less likely (and difficult to predict) events such as product or service substitutions are perhaps not even considered, but they can be responsible for true paradigm shifts causing systemic changes in markets. The predicted market demand and labor supply shifts discussed above are basically *more-of-the-same* predictions (Wack, 1985a) with a low/medium/high changes, typically exerted by experts who, strikingly, seem to do a poorer job than wider based groups (Ringland, et al., 1999, p. 404).

What to conclude from all these different opinions and information sources is a difficult task. Various types of uncertainty, time scales, and anticipated consequences come into play making it hard to develop a shared vision and consequently planning. With respect to determining appropriate time scales, Kees van der Heijden (Heijden, 1996) made a valuable contribution by relating time to uncertainty by means of the graph in figure 12 below.

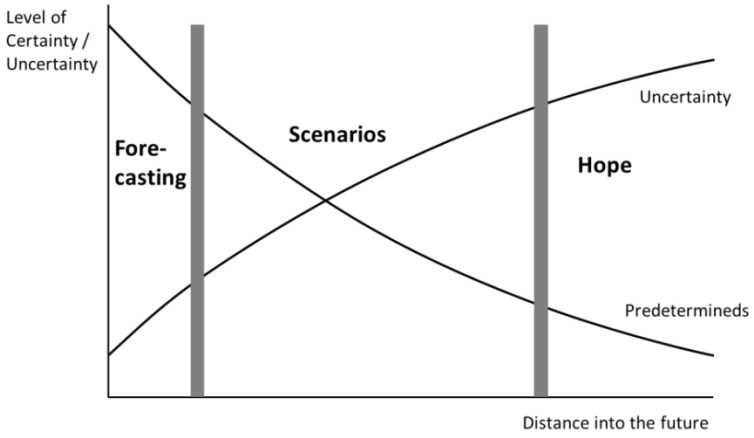

Figure 12, Time versus (un)certainty, related to expectation concepts (Heijden, 1996).

The illustration shows a graph with the time scale on the horizontal axis, and the level of certainty/uncertainty on the vertical axis. The level of predetermined (certainty) factors decreases whereas the level of uncertainty increases conversely when moving further into the future. Relevant forward looking concepts such as *forecasting*, *scenarios* and finally *hope* are positioned on this time line, demarcating their scope. *Forecasting* is time-wise closest by, in this region it is reasonable to assume that the near future will be more-of-the-same (historical data) corrected with estimated variability, e.g. time series. *Scenarios* describe future states that are

based upon assumptions that do not need have statistical backing and often include systematic change, trend breaks, etc. in its exploration. *Hope* symbolizes that part of the future for which we have no clue what possibly could happen.

This graph can be mirrored around the vertical axis. What has happened before becomes more and more uncertain if we look further back in time. This has everything to do with the recording and availability of historical data, which is never complete and decreases rapidly when looking further back in time, so uncertainty is related to lack of knowledge.

Uncertainty is a universal concept; it has different degrees and can be applied to many different subjects. Uncertainty goes by many names in science literature; a short overview is elaborated here. Wynne (Wynne, 1992), starts the uncertainty scale with (1) the notion of *risk* where odds, probabilities, or variations are known (2) *uncertainty* where odds are unknown, but main factors are known (3) *ignorance* where we simple don't know what we don't know, and (4) *indeterminacy* where no cause-effect relationships exist and system behavior is contingent or arbitrary such that understanding cannot be improved by increasing scientific knowledge. Schoemaker (Schoemaker, 1995) only recognizes the first three levels in more universal wordings. Walker (Walker, et al., 2003) adds *Recognized ignorance* which targets uncertainty about the mechanisms and functional relationships of the phenomena's studied. Others (Courtney, 2003), and (Chermack & Payne, 2006) have rationalized similar stages of uncertainty into numbered levels 1 thru 4.

Table 2, Various levels and terminologies of uncertainties.

Author	**Levels of uncertainty**				
Wynne	Risk	Uncertainty		Ignorance	Indeterminacy
Schoemaker	Things we know we know	Things we know we don't know		Things we do not know we don't know	
Van der Heijden	Forecasting	Scenario		Hope	
Walker	Statistical uncertainty	Scenario uncertainty	Recognized Ignorance	Total ignorance	
Courtney, Chermack & Payne	Level 1 (clear enough future)	Level 2 (Alternative futures)	Level 3 (A range of futures)	Level 4 (True ambiguity)	

Although all organizations are more or less subjected to the same kind of uncertainties, individual organizations can deal with this phenomenon differently. Depending on the current financial state an organization may permit itself to invest in knowledge acquisitions to reduce uncertainty and/or it may permit itself to invest in defensive hedging actions to reduce sensitivity, or mitigating actions to cushion potential negative effects. Famous example of such strategic behavior is the development of Scenarios by the Shell Oil Company in the late 70s and 80s (Zenter, 1982), (Wack, 1985a), (Schoemaker, 1995), (De Geus, 1988), which gave Shell management a competitive edge when the oil crisis's unfolded by being mentally prepared in

order to detect new opportunities and react accordingly. The usage of scenarios was not exclusive for Shell, a number of other companies also benefited from the same type of investment, the Shell case became known via the public available scientific publications on this matter (Chermack, Lynham, & Ruona, 2001).

This does not necessarily mean that organizations easily can prevent negative aspects of uncertainty by investing in knowledge and/or preventive actions. These cost money and resources which may not be available or be spend on measures that never will be needed. Lampel (Lampel & Shapira, 2001) illustrates the trade-off between the cost of vigilance and the risk of damage with the diagram in figure 13 below.

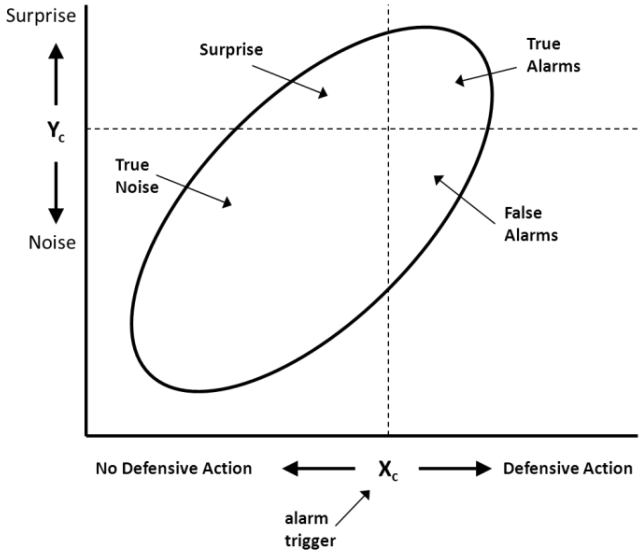

Figure 13, Risk taking in organizational settings (Lampel & Shapira, 2001).

The illustration shows a graph with leading indicator values (signposts) on the horizontal (X) axis, and post event outcomes on the vertical (Y) axis. The ellipse illustrates the uncertainty of the relationship between measured triggers and their respective outcomes in the form of events. This ellipse would be a single line when knowledge is perfect such that no variation exist between measured (ex ante) values and expected (ex post) outcomes. The value X_c on the horizontal axis can be defined a trigger value which initiates defensive actions when values are measured above X_c. Witnessed values on the horizontal axis determine whether defensive action or no defensive action is undertaken, consider the following hypothetical situations:

Action: Defensive actions are started when a trigger value above X_c is observed.

- When an event occurs above Y_c, a true alarm has occurred for which, rightfully, defensive (hedging) actions were initiated earlier.
- When an event occurs below Y_c, the defensive actions taken earlier were unnecessary, this is known as a false alarm, or type I error.

Inaction: No defensive actions are started when a trigger value below X_c is witnessed.

- When an event occurs above Y_c, no defensive actions have been started and the organization is caught by surprise, this is known as a type II error.

Type II errors (surprise) can be catastrophic; however type I errors (false alarms) can be costly. It may be decided to increase the threshold X_c (as a result of having too many costly type I errors) which will increase the chance on type II errors. This illustrates that being vigilant can be a costly endeavor, but the risk of getting surprised increases when one lowers it guards or underestimates or ignores cause and effect (variability's).

Figure 13 illustrates that one can vary three different parameters in order to avoid getting surprised; these are (1) defensive hedging actions and their trigger points, (2) defensive mitigating actions to reduce negative effects of events and increase the threshold of getting surprised, (3) knowledge about system, elements, and their relationships to reduce the spread of uncertainty in cause and effect relations. How to define an acceptable trade-off between the cost of vigilance and the risk of damage is interesting to know.

It is imperative that one cannot predict the future, especially when looking further ahead in time. Sometimes we know our vulnerabilities (or consequences) to certain events (e.g. earthquakes, recessions, innovations), but we know little about their probability or variation. Sometimes we are even ignorant of what could happen, let alone knowing its probability characteristics. It is imperative that it is impossible to spend resources and be able to comprehend the full range of uncertainties. The discipline of forecasting is well embedded in contemporary business administration for budgeting purposes. Its time horizon is a well-chosen balance between resources spent and certainty acquired needed for relevant bookkeeping periods. This suggests that statistical uncertainties (i.e. forecasting) is adequately monitored by the problem owner. It is therefore the zone beyond statistical uncertainty (Walker, et al., 2003) that should deserve attention in answering the central research objective quoted in chapter 1.

2.2 Seizing: Organizational decision-making under uncertainty

> *"[D]ecision-making is not about searching for the sharpest needle in a haystack,*
>
> *but about finding one that is sharp enough to sew with."*
>
> — (March & Simon, Organizations, 1958)

One of the most relevant aspects of the problem setting is not related to the analysis of the problems, system, means or ends, but how the problem owner actually makes (or desires to make) decisions. Problem owners that make decisions in a rational way may need quantifiable characteristics to better weight the available options. On the other end of the spectrum problem owners may realize that limits exist in cognitive abilities to understand the various aspects of the problem settings and/or its options to minimize uncertainty and therefore do not attribute high value to *hard data*. This paragraph will elaborate on the most relevant findings in the vast literature on organizational decision making.

Organizational decision-making exists in a broad context and it is important for this research to underline the difference between *day-to-day decision-making*, dealing with fairly familiar situations and measures, and *imposed decision-making* with limited time, -options, and knowledge of cause and effects as a reaction to unexpected threats. The first case of decision-making is coined *risk taking with slack* (March & Shapira, 1992) which aims to optimize current operations by (re)allocating resources and/or proven solutions in order to *control* the risk. This type of decision-making is typically executed by managers, occurs frequently, and is supported by an established knowledge base and procedures. The latter case is coined *risk taking and danger* (March & Shapira, 1992) in which survival of the organization is threatened. These events are rare and have little empirical means and knowledge to fall back on. This type of decision-making is typically executed by senior management taking leadership in organizational turbulent times. Stress in such a situation is severe since stakes are high, with limited time and knowledge available.

A good starting point in understanding decision-making under uncertainty is Janis and Mann's (Janis & Mann, 1977) conflict theory, which is based upon the, psychological, assumption that people reluctantly make decisions. Especially in situations where all the alternatives have negative aspects which foster stress in decision-making. This can, possibly in combination of Groupthink (Janis, 1971) behavior, result in avoidance or limited options decision-making with potential catastrophic consequences. Wright (Wright, Van der Heijden, Burt, Bradfield, & Cairns, 2008) applied the Janis & Mann conflict theory to the processes of strategy-making, in figure 14 below, to explain strategic inertia found at decision takers.

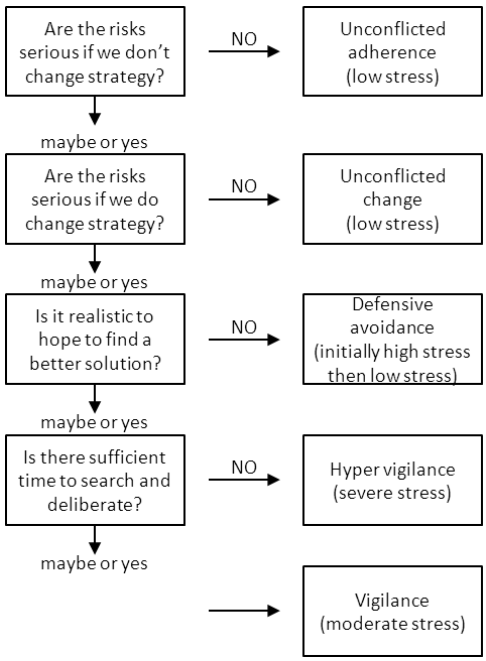

Figure 14, Wright's application of Janis & Mann's theory to the processes of strategy-making.

The model describes five coping patterns at the right-hand side at which decision-makers arrive when one or more conditions, depicted at the left-hand side, apply. The first coping pattern *Unconflicted adherence* is met when perceived risks are not serious enough to change

current strategy. This basically means doing nothing because there is no reason to do so. The second coping pattern *Unconflicted change* is met when the risk of strategy change is low. This pattern involves a change action without any perceived risk in doing so. The third coping pattern *Defensive avoidance* is met when you must change but do not have any options. This is the first situation where stress is involved, initially high, later low because of resignation due to the unavailability of acceptable options. The fourth coping pattern *Hyper vigilance* is met when there is no time left to search for better solutions. Stress levels are high because the possibility to attain solutions diminishes as time passes. The fifth and last coping pattern is Vigilance and is met when strategy must be changed and there is time available to search and assess solutions.

The coping patterns of unconflicted adherence and -change are favored over the others, but this means that risks and possible solutions must be known in advance. This is essential because this implicates that an organization must have prepared itself such that (1) risks are identified and (2) a list of strategic options is available. This also implicates that an organization must have spent time and resources in order to be prepared. It is trivial to expect that when an organization has not prepared at all, it will likely meet the *Defensive avoidance*, *Hyper vigilance*, or (when lucky) the *Vigilance* pattern. In all three cases the company loses competitive advantage to others that have prepared better, since it will lose time to assess the situation and formulate a solution.

In decision-making literature a number of typical decision process modes have been developed over the last five decades. Five relevant modes (1) rational mode, (2) avoidance mode, (3) incremental mode, (4) political mode, and (5) garbage can mode will be discussed below.

Rational mode is about being prepared and being able to choose the best solutions for emerging problems. It suggests that such a company is a rational decision taker when it is intentionally able to oversee, analyze, reduce knowledge gaps, and develop & assess solutions in order to reduce risk and optimize outcomes (Ackoff, 1970). This way of decision-making is coined *rational choice* by Simon (Simon, 1955) and forms one outer side of the spectrum of decision-making, being the ideal form of decision-making. This form assumes that decision-making is a comprehensible, normative process in which the decision-takers (1) define objectives, (2) gather information, (3) develop options, and (4) objectively select the best option. However with the increasing complexity, speed of change in problem settings, mankind has problems in executing each step optimally. Information seems incomplete, and the cost of acquiring/filtering good information is high. The time and resources available to develop options is limited. Objective evaluation of the various options is impossible because of immeasurable qualitative characteristics, particular value systems, politics, biases, etc. Because of these human shortcomings, Rational Decision-making is a theoretical construct rarely seen at corporate level decision-making.

Avoidance mode manifests itself as a tendency to avoid making a choice by postponing it or by seeking an easy way out that involves no action or no change. Strategic decision-making processes often lead to resistance to change (Janis & Mann, 1977). Avoiding behavior can occur when there is uncertainty and/or limited options to choose from in which it is perceived wiser to do nothing. Organizational momentum by Incumbent management proves a strong force in maintaining status quo. The organizational operating systems, or bureaucracy, seek to stabilize its actions despite a changing environment (Mintzberg, 1978). Change, after all, is disturbing the current production apparatus. Important aspect is the prevalence of certainty about the current course of actions versus the uncertainty of change. Stress typically occurs between the pulling forces (Mintzberg, 1983) of the techno structure (inward looking) and the strategic apex (outward/forward looking). Failures of commission (action) are more severely punished than failures of omission (do nothing or buck passing) (Ackoff, 2006) .

An important emotional driver for avoidance is regret (Zeelenberg, Beattie, Pligt, & Vries, 1996). Regret is a negative, cognitively based emotion that we experience when realizing or imagining that our present situation would have been better, had we decided differently. (Zeelenberg, 1999, p. p. 94). Decision makers anticipate less regret for decisions that are reversible compared with similar, but irreversible decisions. Losses weigh more than profit, meaning the regret about not gaining $100 is less severe than losing $100. Hence experimenting (making costs without having secure benefits) is not favored and organizational learning is low. According to (Zeelenberg, Beattie, Pligt, & Vries, 1996) this may even occur after decisions are made, they contend that people in *avoidance mode* will prefer to avoid information that might cause them to regret their decision. The complex emotional influence like regret or fear in *Avoidance Mode* suggests that this mode is the opposite of rational decision-making (Anderson, 2003).

Logical Incrementalism mode originated from public policymaking under the term *Muddling Through* (Lindblom, 1959) and later coined *Logical Incrementalism* (Quinn, 1978) in the context of private policymaking. A Logical Incrementalist shares the objective setting with *Rational Decision-making* but differs in the method of achieving them. It is a method that is very close to us and is about making decisions in small incremental steps, moving slowly onwards and deal with problems or opportunities at the time they arise. Since the environment is unstable and manager's cognitive capabilities are limited, it is considered best to choose the smallest increments possible in order to achieve strategic objectives instead of making detailed plans. Early commitments are kept broadly informative, tentative and subject to later review. This will keep the company open to options. The Logical Incrementalist has the ability to learn from the feedback of the series of small decisions, rather than taking risk with large fundamental changes.

Logical Incrementalism seems to work well in a stable environment of small changes (*statistical uncertainty*) and ditto objectives. Logical Incrementalism is however

susceptible to fail when faced with external changes that shift the basic rules of the game, organizational objectives may have to be reevaluated and/or become unclear for a while.

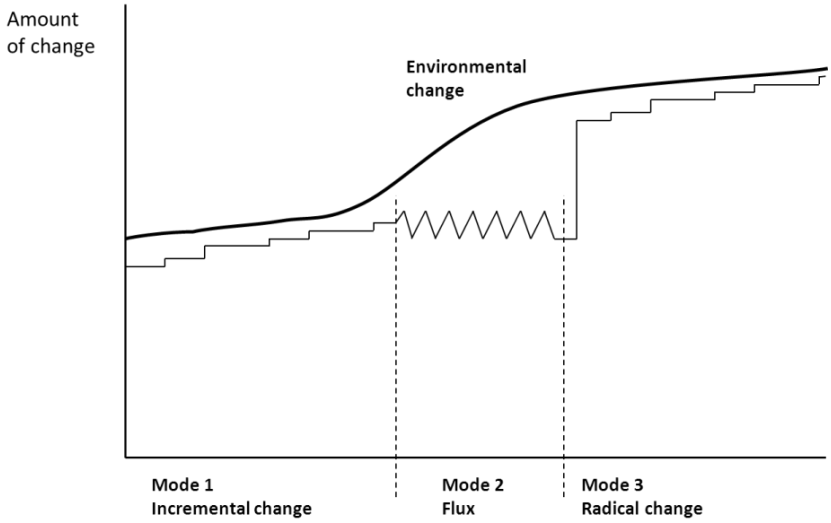

Figure 15, Periods of turbulence (Johnson, 1992).

The illustration shows a graph with the time scale on the horizontal axis, and the amount of change on the vertical axis. The upper curved line symbolizes environmental (contextual) change which, other than the middle section, has a normal rate of change. The jagged line symbolizes the company's response to the environmental changes which, other than de middle section, has the nature of small incremental steps followed by a stable period, named mode 1: *Incremental change*.

When environmental changes are such that fundamental shifts occur and the basic rules of the game change, companies following to mode 1 will learn that lessons learnt from history are no longer valid. The company enters mode 2: *Flux*, wherein it tries to find new ways of doing business. This turbulence may continue for a while since experiments can fail and while doing so time, money, and competitive advantage is lost bringing the company to the point that something radical must be done in order to prevent bankruptcy. Mode 3 *Radical change* is often initiated by bringing in new people that will need to institutionalize radical new ways of working and break with history. The company will survive when these new measures are proven to be right. From this moment on the new regime will revert back to mode 1 Incremental change in order to deal with environmental changes of normal rate.

Political mode assumes that groups of organizational members with competing interests fight for a decision favorable to them. The decision outcome is determined by those who can form the most powerful coalition. Different divisions or departments have different stakes and perceptions and will try to safeguard or achieve their objectives, which can't be done autonomously. Past experiences and history play an important role in goal setting resulting in organizational structures that hardly change (Hickson, 1987) (Amason, 1996). Political mode is omnipresent in matrix- and divisionalized organizations (Hobday, 2000),

as a consequence of the division of labor. The political mode has next to cognitive biases, also affective biases which have their source in group interdependencies and influence games. This makes the political mode difficult to understand for outsiders.

Garbage can mode (Cohen, March, & Olsen, 1972) is the most uncertain and erratic mode of decision-making. Its decision process is reversed to normal decision process. It consists of four components (1) choice opportunities, (2) solutions, (3) participants and (4) problems. Instead of reasoning from problems (ends) towards solutions (means) this process is reversed and *solution entrepreneurs* are trying to sell their solutions to potential problem owners. There is a strong relation with politics because of having vested interests in particular means and the availability of matching problems. What accounts for the outcome of the *garbage can mode* is only timing and chance. The window of opportunity just needs to be open briefly in order to bind existing solutions to existing, and now recognized, problems (Kingdon, 1984) which otherwise remain detached.

The discussed modes of decision-making are different from each other, yet they are not mutually exclusive. Table 3 provides a concise overview of each discussed decision modus with their main characteristics. None of the decision modes is perfect. Each mode is potentially subjected to one or more cognitive and emotional biases (Hambrick & Mason, 1984), for example (1) prior hypotheses and focusing on limited targets, (2) Exposure to limited alternatives, (3) Insensitivity to outcome probabilities, and (4) illusion of manageability (Das & Teng, 1999).

Table 3, Overview of decision modes and their main characteristics.

Decision mode	Main characteristics	Context
Rational	• Availability of time, good knowledge about objectives, options, consequences and ranking. • Optimization.	Preparation, R&D
Logical Incrementalist	• Availability of time, good knowledge about objectives, limited knowledge about options and or consequences. • Small increments by undertaking small experiments	Stable environment
Avoidance	• Limited options and potentially unclear consequences and or ranking. • Maintaining status quo	Changed environment
Political	• Limited autonomous power • Coalitions	Interdependencies between peers
Garbage Can	• Limited time, options and control over decision making process. • Decision windows	Danger

These different decision-making modes can be seen in action in the following hypothetical case. Assume that normally a company makes decisions in the *Logical Incrementalist mode* in order to handle day-to-day decisions in a relatively stable environment. The company will switch

to *Avoidance mode* as soon as it realizes that something unexpected has occurred, which is not well understood, or the list of available options is limited and possibly controversial. Wait and do nothing is preferred over taking risks, hence the name of this mode. Time goes by and the performance of the company has deteriorated because of the external changes and avoidant decision-making. The mode of *garbage can* decision making is entered, current available ideas are put on the table and a decision will have to be made based upon these options. Where does *Rational mode* fit in this hypothetical case? It can only exist in parallel R&D like structures studying, preparing ideas in order to develop strategic alternatives for possible future needs. *Political mode*, which is ever present through all these hypothetical stages, amplifies the effects of *Incrementalist mode & avoidance mode* since it is internally directed instead of outwards.

Understanding business decision-making is key to solving the problem statement from chapter 1. It is important to recognize the various aspects of decision-making such that the modus operandi is facilitated in a most optimum way. The research literature provides ample information about the internals of decision-making. How to elicit of the problem owner's decision-making behavior and preferences is considered to be a knowledge gap in the current research.

2.3 Seizing: Policy options for increasing level of ambidexterity

This paragraph discusses four Contextual Vigilance principles found in literature as policy options. Since the majority of the policy options concern specific arrangements in organizational structure, each option is illustrated by means of a structural diagram to highlight the essential structural differences.

2.3.1 Do nothing

The context for long term objectives is inherently uncertain. The question whether short term objectives need to be sacrificed in order to increase the chance on a more sustained business model is not easy to answer. There are many uncertainties and unknowns with respect how the market could evolve, own objective functions, organizational capabilities, etc., which may (perhaps rightfully so) reduce any hope on being able to prepare the company in advance.

Following this reasoning, "doing nothing" and only react when events have unfolded and others' have found good answers, is a tempting strategy. It allows the organization to fully gear itself in exploitation modus with maximum chance on meeting short term objectives and survive another day.

From a psychological perspective "doing nothing" often is a favorable course of action, perhaps especially in established and conservative contexts. This may be influenced by decision makers' cognitive biases such as regret (Zeelenberg, Beattie, Pligt, & Vries, 1996), conformation (Nickerson, 1998), anchoring (Tversky & Kahneman, 1974), overconfidence (Koriat, Lichtenstein, & Fischhoff, 1980), or accountability (Ackoff, 2006).

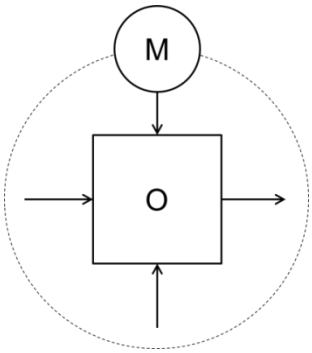

Figure 16, illustration of "doing nothing" option.

Doing nothing is illustrated in the above figure as an activity, box "O" representing operations, which produces output based upon inflows from within the context, depicted by the hashed circle. Operations is controlled by management, depicted by a continuous circle "M", who is positioned on the context's perimeter, being responsible for sensing, seizing, and reconfiguring. There is no provision to actively engage in explorative activities which effectively symbolizes an organization that focusses exclusively on exploitation. The policy option *Do Nothing* can be a consequence of avoidance decision-making (retaining the status quo), see paragraph 2.2.

2.3.2 Structural Ambidexterity

Structural Ambidexterity, uses dedicated organizational departments working (independently) on competing alternatives/strategies, which are likely to be mutually exclusive in terms of technology, organization, culture, etc. but operate as competitors in the same market (Benner & Tushman, 2003), (O'Reilly & Tushman, 2004). Such departments may belong to the organization's techno structure (Mintzberg, 1983), and work concurrently on competitive technologies and/or practices such that the organization as a whole is working on multiple options. Most scientific literature on Structural Ambidexterity stems from manufacturing-, product-, or technology related industries where short time-to-market is a key differentiator. Project-based service organizations do not require to develop conflicting technologies/strategies in parallel as much as product related industries do, however face a similar-like conflict with respect to balancing between making money now and to prepare for later. To accommodate this *Structural Ambidexterity* may be utilized to work on both options concurrently. The dedicated new organizational units are then separated which allows the differences in interests, competencies, and organizational control to coexist such that departments do not have internally conflicting/inconsistent roles.

An extra structure however also introduces short term cost with uncertain distribution of returns in the long term. In addition the split across departments inherently requires additional coordination effort to allow diffusion of knowledge, which creates cost and introduces risk of dependency conflicts in time and space between operating core and techno structure due to differences in priorities and mindset.

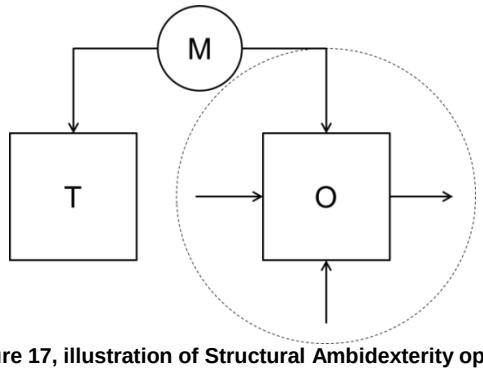

Figure 17, illustration of Structural Ambidexterity option.

Structural Ambidexterity is illustrated in the above figure. Compared to "doing nothing" an extra unit "T" is created, placed outside the context of current operations "O", which is responsible for sensing related activities with regards to operations and its context. Both operations and the techno structure unit are controlled by management "M" who remains positioned on the context's perimeter, being responsible for seizing, and reconfiguring.

2.3.3 Sequential Ambidexterity

Sequential Ambidexterity, also known as vacillation (Boumgarden, Nickerson, & Zenger, 2012), or punctuated equilibrium (Gersick, 1991), concerns alternating between different organizational forms (e.g. explorative, exploitative) in order to reap benefits from each mode separated through time. Alternation avoids negative externalities between both organizational structures when operated at the same time (Boumgarden, Nickerson, & Zenger, 2012). The purposeful switches between different organizational forms is done relatively abruptly, which allows the organization to make leaps between various states which are otherwise difficult to combine or migrate to; switching is preferred over combining/migrating in favor of total performance (Boumgarden, Nickerson, & Zenger, 2012) because firms can more easily switch formal structures than change culture and informal organization. When switched from e.g. a centralized to a decentralized mode, an organization is allowed to fully explore new opportunities collectively without being limited by 'old' organizational control philosophies, reward systems, markets, technology, resources, etc.

Sequential Ambidexterity introduces switching costs and operational risk during switching, which should outweigh the risk of diminishing returns or even loss when continuing operating the current way. Sequential Ambidexterity also brings forward engagement of leaders recognizing and exploring new opportunities and gain important insight on existing- , potential-, and required organizational capabilities, which accelerates double loop learning (Argyris, 1976), which is needed in case of paradigm shifts (game changers).

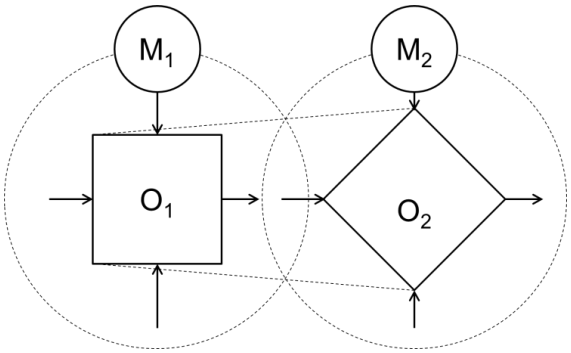

Figure 18, illustration of Sequential Ambidexterity option.

Sequential Ambidexterity is illustrated in the above figure. Compared to "doing nothing" the whole organization is changed (depicted by the tilted activity, and the 2 sub script at both operations and management) such that it can realign itself in the changing, changed, or even a different context. This may implicate that all interaction points, including internals, may change, which contributes to multi-level learning, and knowledge with respect to seizing and reconfiguring activities.

2.3.4 Contextual Ambidexterity

Contextual Ambidexterity is achieved by building a set of processes or mechanisms that enable, encourage, and reward individuals or subsystems to divide their time between conflicting demands for exploration and exploitation (Gibson & Birkinshaw, 2004), (Tushman, Smith, & Binns, 2011). The difference with Structural Ambidexterity is that no additional organizational structures are required, which lowers cost, coordination, and controlling effort. With Contextual Ambidexterity, ambidexterity is pushed downwards in the existing organizational structure up till individual level, which allows better alignment and diffusion of exploitation and exploration knowledge. Precondition is (1) that at individual level it is accepted that their organization is aligned and adaptable, and (2) a loose-tight model that provides trust and stretch and discipline into organizational targets (Gibson & Birkinshaw, 2004). Individuals must additionally have competencies, or room (stretch) to develop them, that allows to them to explore and assess impacts/consequences of findings against organizational objectives or meta-routines. Contextual Ambidexterity can therefore be qualified as bottom-up because of the potentially emerging nature of innovation from the work floor level, whereas structural and Sequential Ambidexterity cab be qualified as top-down because of intentional (re)arrangements of organizational units in order to foster innovation.

Contextual Ambidexterity is, because of the low cost and absent need of organizational restructuring, a viable solution for project-based organizations that face high uncertainties in projects (Eriksson, 2013). Moreover it is contended that structural and sequential separation of exploration and exploitation activities at business unit-, project portfolio-, and project levels do not solve the paradox, due to lack of integrating mechanisms (Eriksson, 2013). The organic and evolutionary nature of exploration at lower organizational levels provides room for micro-level

developments but lacks coordination and decision mandate to deal with disruptive or discontinuous changes in technology and markets (O'Reilly & Tushman, 2013).

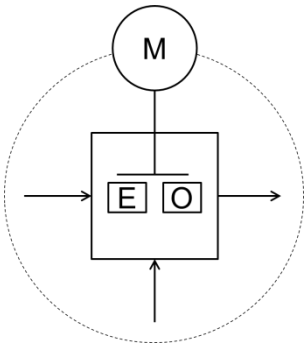

Figure 19, illustration of Contextual Ambidexterity option.

Contextual Ambidexterity is illustrated in the above figure. Compared to *Structural Ambidexterity* not an external unit, but additional room is created at existing units (depicted by the extra "E" box, such that units have room for both exploration and operating in the same context. Both roles are controlled by management "M" who remains positioned on the context's perimeter, being responsible for seizing, and reconfiguring.

2.4 Conclusions

This chapter answers research question 1.1: "*What current scientific state-of-art knowledge is available to support the design of Contextual Vigilance policies?".*

A general conclusion is that scientific literature, relevant for Contextual Vigilance, is found to be comprehensive both in size and diversity, spanning a period of about six decades including recent publications, which suggests that these topics have been, and remain to be, relevant in contemporary history. The required knowledge for Contextual Vigilance is an intersection of multiple theoretical domains for which marginal applied scientific material is available. This is perhaps of (1) its strategic importance, or (2) the specifics that need to be considered for application in business environments. Other specific findings are listed below:

Absence of practical literature, or readily available/applicable solutions, what possible threats are relevant? What actions can be defined that will prevent or minimize perceived negative consequences? How can these actions best be positioned alongside established organizational activities? What may vigilance cost? All these questions are relevant to the problem owner and cannot be answered via literature research.

Many of these knowledge gaps need to be reduced by the problem owner self and should be reevaluated and updated in regular intervals over time. The solution for the problem owner is henceforth not a static answer but a process that will run continuously with an appropriate intensity, depending on organizational capabilities and external developments. I'll coin the design of such a process *Contextual Vigilance policymaking* or abbreviated: *CV policymaking.*

The absence of readily available/applicable know-how or solutions justifies the planned subsequent research activities (CV policymaking case study, CV policy recommendations).

Prerequisite of organizational decision-making mode, it is important to understand that subsequent research activities can only be of relevance to the problem owner when his/her current decision mode is either rational or logical incrementalist. The benefit of scientific research for political or garbage can decision modes is questionable, and for avoidance decision-mode perhaps even useless.

Candidate Contextual Vigilance policy options, are expected to be found in organizational structure, each with different characteristics in terms of investments, control mechanisms, and performance. Three candidate policy options have been identified via literature research: (1) *Structural Ambidexterity*, (2) *Sequential Ambidexterity*, and (3) *Contextual Ambidexterity*. This needs to be complemented with the ever present option *Do Nothing*, totaling to a total of four policy options. Which policy options are favored will depend greatly on how they score for the problem owner (project-based organization) for relevant futures.

Criteria for comparing Contextual Vigilance policies, policy options must evaluated by the decision-maker, which requires performance criteria that can be positioned at the same level as current operational performance criteria. Literature suggests, (Cohen & Gooch, 1990), (Teece D. , 2007), that in order to increase the chance on sustained competitive advantage intentionally (i.e. planned and managed), one must master three non-core activities: *(1) sensing, detection of relevant threats & opportunities*, (2) s*eizing, deciding on alternative, or new strategies*, and (3) *reconfiguring, implement change*, which (together) form Contextual Vigilance. These activities are expected to be operationalized outside (or at least additional to) the operating core since these activities have different objectives, input, tools, and methods which are difficult to consolidate in the operating core without introducing negative externalities (Eriksson, 2013). Therefore Contextual Vigilance goals need to be separated from operational goals because they serve different purposes.

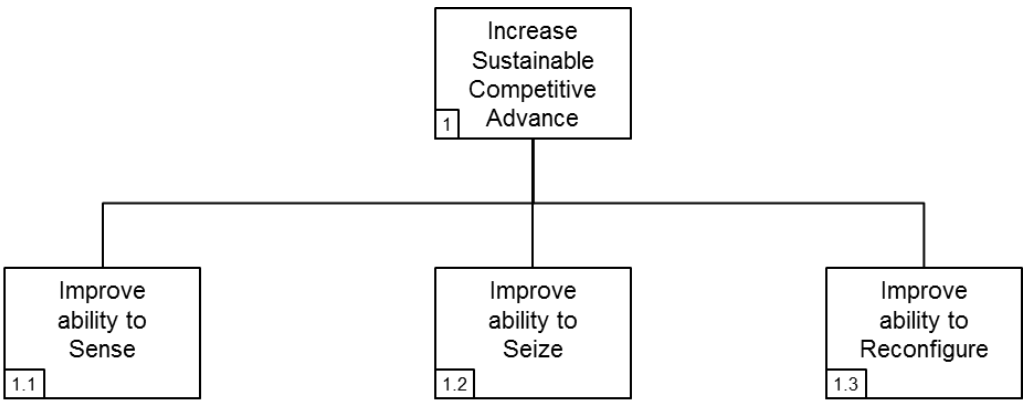

Figure 20, Goal tree Contextual Vigilance, derived from (Teece D. , 2007).

The illustration above visualizes the inferred goal tree that is believed to be relevant for explorative activities. Goals are visualized by means of boxes and the hierarchical relationships by means of lines, the break-down starts with the highest level at the top side of the diagram. A goal can be a specific level (e.g. a 20% increase per year) or a sense of direction (e.g. more, less, or equal of something). A goal may be quantifiable but also qualitative. Reading the hierarchy downwards, one can ask “how” before traversing one level down, and “why” before traversing one level up. The sub objectives listed correlate exactly with the Contextual Vigilance activities, and therefore form the criteria for successful implementation of Contextual Vigilance.

2.5 Methodology

Since it is considered undesired and impossible to experiment with the organization, two alternative sources of input will be considered: (1) expert opinions of Senior Management, and (2) scientific literature in the domain of organization science and future oriented studies.

First phase concerns information gathering via literature survey, aimed to learn more about state-of-the-art scientific knowledge with respect to usable methodologies and/or insights from research targeting EPCm or affinity project-based organizations. Journal databases and Google scholar are used to find articles, initially via keywords and later via referenced literature from those articles that are found interesting for this research. Main search objective concerns finding relevant policy options and experiences with regards to their performances and/or constraints.

Second phase concerns information gathering via interviews with Senior Management which is aimed to elicit opinions and insights with regards to the research topic and relevant aspects of the organization, which will be logged in interview reports, and formalized in System Analysis models like: Stakeholder model, Goal tree, Causal diagram, etc. Interviews are intentionally designed to use open questions such that the interviewee can share the information he/she deems relevant. Detailed follow-up questions may be used to limit undesired digression or stagnation. Interviews will always end in an open question on who else can be interviewed.

Third phase concerns synthesis of the gathered information (System Analyses models, interview impressions, scientific literature) into intermediate outcomes such as decision criteria and factors influencing policymaking. These (together with the gathered information) are used to construct the scenarios such that they will be recognizable and appear plausible to Senior Management.

Fourth phase concerns validation which involves a complete review of the collected system information, the compiled scenarios and their impact on the decision criteria. Further refinement is possible by reiterating through previous phases when required. When found valid, conclusions and recommendations can be formulated.

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3 CV policymaking case study part I: System Analysis

This chapter elaborates on the first part of the Contextual Vigilance policymaking case study: System Analysis. The first paragraph discusses how contextual vigilance currently is organized; the subsequent paragraphs discus outcomes of the system analysis: stakeholders and their interests, business activities, business objectives, and the business model.

These findings are obtained via interviews, which were held between March 2013 and January 2014 with persons from the following positions:

- Human resources
- Manager of Engineering
- Manager of Projects
- Vice president Global Supply Management
- Director Business Development
- Vice President Technologies
- Vice President Operations
- Group Vice President Operations
- Quality Manager Mainland Europe

These person's responsibilities span the realms of technology, human resources, sales, operations, and quality at various management levels for Jacobs Nederland b.v. or have been working for Jacobs Nederland b.v. in similarly roles in the past. The interviews usually lasted up to one hour. An extensive overview of the interview reports is available in appendix B. The following paragraphs consolidate the interview outcomes using system analysis discussed in paragraph 1.5.2.

3.1 Current Contextual Vigilance

This paragraph elaborates on how Contextual Vigilance currently is operationalized in the organization.

3.1.1 Problem perception

The series of interviews learnt that all interviewees recognize the organization's vulnerability to external change. The general consensus is that the pictured problem settings is a plausible one, however not recognized as a concrete and eminent threat that requires action in the short term. In a number of interviews the response was that the interview should be redone when the interviewer brings in a number of clear and concrete examples.

This is except for one interviewee who perceived the topic to be a realistic issue and prepared the interview with a list of measures that, in this person's eyes, should be undertaken in order to reduce risk of responding inadequately to external change. Interesting detail from the latter example is that this particular person nowadays is acting on a global level which enables a

better perception distance regarding the Dutch office and comparison with its peer offices whereas the majority of the 'plausible but not concrete enough' group is working in the Dutch office. This difference in perception can perhaps be explained by two phenomena (1) limited or biased (over)view when working in the same scope which needs to be subjected to self-scrutiny, and (2) strategic behavior as a result of preventing outside interference or loss-of-face when performing self-scrutiny in a collective setting.

When asked who is monitoring external threats or opportunities, the often heard answer was that this was formally embedded through Business Development (Sales), who holds periodical meetings and partly informally, emerging from individual observations or ideas. This introduced the notion of formal (through dedicated business activities and responsibilities) and informal (non-organized) Contextual Vigilance, which are discussed respectively in the subsequent paragraphs.

3.1.2 Formal implementation of Contextual Vigilance

The formalization of Contextual Vigilance through Business Development (Sales) seems a logical choice because Sales is one of the departments which by design has an outwards oriented focus, being able to monitor and detect business opportunities in the market. A follow-up interview with the head of Sales learnt that weekly, perhaps day-to-day when necessary, consultation between the Group Vice President (GVP) and the head of sales. Sales convey the observed signals (threats/opportunities) which are evaluated and potentially connected to follow-up actions targeting both operations and sales activities.

This does not however cover the full scope of Contextual Vigilance practices such as monitoring for specific new threats or opportunities which may emerge from outside the scope of normal interest. Sales has a very specific focus namely finding and selecting client requirements that can be matched to the organization's capabilities and appropriated for winning new contracts. EPCM services for the Oil & Gas industry are regarded as a seller's market. The pool of potential projects is substantial and Sales is more concerned in finding the right projects that match the organization's capabilities and profile, instead of bidding for a limited set of offered projects with a lot of competitors.

This suggests a limited view and that it is likely that only specific change will be detected that actually have come through via client relations which are a form of indirect measurement. Consequence of indirect measurement for these needs via clients, is that clients (un)intentionally can act as a filter and/or delay mechanism. It is debatable whether an indirect, filtered, and delayed measurement will yield a genuine sense of security for external changes.

Limiting factor in this are confidentiality agreements that sales has to respect to (potential) clients. This means that not all known information can be disclosed to operations, which leaves operations with incomplete knowledge.

Another limiting factor is that Jacobs, despite its relationship orientation, works in a setting in which it is often led by the client, instead of working with the client. The former is a much more

transactual relationship where little information is exchanged about the client's higher objectives/concerns. This does not allow much room for sensing and proactive activities which are seen in the latter situation. Working with the client results in more involvement, and increases the chance of creating more added value for the client, but also for Jacobs the opportunity to explore adjacencies.

This limitation is related to the fact that the Oil & Gas industry has no dominant players. Jacobs might be big, but has no different stake in the Oil & Gas market when compared with many of its competitors. This is different for the Bio-Pharma industry, where Jacobs is seen as the business leader. This attribution comes with the added bonus that clients share more strategic information with Jacobs since it is clear that the relationship is of a more permanent nature. The relationship orientation is in these cases bi-directional.

3.1.3 Informal implementation Contextual Vigilance

Informal networks have different characteristics. On one side they are ideal for detecting and acting upon things that are not covered by formal organizational structures and procedures. On the other end informal networks are unmanaged and henceforth difficult to rely on. There is no coordination mechanism that ensures that certain areas are covered. It may be difficult for individuals to come forward because e.g. it is unclear where to address signals or have difficulties to act for such vacant organizational responsibilities (Kroesen, 2008) which might demand specific knowledge, personal effort or even risk taking. Informal networks are not tangible, clearly defined, consistent, nor operate in a continuous form in the same time and place. This fragmentation is caused by the dynamics in the composition of project teams and in formal organizational structures.

For Jacobs Nederland b.v. three sources for informal Contextual Vigilance activities are believed to be relevant: (1) project team members who (in individual projects) detect information and potentially discus and diffuse this information with others in the project team, CoP's, or functional organization, (2) circulation of personnel in the functional organization, project teams, or even with outside organizations who then introduce different perceptions, ideas, and/or methods acquired in other departments or functional roles from within the (similar-like) organization, and (3) diversity (culture, gender, age, experience, education, etc.) amongst personnel from outside the region, industry, etc.

3.1.4 Relevant threats and/or opportunities

When asked for examples wherein the organization would be vulnerable for, relatively few strongly formulated hypotheses were brought to the table. Client relationships ruled the table, only a few times technology topics such as shale gas, or political charged issues such as nuclear energy were mentioned, this (admittedly) only after the "*what other examples can you think of?*" question was raised. Examples of client related topics are: homogeneity in client organizational structures, reputation in client networks, and client contract negotiating dilemma's.

In some cases interviews even stagnated during these questions. It was clear that there was a misalignment between the research topic and the interviewee's daily concerns. It was in such occasions that the interviewee indicated that he/she was happy to participate in such interviews but in order for them to contribute more meaningful, tangible examples needed to be brought to the table.

This reveals the organization's primary operational focus: *the client*. Which is not unexpected in a service oriented organization where the services offered need to match (both qualitatively and quantitatively) the ones required by the client. However it also revealed that not so much else is being observed and thus no significant other form of knowledge than direct client related knowledge is acquired and discussed in the organization.

3.2 Stakeholder network

This paragraph elaborates on the results of the actor analysis elicited from the interviews held. Actor analysis assists in providing insight in involved parties and their behavior operating in a network from which they are e.g. dependent and/or can create advantage from, hence the term stakeholder is used. Parties are purposeful groups, whose involvement is influenced by own knowledge, interests, objectives, strategies, priorities, and value systems, which inherently may vary in time. This variation in own behavior can be influenced directly by (1) changes to the network (parties entering or leaving), (2) behavioral changes of other parties in the network, or indirectly due to contextual changes from outside the network(s) the parties are involved in. Involvement should be seen as having a stake in attaining a status quo in e.g. the distribution of power, assets, finance, or other's behavior, or reversibly, having a stake in change that favors own interests.

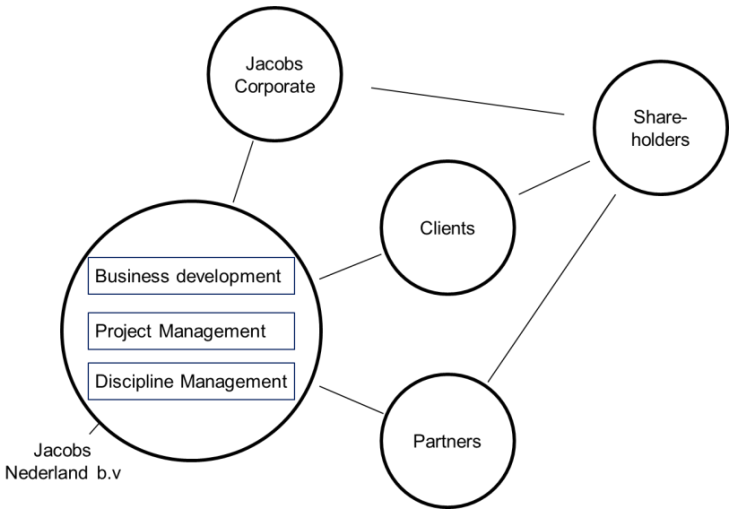

Figure 21, Actor analysis comprising both external and internal scope.

The actor analysis executed during the interviews is visualized in the illustration above. Jacobs Nederland b.v. is used as the primary point of departure, the analysis focuses both outwards (external) and inwards (internal). The actors' characteristics are elaborated in the following paragraphs.

3.2.1 External actors

The outward looking analysis involve peer (external) actors depicted by circles which are operating at the same level but are extern to Jacobs Nederland b.v.

Jacobs Corporate is responsible for generating sustained growth for her shareholders by offering a broad range of EPCM services through its local subsidiaries to clients worldwide that require such services in order to enhance clients' business activities. This is accomplished by (1) emphasizing on Jacobs' core values (Safety, Growth, Relationships, and People) towards shareholders, clients, and local subsidiaries, (2) emphasizing on diversity with regards to markets, clients, and locations in order to diminish the effect of specific market fluctuations, and (3) emphasizing on lean operations and techno structure in order to maximize revenue by eliminating waste and distribution of work across high value offices.

Shareholders have a financial interest in the performance of businesses, they are responsible for maximizing capital gains from investments in firms, either financed with own capital or that of others via broker constructions. Maximization is done by relocating funds (e.g. by selling and buying stocks) of firms, commodities, bonds, etc. that are expected to yield a profit in accordance with the targeted time interval. With many options to choose from shareholders are always evaluating the performance of current investments and exploring for better alternatives in global financial markets. Shareholders can easily enter or exit investments and may invest in Jacobs, Client-, Partner firms, Competitors, or completely different markets when technical services are not yielding enough revenue.

Clients have an interest to sustain or to expand their business performance. Relevant for Jacobs is that client's utilize technical facilities in order to create value for their customers. Unlike Jacobs, who is a service provider, Jacobs' clients are normally producers of goods or raw materials on location, based upon petrochemical, chemical, pharmaceutical production principles. Clients will invest when (1) regulatory requirements have to be met with regards imposed rules and regulations (e.g. safety, environmental, etc.) in order to be allowed to continue operations, (2) upgrade/maintenance of current production facilities is required to meet demand from incumbent markets, (3) creation of new production facilities in order to open up new markets. When investing, clients may require various technical services in different stages. These required services can be awarded through projects to service providers like Jacobs. Depending on the nature and scale of such projects clients may award portions to other parties in order to reduce risk or to shorten the time-to-market. Clients are in turn often also local subsidiaries of global operating firms.

Partners are horizontally equivalent firms or vertically operating firms that work together in a temporal arrangement for the duration of one or more projects for the same client. Horizontally equivalent firms are normally competitors, but for strategic reasons team up

for the same client. Partners may also be vertically equivalent firms like vendors, fabricators, constructors, etc. Partners may also be fellow Jacobs offices which can provide additional resources or knowhow not available to Jacobs Nederland.

Jacobs Nederland, as a subsidiary of Jacobs Corporate, is responsible for delivering growth in revenue for Jacobs Corporate by providing technical services to clients that typically stem from the geographical area and/or line of business Jacobs Nederland is working in. Jacobs Nederland attracts skillful resources from local and international labor markets in order to be able to deliver the required services both in quality and quantity. Jacobs Nederland competes both on the labor market and the client market with competitors.

All external actors have the interest of creating revenue in free markets. Where markets overlap (e.g. client – Jacobs Nederland b.v.), a balance is found in dividing costs and profits, when costs are too high or profits too low, search for other (more attractive) relationships is initiated. These relationships can be qualified as repetitive and interdependent. Exception to this is the relationship between Jacobs Nederland b.v. and Jacobs Corporate. This relationship is different because (1) the relationship is more dependent than it is interdependent because of hierarchical relationships, and (2) there is not easy enter or exit possible.

3.2.2 Internal Actors

The inward looking analysis involves main organizational actors (departments) in the figure above depicted by rectangles within actor Jacobs Nederland b.v. Internal actors are included in the analysis since collectively they will be subjected to contextual vigilance policies and will have to act accordingly with respect to vigilance and forthcoming decision-making and implementation when applicable. They have a role and stake in organizational decision-making and organization's capabilities. Internal actors basically form the primary focus area where external actors do influence internal actors via a contextual construction.

Project management is responsible for customer delight. This essentially means that it is the objective that customers should be enthusiastic with regards to the services delivered. This may theoretically be achieved by: (1) completing under budget, (2) completing within time, and/or (3) delivering more value than requested. The actual ingredients for customer delight may very per customer, or even vary over time for the same customer. It is the project manager's challenge to: (1) elicit the customer's needs & expectations, (2) obtain and allocate required resources from the organization's discipline pool or from outside, and (3) monitor and coordinate activities on quality, budget, and time, resources, progress such that customer delight is achieved (and maintained). With limited resources, both from supply and demand side, this responsibility may come with a lot of tensions because of conflicting interests.

Discipline management is responsible for managing a workforce that is (1) billable such that revenue can be generated, (2) experienced and knowledgeable such that they can fulfill service demands, and (3) flexibly employable to various projects (clients and locations).

Disciplines are subdivided in a number of domains (Process, Mechanical, Instrumentation, Piping, Civil, Electrical, etc.), each requiring different training needs and volume to meet demands. Depending on contract terms and or the phase a project is in, more or less personnel is required from different disciplines. It is the discipline manager's challenge to (1) ensure that a proper balance is maintained between personnel available and required, and (2) fluctuations in demand are compensated by employing contractors from agencies who work on short-term basis contracts.

Business development is responsible for acquiring enough billable work through low risk projects from clients that are fit for the organization, both with respect to its capacity and capabilities. The term 'Business Development' usually relates to innovation activities, however in Jacobs it is used to describe sales activities. Business Development or Sales faces challenges to obtain enough contracts from existing relations and additionally new clients when existing relations do not yield enough volume. This especially with respect to new clients where Discipline management faces difficulties in offering (1) required competencies, and/or (2) required workforce volume. This is the typical organizational pull between the outwards oriented sales department and a consolidating operational core.

Employees have an interest in job security, satisfaction, and maximizing wage paid for labor. Employees try to improve their remuneration by investing in knowledge, competencies, connections that are valuable for *Project management* and/or *Discipline management*. Contractors are excluded from this group.

Internal actors have a joint stake in the firm's success, however have different objectives such as project delivery (which is discontinuous) by project management and high billability rates (which is continuous) by discipline management. These relationships can be qualified as repetitive and interdependent.

3.3 Business activities

This paragraph elaborates on the technical services that Jacobs Nederland offers, how they adhere to globally defined patterns, and in what configurations they are executed. Projects are the primary means of generating revenue for engineering organizations. A project is a planned undertaking, with a clear begin and end, which aims to achieve specific results through a series of activities that are dependent on each other. Both the management of and execution of these activities are part of the range of technical services provided by Jacobs Nederland b.v. This offering of technical services occurs in a free market, there are many buyers and sellers, low barriers to enter or exit, and transparency with regards to the products, services, and prices. Next paragraph elaborates on the anatomy and characteristics of projects in the petrochemical industry.

3.3.1 Project patterns

The way how projects are being executed in the petrochemical industry is commonly structured in seven phases, each representing a specific state a project has to accomplish in

order to accomplish objectives. This pattern is recognized by clients, partners, and peer organizations and thus forms a de-facto standard in how projects can be disentangled.

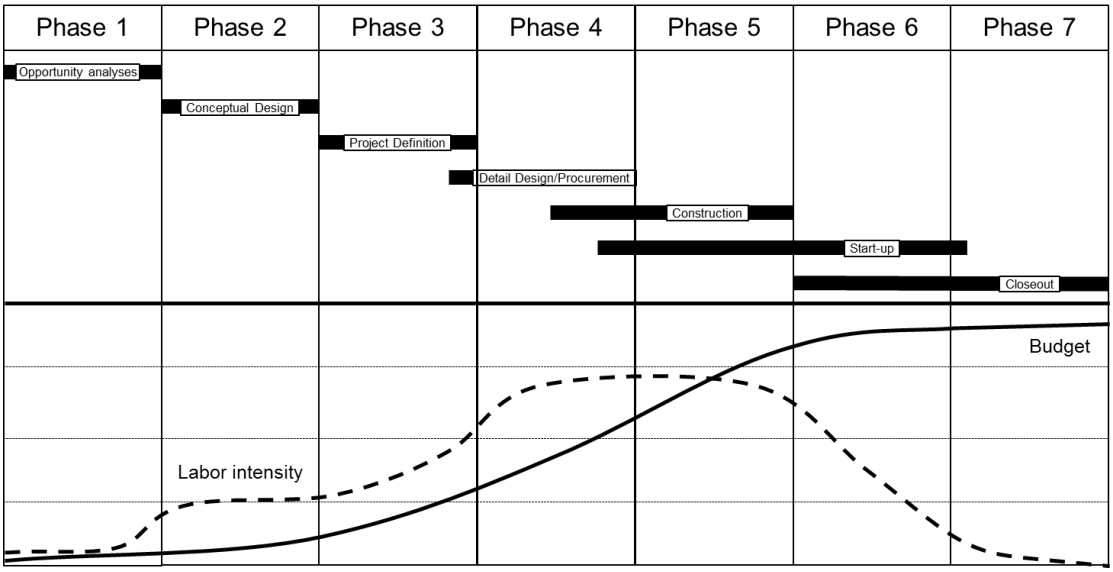

Figure 22, Seven project phases in the petrochemical industry.

The figure above illustrates seven commonly recognized project phases which can best be explained from a client's perspective because each phase may be awarded to different service providers, not all projects will complete the full execution chain, or may execute all phases in a consecutive manner; this continuity is highly related to the opportunities the client has in the markets which it is operating in. Phases are represented by columns that are arranged in a chronological sequence reading from left to right, based upon an increasing level of concreteness, ranging from ideas that initiate projects to start-up and evaluation activities at the very end of a project. Typical activities are represented by horizontal bars, which may also be executed in earlier- or extended to later phases in order to meet overall time constraints.

On the lower side of the figure an oblique sinus, with continuous line format, illustrates the increase of the budget up to the Total Installation Cost (TIC), or Budget At Completion (BAC) over all phases, seen from client's perspective. Main cost elements are purchasing of equipment, material, and hiring of staff. Another aspect, visualized by the dashed curve, is the magnitude or intensity of the labor volume required in each phase. This represents the potential volume of billable hours typical for each project phase, seen from the service provider perspective.

The seven different phases discussed are: (1) *Opportunity analysis*, this phase involves identification of potentially beneficial business opportunities and perform an initial analysis, scoping and order of magnitude estimate to determine whether opportunities are worth further investigation; (2) *Conceptual design*, which continues investigating one or more identified opportunities by selecting best of identified project approaches, analyze concept(s) and prepare study cost estimate, to confirm project viability; (3) *Project definition*, which continues on confirmed viable projects by finalizing technology, project objectives, process and design scope

definition, major equipment pricing and project execution plan to support a budget cost estimate and funding request; (4) Detail design/procurement, which continues conform the project execution plan. This is the phase wherein most of the technical design activities take place which are necessary for procurement, construction, commissioning and startup in the next phases. Long lead items (engineer to order items that will require long fabrication and delivery times, such as complex columns, compressors) will be procured such that they can be delivered on time; (5) *Construction*, which mobilizes and manage the construction forces and perform other activities including procurement necessary to construct the facility in accordance with the construction documents; (6) *Start-up*, which involves execution of commissioning and operating activities required to achieve design performance levels; (7) *Closeout*, which performs regulatory, contractual, archival and Jacobs required activities to close the project in an orderly manner.

3.3.2 Partnership projects

Partnership projects are different from normal projects with respect to the exclusiveness of the services provided and its coordination. Normally a project phase or multiple phases are awarded to a single organizational entity. Project phases that require large volumes of finance (e.g. phase 4, *Detail Design* and phase 5, *Construction*) can be granted to multiple engineering firms in order to spread risk and/or reduce throughput time. In such cases competitors team up and jointly fulfill the services required by the client's project. This is possible because of standardization of project execution and the engineering activities within. This demonstrates that engineering service providers are interchangeable and that it is difficult for single players to innovate radically because they have to maintain compatibility with all external parties, including the client.

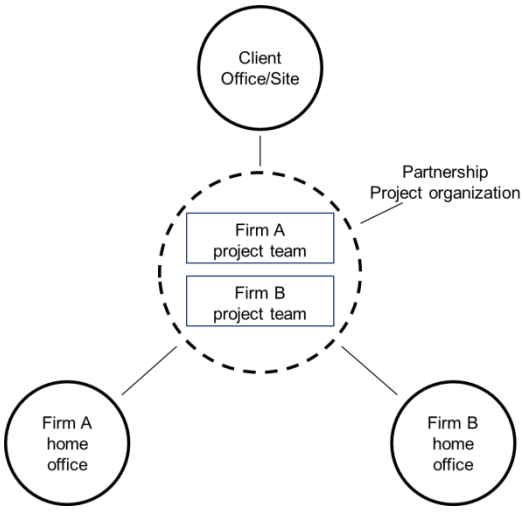

Figure 23, partnership projects.

The figure above illustrates how partnership projects are organized. The central dashed circle represents the partnership project organization which comprises two or more engineering service providers, represented by the boxed Firm A & B project team inside, who jointly work for

a client, represented by the top circle. These boxed project teams have their functional basis in their respective home office represented by the bottom circles.

The lines between the circles represent the communication lines, and the illustration demonstrates that all communication between the parties goes through the partnership organization. This reduces the risk of accessing sensitive information between the partners, and reduces direct influence of individual service providers towards the client. Effectively partnership projects are situated at a neutral location, preferably close to the client's site. Computer networks are generally autonomous which means that there are no direct links between home offices and the project office such that digital communication is limited to e.g. email via the Internet.

This implicates that the workforce is working in an isolated manner from the home office, following locally defined standard operating procedures as the result of the agreed split of work and client specific circumstances. Partnership projects are projects that typically have a long duration and comprise about 20% of total billable working hours.

3.3.3 Work share projects

Work share projects are projects wherein the labor and expertise is not divided over competitors such as in partnership projects, but divided over multiple Jacobs offices. This division of labor may be economic, expertise, and/or time schedule driven. The contracting office will be the lead office in communication, management of activities, and be overall responsible for project performance.

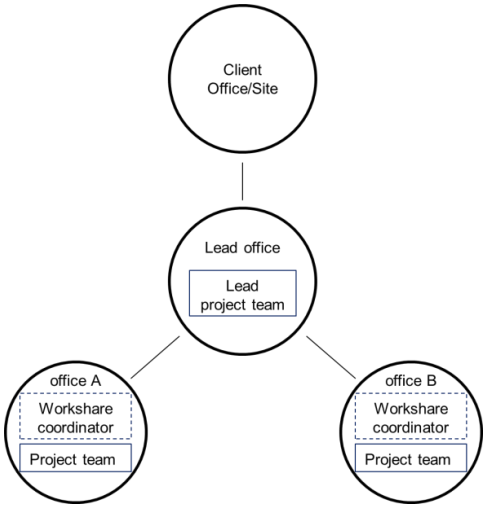

Figure 24, work share projects.

The figure above illustrates how work share projects are organized. The central circle represents the lead office which comprises the lead project team depicted by a box within. The lead office will be responsible for project performance and will delegate work to other Jacobs offices, depicted as office A & B in the lower circles in order to be able to fulfill expectations. All communication goes via the lead office, since the joint collaboration can be temporal and/or affects project deliverables that require to be aligned with activities executed by other offices.

Depending on the intensity of the work share and the cultural differences, lead offices may designate a work share coordinator at the work share office, depicted by the dashed box in the work share office. These work share coordinators are normally based in the lead office, but now fulfill an outpost role of to ensure good liaison between the offices.

Work share projects introduce extra coordination, however are favored when (1) projects demand a high volume of labor for a limited amount of time which cannot be accommodated easily locally, (2) project activities demand specific expertise which is not available locally, (3) projects demand lower rates for the services offered which can then best be executed in high performance (read low cost) centers, or (4) project schedules requires high labor throughput in small time frames whereby utilizing resources in other time zones becomes a means to offer 24h-like services. Work share projects are projects that typically have a short to normal duration, but occur about 80% of the total turnover.

3.3.4 One-off projects

One-off projects are projects that are executed for clients from whom it is likely that no new projects will be awarded in the near future, or have been in the past. One-off projects are also known as discrete projects. The corporate strategy is to emphasize on long term relations, and one-off projects do not necessarily fit in that strategy. One-off project are however accepted for the following reasons: (1) global clients from other regions require engineering services in this location which best can be executed by the local office, (2) local shortage of preferred project types lower the threshold of offering engineering services to one-off clients in order to maintain an acceptable level of billability, (3) potential acquisition of new relations by executing one-off projects.

Staffing one-off projects is relatively easy in times of shortage of projects, however is a challenge when there is no shortage because all talented personnel is already assigned to running projects. In any case the project teams are formed for this instance and can be qualified as ad-hoc project teams, since chances are low that similar constellations will reoccur in the future. Ad-hoc project teams, new client standards and expectations introduce a higher risk factor then normally. The risk factor is even further amplified when the project is accepted on lump sum terms, which introduces the effect that cost overruns will not be reimbursed. For this reason lump sum (fixed price) projects are avoided when possible.

One-off projects are also known as discrete projects because of their inherent non-repetitive character. Despite the intentions to establish long term relationships via one-off projects, however marginal one-off projects result truly in the desired long-term relations. One-off projects are projects that typically have a short to normal duration and comprise about 15% of total billable working hours.

3.3.5 Framework projects

Framework projects are projects that are derived from an overarching agreement to acquire a certain volume of technical services dispersed over a certain time frame. A Framework

agreement is not targeting specific engineering services like normal projects do, but defines an intention to acquire engineering services for activities which are to be determined later on. Framework project agreements can span multiple years.

The philosophy is that the client estimates a certain volume of services required within a certain time frame. This allows the offering service provider to reserve and align technical skills and competencies exclusively for the client. The client enjoys the benefit of a dedicated work force with assured availability that knows about the client's history, standards, fringe requirements, etc.

Framework projects are strongly maintenance related which often involves turnarounds (TAR). Turnarounds are scheduled events wherein entire plants or units are taken out of service for a period of time in order to renew elements as part of preventive maintenance tactics. Turnarounds are expensive, both in terms of lost production while the process unit is offline and in terms of direct costs for the labor, tools, heavy equipment and materials used to execute the maintenance. They are the most significant portion of a plant's yearly maintenance budget and can affect the company's bottom line if mismanaged. Long before the actual maintenance equipment and material with long delivery times need to be engineered and ordered such that all pieces are available at the planned moments.

This greatly affects both the engineering service provider activities as well as the client's production performance which is based upon mutual dependency with respect of each other's activities. With such dependencies it is for both parties better to emphasize framework projects instead of attempting to manage it via discrete one-off projects with higher risk profiles. Framework projects are projects that typically have a long duration and comprise about 55% of total billable working hours.

3.3.6 Technology projects

Technology projects are projects that apply complete formulae or concepts, based upon patents for PVC production- or Sulfur recovery technology. These projects are most often lump sum (fixed price) contracts. This is possible because (1) this is a sellers' market, and (2) the formulae are predefined templates that need to be adapted to local client conditions. Required project competences are specialistic and primarily executed locally, with marginal overlap with other projects and disciplines within Jacobs Nederland b.v.

Technology projects are projects that typically have a short duration and comprise about 10% of total billable working hours. Relatively high profits are made with technology projects, these are substantial enough to overcome periods of time between projects (idle time).

3.3.7 Conclusions

Total business turnover is spread across various types of projects; however 75% is generated with project types that are part of long term relationships in a buyers' market. This implicates that for the majority of the work low margins and a low level of autonomy exists. This

is not perceived to be a problem, since operational volume is high and operational risk is considered to be low.

The table below provides an overview of the spread of work using project types as vantage point. Level of autonomy is the inverse of the power to influence market mechanisms for personal favor. This due to the relations with other parties during project execution, which act as constraining interfaces (enforced by de facto standards in terms of activities and the quality of their outputs). The overview underlines the exploitative character of JNL's business model, and demonstrates her limited maneuvering space to optimize, using explorative activities.

Table 4, Overview of project types and their characteristics.

Project type	Part of turnover	Market type	Contract type	Typical duration	Level of autonomy
Framework	55%	Buyers	Rate	Long	Low
Partnership	20%	Buyers	Rate	Long	Low
One-off	15%	Buyers	Rate	Normal	Moderate
Technology	10%	Sellers	Fixed price	Short	High

3.4 Business objectives

Business objectives describe a target, or sense of direction, and how this should be accomplished by lower level objectives. Which, together, translate into a high level business strategy. The high level business objectives are paramount, well defined and discussed, in interviews with various actors lower level objectives have been elicited by asking how they contribute to the high level goals. This is used to construct a goal tree (see illustration below) which visualizes organizational goals at various levels in a hierarchical manner. The goal tree describes goals that are relevant for an exploitative oriented organization which is a different one than the goal tree for explorative activities compiled from literature in paragraph 2.4.

Both explorative and exploitative goals trees can perhaps be merged into one by placing both under one overarching goal: *Increase Competitive Sustainability*, where the time frame of the top objective is different from the lower level: *Maximize Profit*.

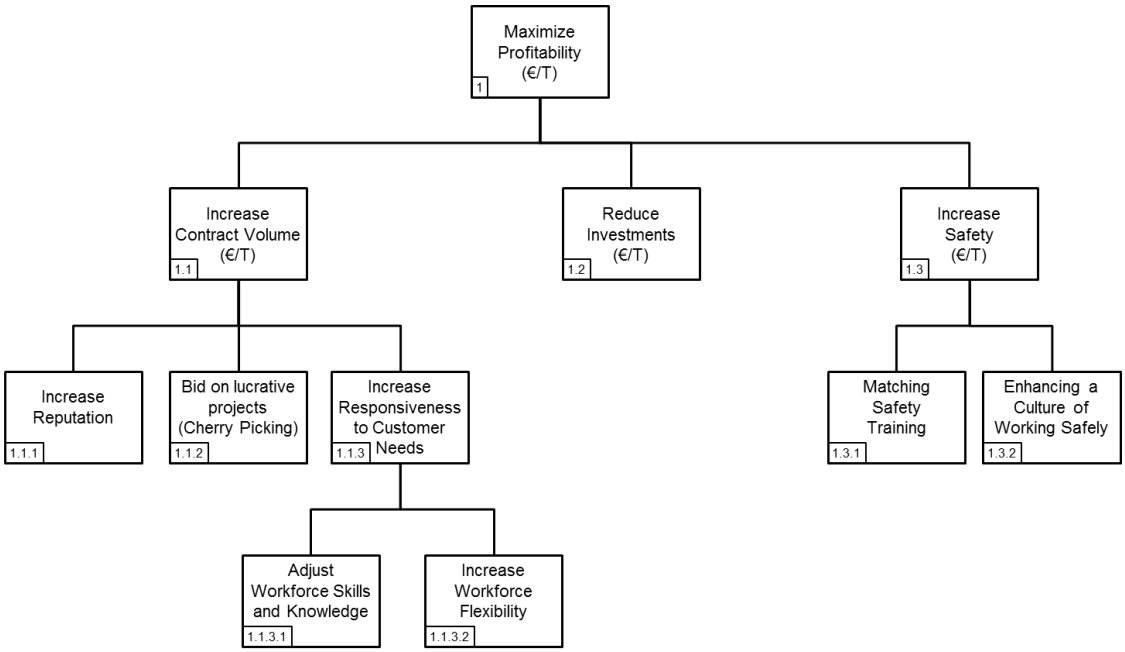

Figure 25, Jacobs Nederland b.v. goal tree.

A narrative description of the diagram is provided below:

1 *Maximize Profit* concerns the maximization of income versus expenditures per unit of time.

1.1 *Increase Contract Volume* concerns the growth of the total amount of billable hours per unit of time.

1.1.1 *Increase reputation* concerns raising the level of trust that value can be delivered in a controllable manner.

1.1.2 *Bid on lucrative projects (Cherry picking)* involves selecting contracts that are profitable for the organization in terms of low risk, favorable tariff, best fit between required and available services, etc.

1.1.3 *Increase responsiveness to Customer Needs* involves the ability to follow customers in their needs both qualitatively and quantitatively.

1.1.3.1 *Adjust Workforce Skill and Knowledge* involves a combination of more diversity and/or specialization to match current or expected market demand.

1.1.3.2 *Increase Workforce Flexibility* involves the ability to relocate various workforce resources between projects such that projects have no delay and amount of non-billable hours is low.

1.2 *Reduce Investments* concerns the reduction of costs per unit of time. This is not further detailed, but comprises cost reducing methods in terms of reduction of general expenses, operational expenses, etc.

1.3 *Increase Safety* concerns the reduction of accidents and loss of productivity as an indirect result of undesired safety related events.

1.3.1 *Matching Safety Training* concerns a training program which should train the workforce for relevant situations at office or client location.

1.3.2 *Enhancing a culture of working safely* concerns a higher level of consciousness and practice of safe working.

Difficulty with hierarchical representations is that there can only be one form of relationship in the diagram, in this case (de)composition. Sometimes nonhierarchical relationships exist between the goals mentioned. This can for example be the relationship between *1.2 Reduce Investments*, and *1.3.1 Matching safety training*. Training forms a cost, however also value, which makes its location ambiguous. Such ambiguities will be more abundant when introducing additional levels of details.

3.5 Business model

This paragraph elaborates on how Jacobs Nederland manifests itself in the market by analyzing the value creation mechanisms. A business model is an abstract description of how various organizational elements interact logically in order to enable the organization to be successful (economically, socially, culturally, or in other forms of value). Business models are used in competitive business environments to discuss or analyze the rationale of typical business activities which are aggregated into higher levels to support decision-making with respect to operational control and/or innovation activities (Teece D. , 2010).

There are various ways to describe business models, ranging from descriptive text to mathematical models. Most often high level descriptive text or diagrams is used to identify the main drivers complete enough for internal use, leaving enough room for interpretation to ensure flexibility, and incomplete enough such that secrets remain fussy for outsiders.

Figure 26, Jacobs' high level business model.

The figure above illustrates Jacobs' publicly available high level business model which comprises a triangular relationship between the three major stakeholders by listing the relevant objective for each: growth for shareholders, relationship for clients and greatest asset for employees. Although not visualized as such, one can imagine this as a model by which it is inferred that for a service provider it is imperative that growth can only be realized by matching

more staff to more clients. Simply raising the tariff could only temporarily yield a marginal benefit since, in a free market, clients would switch to other service providers.

This publicly defined business model is too broadly defined in order to be able to explain a more accurate working and related sensitivities. It therefore needs to be operationalized at least one detail level further in order to make it useful for this research activity.

The diagram below illustrates the Jacobs Nederland business model using causal diagram format. A causal diagram describes variables, depicted by ellipses, whose value may change over time. A variable can influence other variables directly when its own value changes, this is known as a causal relationship which is depicted by an arrowed line from the source variable directed towards the affected variable. The sign at the end of the causal relationship indicates the direction of the impact on the receiving variable. Causal relations can be seen as statistical or physical proven relationships (Joffe & Mindell, 2006) which may form an intricate network of relationships that propagate variable changes and may contain feedback loops, indicated by circular arrows, which can accelerate of dampen variable changes. A causal diagram is a model, which in essence is an implementation of one's perception of reality for a certain purpose, it may contain deliberate simplifications, but also lack unknown elements which introduce hidden factors in causal relationships.

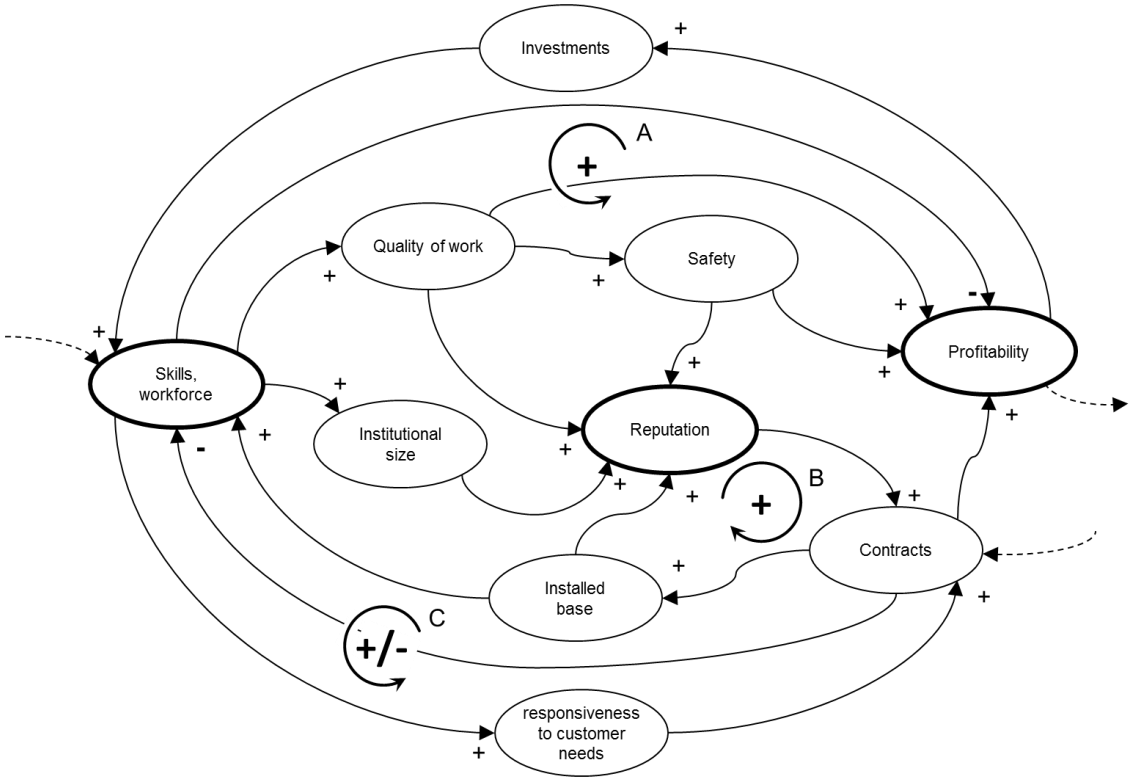

Figure 27, The business model as a causal diagram.

The illustrated model is partially derived from interviews and complemented with findings from (Heijden, 1996, p. 73). The model will be described in detail below, discussing each variable and its outward directed relationships.

Profitability is considered to be directly related to the overarching performance indicator *Growth*. Profitability is the difference between revenue and costs per time unit. Profitability has two causal relationships flowing towards *Investments* and outwards to *Intrinsic Share value*, a performance criterion for shareholders (not included in the diagram, but visualized by a dashed arrow flowing outwards). When profitability increases more internal investments can be made.

Investments are costs spend to maintain and/or upgrade production capabilities. Investments has one causal relationship flowing towards *Skills, workforce*. When investments increase, internal assets such as skills and employee volume can be improved or acquired through acquisition of other technical service providers.

Skills, workforce are internal assets that can be utilized to offer payable services to clients. Skills, workforce has four causal relationships flowing towards *Profitability*, *Quality of work*, *Responsiveness to customer needs*, and *Institutional size*. When *Skills, workforce* increases, profitability will be affected negatively since labor costs increase because of increase of volume and/or quality. When *Skills, workforce* increases, the quality of work will increase because of higher skills. When *Skills, workforce* increases, the responsiveness to customer needs will increase because of higher or more diverse skills and or workforce volume. When *Skills, workforce* increases, the *institutional size* will increase because of higher workforce volume. Natural turnover of personnel to/from labor markets, as an external factor is not included in the diagram, and visualized by a dashed arrow flowing inwards.

Quality of work is the level of accordance with specification and time of the created output. Quality of work has three causal relationships flowing towards *Profitability*, *Safety*, and *Reputation*. When Quality of work increases the amount of rework or errors decreases which has a positive effect on profitability. When Quality of work increases the amount of accidents decreases which has a positive effect on safety. When Quality of work increases clients will be more delighted with the outcomes, which has a positive effect on reputation.

Safety is the condition of being protected from a cause of danger, risk, or injury. Safety has two causal relationships flowing towards *Profitability* and *Reputation*. When *Safety* increases the amount of accidents decreases which has a positive effect on *Profitability*. When *Safety* increases the amount of accidents decreases which has a positive effect on *Reputation*.

Reputation is considered to be directly related to the overarching performance indicator *Relationship*. Reputation is represented by the set of believes and opinions that are held about the company by others. *Reputation* has two causal relationships flowing towards *Contracts* and outwards to *Shareholders* (not visualized). When reputation increases more internal investments can be made. When profitability increases more revenue (minus investments) for shareholders can be created which basically leaves the system.

Contracts are legally binding agreements wherein the company agrees to deliver technical services for a certain fee that will generate value for clients. The inward directed flow coming from clients is not visualized here. *Contracts* have three causal relationships flowing towards *Profitability*, *Skill, workforce*, and to *Installed base*. When contract volume increases more billable hours can be made which has a positive effect on *Profitability*. When contract volume increases more reference cases and knowledge accrues which has a positive effect on the installed base. When contract volume increases more skills and workforce is utilized which has a negative effect on the volume of *skills, workforce*. Contract awards from technical service markets, as an external factor, is not included in the diagram, and visualized by a dashed arrow flowing inwards.

Installed base is a measure of the number of specific projects executed. *Installed base* has two causal relationships flowing towards *Reputation* and to *Skills, workforce*. When the installed base increases more testimonials become available to proof the company's capabilities, which increase *Reputation*. When installed base increases more knowledge becomes available for the workforce which has a positive effect on the skills.

Responsiveness to customer needs is the ability of a business to recognize and respond to changing customer needs. *Responsiveness to customer needs* has one causal relationship flowing towards *Contracts*. When the responsiveness to customer needs increases, a better fit with client's demand can be offered, this has a positive effect on the number of contracts.

Institutional size is the size, measured in full-time equivalent (FTE), of the company that performs billable activities. *Institutional size* has one causal relationships flowing towards *Reputation*. When the institutional size increases also the company's capacity to execute technical services at bigger scales increases, which increases *Reputation*.

The model identifies three positive feedback loops identified by characters A, B, and C. feedback loops are self-reinforcing loops that could cause the system to shift performance drastically once influencing factors are balanced improperly.

Loop A is a typical inwards oriented entrepreneurial loop that suggests that internal *investments* will contribute indirectly to *profitability*, provided that the investments made contribute positively to variables such that the company outperforms competitors in client appraisal processes. High workforce costs, and/or incorrect investments form either opportunity costs or losses, dampen the effect of loop A.

Loop B is a typical external oriented loop that suggests that the installed base accrues as the result of awarded and fulfilled *Contracts*, which has a positive effect on *Reputation* which in turn has a positive effect on the amount of awarded project by clients. This loop enforces specialization since *Reputation* is the result of past successful projects and has therefore the tendency to narrow down the chance of being awarded other types of projects.

Loop C describes a feedback loop from which the sign (positive or negative) is indeterminate. There is a positive relationship through *Installed base*, and *Responsiveness to customer needs*, but also a direct negative relationship with respect to withdrawing resources from the available pool when contracts are awarded. This represents that the responsiveness to customer will be lower as a consequence of allocating skills to currently awarded projects.

3.6 Conclusions

The conclusions of the system analysis and how results can be used for scenario analysis in the next chapter is discussed below:

Problem recognition, observations during interviews learnt that the pictured problem statement is recognized by all interviewees, however not always seen as a realistic or eminent problem. This is except for interviewees who are not (exclusively) functionally involved with Dutch operations anymore. It is striking to see the differences in perceptions between incumbent and former management, which can perhaps be explained by asynchronous knowledge, differences in experiences, -observation position, and/or self-interest.

Current Contextual Vigilance, interviews learnt that current Contextual Vigilance is formally operationalized via Business Development (Sales) unit, who is responsible for acquisition of billable work in the form of projects. This is mainly done via existing client relations, which is an important source of information, however also a limited one because clients (un)intentionally can act as a filter and/or delay mechanism.

Limited autonomy, stakeholder analysis and analysis of business activities showed that Jacobs Nederland b.v. externally has repetitive interdependent relationships with clients and partners, and a dependent relationship with Jacobs corporate. All internal actors are dependent on Jacobs Nederland b.v. but have repetitive interdependent relationships between themselves. Repetitive interdependent relationships can be seen as buyer-seller markets with a limited amount of actors such that there is no easy entry or exit. The repetitive character reinforces actor's positions. There are no major players that can set standards or prices by themselves, this also applies to Jacobs Nederland b.v., and can perhaps be seen as applicable for project-based organizations in general.

Conservative industry, analysis learnt that the petrochemical industry in Europe has not seen many changes since it was rebuild after the Second World War. Technology may have changed, but this has only marginal impact on how EPCm services are organized and executed, e.g. in today's IT age relative much work is still paper based. This can perhaps be explained due to a significant producers' surplus (at clients) which eliminates the need to optimize and seek risk. Clear hierarchical relations, well-defined roles and responsibilities, and clear job descriptions characterize firms operating in stable environments.

Few clients, many transactions, interviews learnt there exist little variation in the client pool, however there are many projects executed for a limited set of clients. This proves that the relationship model is effective. There are enough clients in order to cope with natural variation of work per client. The elasticity in these client relationships is however a concern because losing a client would typically implicate a significant drop in turnover. Clients can be lost due to direct client relationship issues (reputation) or indirect because clients relocate business activities.

Structured and formalized business activities, analysis learnt that business activities are structured and formalized, which (certainly in combination with other parties) leaves marginal room for variation or optimization. This translates to equal access to factors of production (one of the components of a perfect market) and further division of labor between parties, reinforcing the repetitive interdependent relationships. Only 25% of the total billable hours are generated with one-off and technology projects, the rest is from framework-, and partnership projects. Jacobs Nederland b.v. is thus dominantly involved in long term relationships that do not allow much room for maneuvering and trial and error optimization methods.

Labor intensive business model, except for the technology projects, the majority of the turnover is generated by cost-plus-fee work, which inherently makes the organization reliant on the ability to appropriate the specialist workforce in the market. Labor costs form a significant portion of operational costs. This raises concerns with respect to *flexibility* (to efficiently balance supply and demand of services in volume), and *adaptability* (imposed change or pursue of different type of demand in relation to specialisms).

Discontinuous and separate business activities, analysis, and observations learnt that project-based organizations have, per definition, separation of business activities in both time and space. This greatly hinders the diffusion of knowledge across projects, business units, disciplines, etc. Partnership-, framework-, and workshare projects contribute to this isolation in a structural manner. The absence of formal integrative research & development activities further underlines the discontinuity of knowledge creation and adaptation. Although it is formally stated that project management and discipline management have equal power, informally more power is attributed to project management.

Self-awareness, The high level business objectives and business model are engraved in stone. How it exactly works in detail is less universally available, and has room for interpretation and framing. Especially discussing analysis results with senior management resulted in interesting mismatches. On occasions it was argued that the high level models were easier to use because one could apply them in many different situations compared to detailed models, which underlines the room for interpretation.

Target (short term) oriented, the firms' primary operational modus is exploitation (i.e. maximize revenue) of skilled labor in a low-risk setting by working on cost-plus-fee basis, applying lean execution methods, and minimizing General and Administrative expenses (G&A's). The low-risk business model is stable and successful, which implies that little incentives exist to optimize, because this would introduce cost and risk with a marginal chance on improvements.

Strong identity, interviews learnt that identity is the way how a firm is identified by existing and potential customers. Potential customers are influenced by how a firm presents herself. Existing customers have built up a perception based upon past experiences wherein the term *reputation* is perhaps more appropriate than *identity*. One's reputation is difficult to influence directly and may limit client's recognition of new (or elevated) roles put forward by the incumbent firm. Reputation is a central element in the created business model and part of an important feedback loop which demonstrates that total performance is sensitive to reputation changes.

The factors listed above indicate how JNL currently is operating in the market. These can be summarized in the following sentence:

> Jacobs Nederland b.v. is a project-based company with a strong identity, with short term targets, utilizing a labor intensive business model with limited set of clients and partners in a conservative industry, exploiting formalized activities in a structured manner for projects, henceforth with limited incentives and/or room to optimize operations for other reasons then safety and reputation.

The outline above explains JNL's current position with respect to Contextual Vigilance. It can be concluded that Jacobs Nederland b.v. faces constraints when it wants to increase its level of Contextual Vigilance via policies. These constraints are mainly related to financial performance, client/partner relations, and relationship with Jacobs corporate.

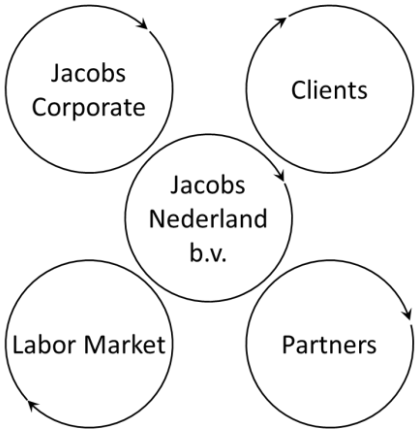

Figure 28, High level overview of relevant market interfaces.

The illustration above visualizes the relevant market interfaces for Jacobs Nederland b.v. These are relevant in day-to-day business, however also are deemed relevant for designing Contextual Vigilance policies. Contextual Vigilance policies by design deal with external

changes themselves, however also function in a (meta-) context that can influence the effectiveness and/or efficiency of a Contextual Vigilance policy. From these four, *Client*, *Corporate*, and *Partners* are considered to be most relevant, which is motivated below.

Clients' strategic behavior, from the five competitive forces (Porter M. , 1979), bargaining power of clients is the most prominent external force exerting on Jacobs Nederland b.v. daily operations and strategy making. This client dependency was a permanent element in all interviews. JNL's business model directly follows clients' needs and has little margin for deploying unbillable services because this is detrimental for profit margins. Contextual Vigilance therefore has to be designed such that it has (1) marginal costs, and/or (2) is valued by clients as part of the offered service portfolio. Clients may intentionally exert force on the relationship with JNL in order to create better value propositions, or may unintentionally (perhaps as consequence of market changes they are operating in, or internal changes) require different services from Jacobs Nederland b.v., which in both cases will affect profit margins and availability of resources for Contextual Vigilance processes. Clients' strategic behavior is therefore (perhaps counter intuitively) positioned both as a subject in Contextual Vigilance policies, and as an external factor in Contextual Vigilance policymaking.

Corporate governance, the influence of Jacobs Corporate on its subsidiaries may change. Jacobs Corporate utilizes diverse subsidiaries over the world for creating profit for shareholders. A certain level of freedom is given to local subsidiaries to manage their own processes and resources in order to better align with local clients. This is based upon the premise that it is impossible to create policies that can be applied to all offices resulting in similar effects as seen in Operations Excellence firms such as McDonald's, Wal-Mart, FedEx, etc. (Treacy & Wiersema, 1995). Notwithstanding that general policies are imposed to subsidiaries to outsource a proportion of their billable work to high value centers in India because via these subsidiaries more revenue can be generated. It is unknown whether the level of influence will increase or decrease as the firm grows, and diversifies through future acquisitions.

Supply & technical support institutions, and partners, the supply chain of goods and services is comprehensive and cannot be influenced by the problem owner to change should this be required. Conversely forces creating systemic change can be exerted upon Jacobs Nederland b.v. opening up or closing possibilities for implementing Contextual Vigilance processes.

Excluded from this list is the labor market, which is mentioned during interviews, from which it is contended that it is increasing challenging to attract employees who are educated and willing to work in technical services. The labor market is an external factor for operations, given the substantial need, however is deemed to play a marginal role in relation to Contextual Vigilance policymaking.

4 CV policymaking case study part II: Scenario Analysis

This chapter elaborates on the second part of the Contextual Vigilance policymaking case study: Scenario Analysis. Challenge for project-based organizations such as Jacobs Nederland b.v. lies in the ability to combine both explorative and exploitative activities in such a manner that short term objectives (operational performance) and long term objectives (sustained competitive advance) with their inherent uncertainties are achievable. Policy options that would perform best under todays' conditions may however not perform equally (or even counterproductive) in the future because of fundamental change. It is therefore worthwhile to explore the sensitivity or robustness of policy options, especially when they cannot easily be reversed or substituted with others due to high investment costs or lock-ins. This chapter discusses how this best may be achieved by using scenario analysis.

Since current formal Contextual Vigilance activities are almost absent, little empirical or detailed knowledge is available about policy options, their costs, outcomes or side effects. Experimenting with the organization, or waiting on empirical evidence in order to gain better knowledge on these performances for the benefit of this research is considered undesirable and impractical respectively. Therefore the policy options listed in paragraph 2.3 remain to be defined at a relative high level of abstraction. The policy options taken from scientific literature will thus not include specific, tangible, modifications or additions that are readily implementable.

To support decision-making the paragraphs below discuss relevant decision criteria, various Contextual Vigilance principles as policy options, possible futures, and expected impact of these policy options on the criteria. The scores presented in the following paragraphs are value-based (not fact-based) derived from reasoning elicited from interviews using what-if-questions. Scores for *Structural-* and *Sequential Ambidexterity* could not be derived from interviews due to the absence of these topics, and have been amended by using own assessment. The complete scores and forthcoming ratings in this chapter have been evaluated with the problem owner in a review session. It reflects current understandings, and may get refined further with new insights, or deepened analysis.

4.1 Decision Criteria

The criteria are derived from the goal analysis discussed in paragraph 3.4, *Business objectives*. The criteria that are deemed relevant are (1) those that reside on the intersection of the goal tree and the business model discussed in paragraph 3.5, *Business model*, which form *short term criteria*, and (2) those that were found relevant in paragraph 2.4 in relation to contextual vigilance, which will be referred to as *long term criteria*.

Main short term criterion is *Maximize Profitability*, which is too broad for direct use when comparing policy options. The sub objectives listed in paragraph 3.4 will be used to define the exploitative criteria instead.

1 *Responsiveness to customer needs,* immeasurable, which represents the gap between required technical services by (potential) clients and the services offered in terms of quality, volume, and price. This criterion, as well as *reputation*, is preferred over the compound criterion *contract volume*, since it contains fewer disturbances due to other (potentially unmapped) factors.

2 *Reputation*, immeasurable, which represents the way how Jacobs Nederland b.v. is viewed by (potential) customers, what they think of JNL, and what qualities are attributed to JNL, such that the choice for Jacobs Nederland b.v. seems plausible when in need of technical services.

3 *Investments*, measured in euros per unit of time, which is an indicator for how much of the organizations' profit is spend on optimization to ensure maximization of profitability.

Main long term criterion is *Sustained Competitive Advantage*, which is also too broad for direct use when comparing policy options. The performance of Contextual Vigilance activities listed in paragraph 2.4 will be used as criteria instead.

4 *Sensing*, is the ability to analyze and detect relevant threats or opportunities from various information sources, such that seizing-related activities can be initiated. Its performance can theoretically be measured (provided that all alarms are known) by the number of detected true alarms and, conversely, the number of raised false alarms.

5 *Seizing*, is the ability to correctly decide whether to change or not, based upon current operational performance, potential performance(s), their cost and risk to implement, and remain compatible with plausible futures. Its performance can theoretically be measured by mapping opportunity costs onto historical operational performances.

6 *Reconfiguring*, is the ability to transform current operations such that it ultimately performs better in the new or changing context, without significant detrimental effects to current operations in terms of performance, resources, and reputation.

All criteria listed above are not expected to be equal in terms of relevance for the problem owner, nor are they easily comparable because of differences in measurements, intensity, and level of abstractness.

4.2 Scenarios

The performance of Contextual Vigilance policies are also subjected to external change. Following table 1, the sources of fundamental change can be expected from (a) the general environment (e.g. Social, Technological, Economic, Environmental, and Political (STEEP)), (b) the competitive environment (e.g. coalitions, patents, etc.), and (c) the organization (e.g. reorganizations, mergers, acquisitions, etc.). These are all considered relevant sources when Contextual Vigilance is operational; however for policymaking it is relevant to understand the performance of each policy option.

This can be evaluated by using scenarios. Scenario Analysis assists in, not making predictions about the future, but what could be done under several anticipated futures (De Geus, 1992). Following (Heijden, Bradfield, Burt, Cairns, & Wright, 2002) the two most important and most unpredictable (uncertain) clusters/factors must be chosen for scenario construction. This results in two axes from which in total four scenarios can be constructed, which (according to (Wack, 1985b), (Heijden, 1996)) is ideal, because more than four scenarios may confuse users and limit their ability to explore uncertainty.

What factors influence Contextual Vigilance policymaking most significantly? The identified policy options have an impact on the organizational structure, and thus how the organization manifests itself in the various market interfaces as discussed in paragraph 3.6. The factors listed herein have a competitive and organizational nature and eliminate general environment (STEEP) factors. Interviews have underlined the concern for both client relationships and the relationship with corporate headquarters as most determining in policymaking. From the factors defined in paragraph 3.6, *client's strategic behavior* and *corporate governance* have been selected, based upon the "most important, and most unpredictable" criterion. The selected factors have been rephrased into more general terminology allowing room for interpretation and substitution, forming the following axes:

Market Cooperation, influenced by factor *Clients' strategic behavior* as a result of e.g. (absent) fluctuations in their markets, which may result is a stable and managed (i.e. evolutionary) path of changes where there is room for mutual adjustments that leads to further enforcement of co-specialization (mutual adjustment), or on the opposite end of the scale, stochastic change (perhaps fueled by shifts in e.g. new technology, politic, or environmental conflicts) that may reshape co-specialization alliances completely rendering into more competition and open markets (divide and conquer).

Control Autonomy, influenced by factor *Corporate governance*. Because of continuing pressure to deliver value for shareholders, corporate headquarters may exert more control on how operations at local subsidiaries is to executed, resulting in less autonomy and peripheral business activities (centralized control), or on the opposite end of this scale allowing more room for autonomy (either at subsidiary or business line level) to increase performance in a sustained manner (local control).

The figure below visualizes the two autonomous axes, alongside which potential futures may be projected. At the end of every axis an impression of relative change is depicted, rendering the crossing as the current (no change) situation. The quadrants, identified by roman numbers I through IV illustrate the location of each scenario. There exists overlap between the scenarios because they share axis with neighboring scenarios (e.g. scenario I & II have in common that market cooperation moves to mutual adjustment), this overlap creates repetition in the scenario texts which is indicated per scenario. The repetition allows each scenario to be readable independent of the others.

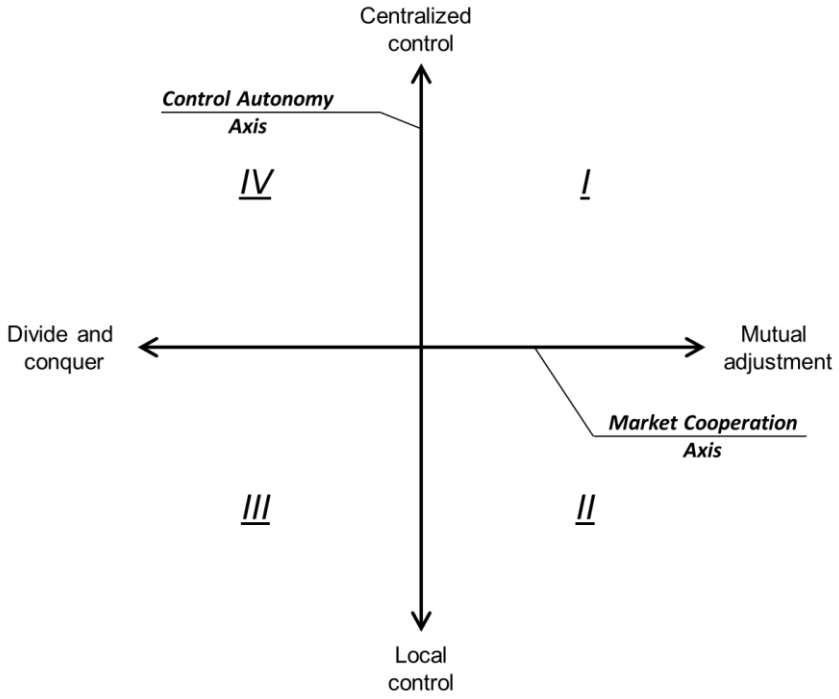

Figure 29, Scenario axes.

The following paragraphs describe plausible futures by means of a vivid, but hypothetical story, using the Intuitive Logics method (Huss & Honton, 1987) due to the absence of readily available metrics at this level of aggregation.

These stories about plausible futures, allows the reader (i.e. decision-maker, analyst) to put him or herself in such hypothetical settings and reason how effective policy options would work, evaluated against the list of criteria using a five point scale as described in the table below.

Table 5, Overview of criteria ratings, symbols, and ranking values.

Rating	Symbol	Ranking value
Good	++	2
Moderate	+	1
Neutral	=	0
Mediocre	-	-1
Bad	--	-2

To underline that these scenarios occur in a free competitive market, and to make a reference to the military misfortunes by Cohen & Gooch (Cohen & Gooch, 1990), all scenarios have been given a name that refers to conflict settings. So read the following scenarios as if you were to defend your assets and determine which policy option would yield best results under all these projected circumstances.

4.2.1 Scenario I: Trenching at both fronts

This scenario assumes a future located in the first quarter where:

- External markets reaffirm relationships and adjust mutually
- Internal control is moving to central level

In line with global trends, stable markets, and economies of scale, further reaffirmation and consolidation of interdependent relationships between clients and partnering firms takes place. Technology and market shifts are diffused, and implemented by the various partners in the market chains in synergy, because collective interdependencies have proved to yield stable profit margins, which prevents firms from risk taking in isolation or with new partnerships. This leads to further optimization of current relationships and anchoring of positions in various production chains. Which in turn lead to a more stable equilibrium, mutual lock-in, with better defined roles and responsibilities, contract forms, which will contribute to experiencing work as 'business as usual'.

At the same time corporate headquarters recognizes that global diversification, as a result of various acquisitions, leads to conglomerate characteristics which do spread risk, but not necessarily yield profit maximization because of suboptimal (too universal) control mechanisms. To answer shareholders, various business lines (e.g. mining, defense, energy, bio-pharma, telecommunications, etc.) will be subjected to dedicated control, planning, and administrative policies, complemented with operating procedures and shared resources, which leads to further reinforcement of corporate influence at local subsidiaries. This leads to a reduction of support activities and harmonization of accounting and control methodologies at local subsidiaries paving the way to become more a machine bureaucracy instead of a professional bureaucracy.

Both changes lead to a reduction of the degrees of freedom, in terms of (contractual) agreements, and autonomy, that Jacobs Nederland b.v. currently has, hence the title 'Trenching at both fronts'. Positions in both arenas are being fortified. The consolidation of markets and the reinforcing level of control from corporate do not dismiss Jacobs Nederland b.v. from developing and implementing Contextual Vigilance policies because markets remain very competitive.

Evaluation of policy options

In this future *Do Nothing* would score most favorable (+), basically all current positions are reaffirmed without a need to invest, and potentially less investments because some activities are transferred to corporate level. *Contextual Ambidexterity* scores next most favorable because this policy option allows diversification at unit and individual level, which is internal for both market and corporate. Because of positive effects at individual level, a positive effect (+) is expected for criteria *responsiveness to customer needs*, and *reputation* because in direct contact more positive externalities can be expected for fringe activities and requirements. *Structural Ambidexterity* is expected to score neutral (=) to mediocre (-) because the situation does not require extra local provisions next to corporate ones, and it could potentially trigger a wrong signal to other parties because it suggests that Jacobs Nederland b.v. is anticipating

change whereas all parties involved aim at consolidation. Least favorable policy option is *Sequential Ambidexterity* (if allowed by corporate) in relation to criteria *responsiveness to customer needs*, *reputation* and *investments* because this involves realignment across many of the market interfaces, which could be counterproductive or perhaps even disruptive in the short term, hence the rating bad (--) is given for all three criteria.

Table 6, Short term impact of policy options for Scenario I: Trenching at both fronts.

Criteria	Policy options			
	Do Nothing	**Structural Ambidexterity**	**Sequential Ambidexterity**	**Contextual Ambidexterity**
1, Responsiveness to customer needs	+	=	--	+
2, Reputation	+	-	--	+
3, Investments	+	-	--	=
Rank	**1**	**3**	**4**	**2**

4.2.2 Scenario II: Neighborhood surveillance

This scenario assumes a future located in the second quarter where:

- External markets reaffirm relationships and adjust mutually
- Internal control is moving to local level

Repeated from Scenario I: *In line with global trends, stable markets, and economies of scale, further reaffirmation and consolidation of interdependent relationships between clients and partnering firms takes place. Technology and market shifts are diffused, and implemented by the various partners in the market chains in synergy, because collective interdependencies have proved to yield stable profit margins, which prevents firms from risk taking in isolation. This leads to further optimization of current relationships and anchoring of positions in various production chains. Which in turn lead to a more stable equilibrium, mutual lock-in, with better defined roles and responsibilities, contract forms, which will contribute to experiencing work as 'business as usual'.*

At the same time corporate headquarters recognizes that the diversity of various operations across the globe requires more autonomous control for local subsidiaries in order to allow local autonomy with regards to optimization, which is expected to lead to higher total revenue projections for its shareholders because of the reduction of negative local externalities. This leads to less guidance and support in generic terms from corporate level and more variations at local level.

The consolidation of markets does not dismiss Jacobs Nederland b.v. from developing and implementing Contextual Vigilance policies because markets remain very competitive. The increase of local autonomy for Jacobs Nederland b.v., opens up the possibility to determine self on where and how to optimize operations based upon local opportunities. Hence the title 'Neighborhood surveillance' is chosen for this scenario.

Evaluation of policy options

In this future both *Structural-* and *Sequential Ambidexterity* are expected to score similarly as in *Scenario I: Trenching at both fronts*, which reveals already that *Structural-* and *Sequential Ambidexterity are not favorable as long as the external market seeks to affirm existing relationships*. *Contextual Ambidexterity* scores most favorable (+) because this policy option allows diversification at unit and individual level, which is internal/hidden for the market. Because of positive effects at individual level, a similar positive effect is expected for criteria *responsiveness to customer needs*, and *reputation* because in direct (person to person) contact more positive externalities can be expected for fringe activities and requirements. The policy option *Do Nothing* scores neutral (=) in this setting since the behavior and forthcoming demands of clients & partners will not change much compared to the current setting.

Table 7, Short term impact of policy options for Scenario II: Neighborhood surveillance.

Criteria	Policy options			
	Do Nothing	**Structural Ambidexterity**	**Sequential Ambidexterity**	**Contextual Ambidexterity**
1, Responsiveness to customer needs	=	=	--	+
2, Reputation	=	-	--	+
3, Investments	=	-	--	=
Rank	**2**	**3**	**4**	**1**

4.2.3 Scenario III: Civil unrest

This scenario assumes a future located in the third quarter where:

- External markets break up and re-align
- Internal control is moving to local level

Because of major shifts in energy markets (either politically, economically, and/or technically driven), major local clients have chosen to relocate to other markets and geographic locations leading to breaking up existing operations into multiple parts by selling or leasing segments to various others (potentially newcomers). This leads to many new relations with different and shifting interfaces and existing relations venturing into new (relatively uncharted) markets. Short

term profit margins are unstable because of this fragmentation, which allows existing and new entrants to step in and take away portions of the local market share. Existing clients moving to other markets and/or geographic locations require different services for which incumbent technical service providers may have competitive/better matching offerings.

Repeated from Scenario II: *At the same time corporate headquarters recognizes that the diversity of various operations across the globe requires more autonomous control to local subsidiaries in order to allow local autonomy with regards to optimization, which is expected to lead to higher total revenue projections for its shareholders because of the reduction of negative local externalities. This leads to less guidance and support in generic terms from corporate level and more variations at local level.*

Both changes lead to an expansion of the degrees of freedom, in terms of market interactions and autonomy, compared to what Jacobs Nederland b.v. currently has, hence the title 'Civil unrest'. There will be little support from corporate level, and the local markets are scattered across many parties, all trying to increase their competitive advantage in their own way because of fierce competition and scarcity of resources and infrastructure. Undeniably for this kind of future Contextual Vigilance policies are a must, however which policy option scores best under these circumstances is of interest.

Evaluation of policy options

In this future *Sequential Ambidexterity* would score most favorable (++) in relation to criteria *responsiveness to customer needs*, and *reputation* because of required realignment across many of the market interfaces, which allows new and incumbent clients to reposition while being supported by new organizational features from Jacobs Nederland b.v., which is expected to have a positive effect on *reputation*. Investments are considered to be substantial because the whole organization will have to restructure/realign, and score therefore bad (--). *Structural Ambidexterity* has, certainly compared to scenario I & II moderate (+) scores in relation to criteria *responsiveness to customer needs*, and *reputation*, because it allows the organization to be active in more than one market segment at the same time, because of structural segregation of activities. *Contextual Ambidexterity* scores neutral (=) because this policy option does not result in significant improvement of *responsiveness to customer needs* at organizational level. The policy option *Do Nothing* scores less favorable in this setting because this policy is deemed most incapable in following up the rapid changes in the local markets. It would send out the message that despite local changes this company is continuing business as if nothing relevant has happened scoring bad (--) for *responsiveness to customer needs*, and mediocre (-) for reputation, investments remain neutral (=) because of its absence.

Table 8, Short term impact of policy options for Scenario III: Civil unrest.

Criteria	Policy options			
	Do Nothing	**Structural Ambidexterity**	**Sequential Ambidexterity**	**Contextual Ambidexterity**
1, Responsiveness to customer needs	--	+	++	=
2, Reputation	-	+	++	+
3, Investments	=	-	--	=
Rank	**4**	**2**	**1**	**3**

4.2.4 Scenario IV: Goliath vs David(s)

This scenario assumes a future located in the fourth quarter where:

- External markets break up and re-align
- Internal control is moving to central level

Repeated from Scenario III: *Because of major shifts in energy markets (either politically, economically, and/or technically driven), major local clients have chosen to relocate to other markets and geographic locations leading to breaking up existing operations into multiple parts by selling or leasing segments to various others (potentially newcomers). This leads to many new relations with different and shifting interfaces and existing relations venturing into new (relatively uncharted) markets. Short term profit margins are unstable because of this fragmentation, which allows existing and new entrants to step in and take away portions of the local market share. Existing clients moving to other markets and/or geographic locations require different services for which incumbent technical service providers may have competitive/better matching offerings.*

Repeated from Scenario *I: At the same time corporate headquarters recognizes that global diversification, as a result of various acquisitions, leads to conglomerate characteristics which do spread risk, but not necessarily yield profit maximization because of suboptimal (too universal) control mechanisms. To answer shareholders, various business lines (e.g. mining, defense, energy, bio-pharma, telecommunications, etc.) will be subjected to dedicated control and planning policies, complemented with operating procedures and shared resources, which leads to further reinforcement of corporate influence at local subsidiaries. This leads to a reduction of support activities and harmonization of accounting and control methodologies at local subsidiaries paving the way to become more a machine bureaucracy instead of a professional bureaucracy.*

The disintegration of local markets and loss of autonomy, compared to what Jacobs Nederland b.v. currently has, makes this future a very difficult one, because global

conglomerate behavior and reasoning is enforced by Jacobs corporate while locally the market requires micro-control governance, hence the title 'Goliath vs David(s)' where the multiplicity of David refers to several (diverted) local markets, who potentially can defeat the giant Goliath. There will be constraints imposed from corporate level that will limit Jacobs Nederland b.v. in maneuvering through and realigning with clients and partners in new local markets. The responsiveness to customer needs is falling behind.

Evaluation of policy options

In this future S*equential Ambidexterity* would score most favorable (++) in relation to criteria *responsiveness to customer needs*, and *reputation* because of required realignment across many of the market interfaces, which allows new and incumbent clients to reposition while being supported by new organizational features from Jacobs Nederland b.v., which is expected to have a positive effect on *reputation*. Investments are considered to be substantial because the whole organization will have to restructure/realign, and score therefore bad (--). Question remains whether implementing *Sequential Ambidexterity* is allowed by Jacobs corporate because this would also have impact on the internal relations and control interfaces. *Structural Ambidexterity* has, certainly compared to scenario I & II moderate (+) scores in relation to criteria *responsiveness to customer needs*, and *reputation*, because it allows the organization to be active in more than one segment, because of structural segregation. *Contextual Ambidexterity* scores mostly neutral (=) because this policy option does not result in significant improvement of *responsiveness to customer needs* at organizational level. Least favorable policy option is *Do Nothing*, because by practicing conglomerate behavior and reasoning, many clients will find Jacobs Nederland b.v. following its own course of actions irrespective from current needs which results a bad (--) score for *responsiveness to customer* and mediocre (-) for *reputation*.

Table 9, Short term impact of policy options for Scenario IV: Goliath vs David(s).

Criteria	Policy options			
	Do Nothing	**Structural Ambidexterity**	**Sequential Ambidexterity**	**Contextual Ambidexterity**
1, Responsiveness to customer needs	--	+	++	=
2, Reputation	-	+	++	+
3, Investments	=	-	--	=
Rank	**4**	**2**	**1**	**3**

4.3 Impact of policy options on long term criteria

The impact of the policy options has been evaluated against the short term criteria for the relevant scenarios in the previous paragraphs. The long term criteria have not been included in that evaluation since it is assumed that, considering that the policy options are defined at conceptual level, they would not score differently per scenario. The long term criteria refer to qualities that are deemed relevant for Contextual Vigilance and only provide insight in the effectiveness of policy options.

The policy option *do nothing* is expected to bring neither improvement nor deterioration, hence the score is set to neutral (=) for all long term criteria. *Contextual Ambidexterity* scores marginally better because it is assumed that *sensing* will be improved because more room is granted to individuals to explore, which increases the level of awareness about external events, trends, and their internal consequences or opportunities. *Contextual Ambidexterity* introduces ambidexterity at existing levels, and therefore lacks conflict-free decision-making and reconfiguration capabilities, which leads to a neutral score for *seizing* and *reconfiguring*. *Structural Ambidexterity* is expected to score moderate (+) for *seizing* and *reconfiguration* and good (++) for *sensing*. This because new units in, parallel structures, have fewer conflicts with existing structures since they are formally separated, and may have different interfaces, and ditto internal mechanisms. This provides a stepping-stone for seizing and reconfiguration experience and know-how. Best scoring policy option is believed to be *Sequential Ambidexterity* because it is expected that best learning experience is achieved by navigating the organization through various contexts in time. This method will yield collective learning about what is possible, such that at all criteria a higher level of effectiveness can be achieved.

The scores presented in the table below are value-based, derived from reasoning retrieved from scientific literature and thus based upon own assessments. It reflects current understandings, and may get refined further with new insights, or deepened analysis.

Table 10, Long term impact of policy options.

Criteria	Policy options			
	Do Nothing	**Structural Ambidexterity**	**Sequential Ambidexterity**	**Contextual Ambidexterity**
4, Sensing	=	++	++	+
5, Seizing	=	+	++	=
6, Reconfiguring	=	+	++	=
Rank	**4**	**2**	**1**	**3**

4.4 Conclusions

The high score of *Sequential Ambidexterity* on long term criteria does not automatically mean that this is the best Contextual Vigilance policy for Jacobs Nederland b.v. It indicates that with the knowledge currently available *Sequential Ambidexterity* is expected to yield best results in terms of Contextual Vigilance in the long run. However *Sequential Ambidexterity* is also expected to have high investments costs, which is detrimental for short term performance. Additionally, scenario analysis reveals that in futures with high mutual adjustments and interdependencies in the local markets (scenarios I and II), this policy option was least favored, which undermines the abovementioned long term expectation should local markets really move further towards mutual adjustment.

Using scenario analysis one can generate a set of what-if's in combination with action sequences, i.e. policy options (De Geus, 1992). Policy options that score reasonable in many cases should be favored over policy options that score optimal in limited futures. Especially when resources are limited, or when policy options are mutually exclusive or difficult to reverse. The table below is constructed by summing the policy option scores for each scenario discussed. Table 6 showed that policy option *Do Nothing* scored three times moderate (+), which sums up to 3 using the ranking values from table 5. This leads to the following numerical ranking where policy option *Contextual Ambidexterity* is ranked 1.

Table 11, Policy options summed impact for all scenarios.

Scenario		**Policy options**			
		Do Nothing	**Structural Ambidexterity**	**Sequential Ambidexterity**	**Contextual Ambidexterity**
I	Trenching at both fronts	3	-2	-6	2
II	Neighborhood surveillance	0	-2	-6	2
III	Civil unrest	-3	2	2	1
IV	Goliath vs David(s)	-3	2	2	1
Summed score		*-3*	*0*	*-8*	*6*
Rank		**3**	**2**	**4**	**1**

It goes without saying that ranking can easily be influenced by using different scores during scenario analysis. However it expresses current beliefs and/or sentiment which can be refined further when the organization is monitoring and exploring internally/externally and succeeds in diffusing the herein acquired knowledge and understandings across various organizational layers and units. This refinement process is believed to bring much needed collective

understanding and backing of theorems which ultimately will lead to better overall performance in times of change (or conversely the absence of it).

Additionally it must be noted that it's not guaranteed that the operational criteria (*responsiveness to customer needs*, *reputation*, and *investments*) used in this scenario analyses will remain stable as well in times of change. It is perceivable that the organizations' business model will change because of external change and therefore potentially also the inferred operational criteria and/or their weight.

Current ranking of the policy options advocates that policy option *Do Nothing* is not the most favorable course of action. So it can be concluded that action is required. To assist in determining what type of action, perhaps an alternative view on the policy options can help. The policy options discussed in can be placed on a scale which illustrates the level of control with respect to Contextual Vigilance.

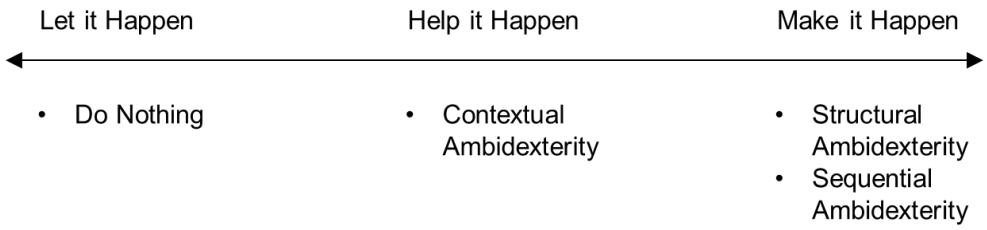

Figure 30, Policy options positioned alongside the level of control.

The illustration above positions the policy options on an axis that represents the level of control with respect to contextual vigilance. The horizontal axis is partitioned in three parts (1) let it happen, (2) help it happen, and (3) make it happen, under which the policy options are grouped. Both structural- and Sequential Ambidexterity require leadership and involvement of senior management, since this requires planned organizational change, hence they are placed under *make it happen*. Contextual Ambidexterity is located on the work floor, low enough that only control mechanisms need to be adjusted, while everything else remains intact, which is ideal to foster evolutionary (adaptive) change processes arising from bottom-up. However with less control on progress, quality, and direction from senior management, hence the allocation under *make it happen*.

The policy options listed under *make it happen* are not better or worse than the other policy options listed. Scenario Analysis revealed that these policy options dominantly are relevant as a reaction when external markets move *from mutual adjustment* to *divide and conquer*. Implementing *Structural*, or *Sequential Ambidexterity* proactively in a stable market that seeks for mutual adjustment may however send out a wrong signal to clients and partners, unless perhaps carefully planned to migrate collectively to higher levels of mutual adjustment. Conversely implementing *Structural*, or *Sequential Ambidexterity* proactively in a stable market may be used as an aggressive tactic to gain more market power. In this case the policy options would be used to intentionally influence external markets, which is a totally different approach than the reactive setting of Contextual Vigilance assumed in this research. Either way

Structural, or *Sequential Ambidexterity* policies will impact how the organization is structured and manifests itself to the outside world. The policies cannot be easily reversed, since this would again introduce costs and risk. *Structural*, or *Sequential Ambidexterity* policies are therefore regarded as policies that have a higher cost, and risk profile because of potential negative consequences with clients and partners should the external market remain the same.

Best alternative for the short term is to implement *Contextual Ambidexterity*, which introduces, encourage, and rewards individuals and/or subsystems to divide their time between conflicting demands for exploitation and exploration. It is expected that this would increase the level of self-awareness, internal knowledge creation, entrepreneurship, and vigilance for threats or opportunities; provided that JNL's external market does not move from mutual adjustment to divide and conquer. Implementing Contextual Ambidexterity does not require different organizational structures, and is henceforth relatively hidden for clients and partners. It also allows more variation than the somewhat holistic structural change, which is needed in the execution of various project types. The implementation of a Contextual Ambidexterity policy can also be reversed more easily compared to Structural, or Sequential Ambidexterity.

Contextual Ambidexterity is the recommended policy option, certainly where there is not enough support to invest in more organized options such as Structural- or Sequential Ambidexterity that have negative short term and uncertain future performance. Opting for *Contextual Ambidexterity* or *Do Nothing* is acceptable in line with currently practiced Logical Incrementalism decision-making. Contextual Ambidexterity can even be related as the next level of existing initiatives like Inclusion, which emphasizes on the positive externalities of employee diversity in teams.

5 Contextual Vigilance policymaking recommendations

This chapter elaborates on recommendations for Contextual Vigilance policymaking based upon the experiences and observations during the Contextual Vigilance case study described in the previous two chapters. The first two paragraphs elaborate on the methodologies used in the Contextual Vigilance case study. The last two paragraphs discuss the efficiency of Contextual Vigilance policymaking based upon case study experiences, and organizational factors influencing the process of policymaking respectively.

5.1 System Analysis methodology

This paragraph answers the first component (system analysis) of research question 1.2: "*What is the effectiveness of system analysis and scenario analysis method's in the design of Contextual Vigilance policies?".*

System Analysis is found to be an effective method for outsiders or novice persons, because it allows (1) gaining deeper insight into the workings of the business (or system) in a structured manner, and (2) captures tacit system' characteristics in tangible formats, which is useful when discussing/sharing with others and future knowledge creation. For incumbent management, who in this case are the specialists in their own territory, the significance of system analysis seems to be lower; perhaps because the methodology captures things they already know or believe tacitly. Sometimes they're even uncomfortable with the high level of detail (which actually is debatable, there are e.g. no statistically proven causal relationships). This unease was observed during follow-up interviews (wherein intermediate results such as the goal tree (paragraph 3.4), and the business model as a causal diagram (paragraph 3.5) were discussed) it became obvious that only a limited number of interviewees was 'comfortable' with dealing with new (different than usual) information. This indicates that there is a mismatch between exploitative and explorative interests, subject matters, and perhaps believes. Information generated from explorative analysis is not understood, trusted, and/or often dismissed as 'scientific' by operations. This mismatch can perhaps be explained by (1) competence or knowledge gaps where new material formats are not understood because they are different than the daily report formats used, (2) untrustworthy source/unchecked or unapproved by higher management where the backing of the claim is questionable (dissertation or perhaps even exploration), and thus not trusted, (3) confirmation bias where new material is rejected because it does not fit current believes.

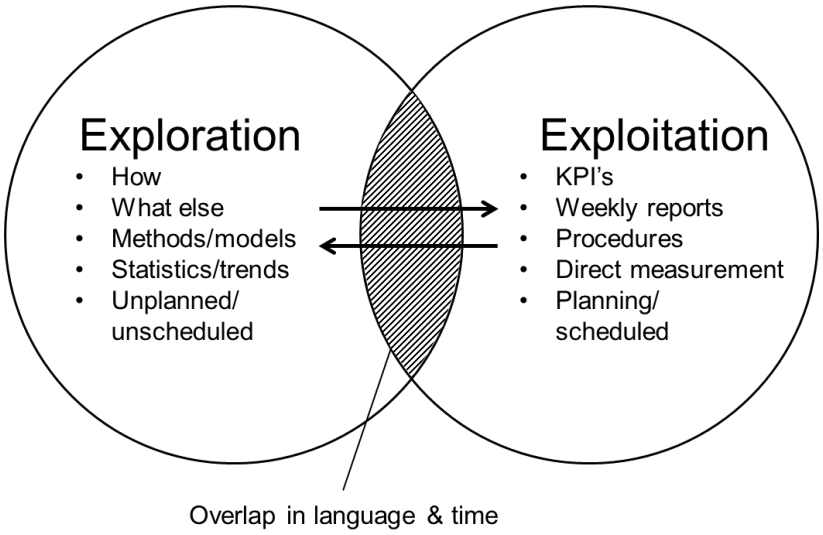

Figure 31, overlap between explorative and exploitative discourse.

The figure above illustrates the misfit in discourse between exploration and exploitation. Both have a different scope of interest, methods, intervals, and deliverables, depicted by circles. The overlap is symbolized by the hatched area where the exploration and exploitation circles overlap. Such an overlap may not exist because (1) the complete absence of exploration activities, (2) the 'distance' of discourse between both exploration and exploitation, or (3) differences in time and place (e.g. schedule versus unscheduled). Because of the scale of activities, labor is divided across multiple teams and/or disciplines. This introduces interaction points, but also a limitation in overview, resulting in partial or incomplete knowledge about adjacent activities and ditto consequences should things change.

System Analysis is found to be a labor intensive method, because the process of eliciting, structuring, validating, and formatting knowledge requires considerable attention. This is especially valid for the situation where no, or marginal material from prior analysis is available and thus a first attempt must be made to compile a complete picture from various, sometimes incomplete sources (due to perceptions, belief systems, terminology, concepts, etc.). This is not an easy task because a lot of different information is brought together into a single whole.

Contrary to the investment effort, it is however witnessed that the process of reviewing, analyzing, elaborating, and thus utilizing prior analysis accelerates learning. Learning in this case is about diffusing acquired knowledge, experiences, between the exploration and exploitation scope. This in return contributes to deeper understanding of current operations, impact of external changes, organizational design, seizing-, and reconfiguration performance. This is where knowledge about routines and meta-routines is valuable. It is therefore concluded that, albeit that system analysis can be labor intensive, the method outweighs the investments made, because the externalities (both now and later) are believed to be substantial.

5.2 Scenario Analysis methodology

This paragraph answers the second component (scenario analysis) of research question 1.2: "*What is the effectiveness of system analysis and scenario analysis method's in the design of Contextual Vigilance policies?".*

In general it must be concluded that scenario analysis is effective for both outsiders and incumbent management, because it provides easy insight in the sensitivity (or consequences) of various options to uncontrollable external changes, using well-based and plausible stories. Scenarios are written in a narrative form using terminology and reasoning that has no 'scientific' (i.e. difficult to understand) constructs. This make the threshold to use scenarios low, which opens up the possibility to discuss and relate to in personal, or group sessions, which renders scenario analysis in a powerful tool.

Scenarios must however be formulated at the correct level, using valid arguments and reasoning. The backing of these arguments and reasoning in the Contextual Vigilance making case study is based upon the results of system analysis. Other forms of input are certainly possible; however it has been proven valuable to use system analysis outcomes which in turn are based upon inputs from the target audience self. People involved in the Contextual Vigilance case study could easily relate to the scenarios created, knowing that these have been based upon consolidated input from their peers, instead of an individual's opinions.

5.3 Efficiency of Contextual Vigilance policymaking

This paragraph answers the research question 1.3: "*What is the efficiency of the design processes of Contextual Vigilance policies, and how is this influenced by the organization?".*

Efficiency is about the amount of effort to do, or to produce something. It is often expressed as the ratio between inputs and results. So when e.g. two methods A & B result in the same outcome, method A can be twice as efficient to method B when it e.g. requires half the inputs as compared to method B. To determine the efficiency of the design of a Contextual Vigilance policy, information needs to be gathered about how much effort was invested, the value of the outcome, and the forthcoming efficiency indicator of the initial investment. This is elaborated in the next three paragraphs. The last paragraph discusses how the organization influences the efficiency of the design process of Contextual Vigilance policies.

5.3.1 Effort spend on Contextual Vigilance policymaking case study

In this case it concerns the level of investments that must be made in order to do or produce the design of Contextual Vigilance policies. The investments made for the Contextual Vigilance policymaking case study are measured in spend working hours and are summarized in the table below. Total required effort is about 168 working hours, which roughly relates to one month of labor, assuming a forty hour workweek.

Table 12, Overview of Contextual Vigilance policymaking case study.

Activity	Duration (hrs.)	Remarks
Interviews	36	Nine interviews, each requiring two hours (interviewee and interviewer), and two hours for reporting
System Models	60	Five model components, each requiring about four hours for synthesis and eight hours for reporting
Scenarios	32	Four scenarios, each requiring eight hours for the scenario text and ranking
Report	40	Remaining report writing
Total	**168**	

The overview above does however not reveal that these activities were executed in a discontinuous manner. This is representative for exploitation oriented firms; these (explorative) activities were undertaken alongside daily activities (for which not always the required additional time was found). Consequence of this is that activities were rescheduled further in time. This is believed to contribute positively to the outcome quality and negatively to the process's efficiency. The positive impact on quality is identified, because it has been proven beneficial to allow some time off, or take some distance, during analysis. New or revised insights or framing most often occurred when one is not actively involved with the subject matter. The negative impact on the process's efficiency was witnessed when activities were picked up again, simply to answer questions like "where were we?", and "what needs to be done next?".

5.3.2 Value of Contextual Vigilance policymaking case study

The systems analysis executed in the Contextual Vigilance policymaking case study has just enough details to continue with scenario analysis. It is recommended that the acquired and captured knowledge will be used for the next round of system analysis in the future. With the experiences and insights created from now onwards, parts of the analysis may be found correct, whereas others may need to be refined such that the knowledge about how things work, and how they contribute to objectives increases and is shared for better decision-making.

The scenario analysis executed in the Contextual policymaking case study, is defined at a high level, and the impact scores have been set based upon first assumption by experts. The outcomes must be seen as a first indication of what matters most in terms of sensitivity and impact. So here too the scenario analysis executed has just enough details to assess what is important, and trigger a new successive round of research wherein it is possible to adjust the expert assumptions based upon further analysis.

The value of the system- and scenario analysis executed is difficult to assess. There are at least two locations where value can be expected: (1) future analysis that use these outcomes as point of departure, and (2) adjacencies, being future organizational decision-making not concerning Contextual Vigilance related topics.

5.3.3 Efficiency of Contextual Vigilance policymaking case study

There are no exact measurements of the expected utility possible, because it is very difficult to isolate the contribution of analysis in future decision-making. The efficiency of Contextual Vigilance policymaking can only be assessed by identifying two extreme outcomes: worst-, and best case. Worst case is that neither future analysis nor organizational decision-making utilizing the analysis outcomes takes place, and that the knowledge gathered and captured during this case study will not be used subsequently. Thus the hours spend are incurred, but nothing will be done with the outputs. This is then considered a total loss of investment, in this particular case a loss of 168 working hours. Best case is that organizational decision-making uses the gathered and captured knowledge to come to a better decision. The difference in organizational performance resulting from this extra or more refined knowledge is in this case the actual explained value of Contextual Vigilance policymaking. Chances are however that because of organizational scale, the impact (or utility) of better decision-making is much higher than the cost invested. For example suppose that utilizing current research outcomes in a decision would yield an extra 0.1% productivity gain for one hundred employees. This would yield a benefit of say 184 hours (assuming 46 workable weeks, times 40 hours, times 0.1% times 100) which results in a return factor of about one.

The best case example discussed above demonstrates that, in case of factor improvements (operational efficiency gains) utilizing research outcomes, executing research can yield higher overall efficiency, provided that the scale of operations is substantial enough. Proportional improvement is also possible by e.g. using different mechanisms that significantly yield higher operational outcomes. Such fundamental improvements are however more difficult to predict or plan, however do have high efficiency gains. This basically underlines the old dilemma of the high variation of the distribution of returns. Either there is only a loss, or (depending on the odds) there is a change of returns later. This dilemma is only solvable by conducting long term organizational experiments in order to collect fact-based evidence to proof the actual efficiency of explorative activities. Such experiments render to be well out of scope for dissertation research, and likely as well for commercial organizations because of forthcoming operational risks and various other influences during such experiments.

The answer to research question 1.3: "*What is the efficiency of the design processes of Contextual Vigilance policies, and how is this influenced by the organization?"* must therefore not be answered with the highest objective "sustained competitive advantage of organizations" in mind, but in relation to the supporting explorative processes self; *System Analysis* and *Scenario Analysis*. *System Analysis* has proved to be less efficient than *Scenario Analysis* in terms of organizational reach. Good (but relatively hypothetical) scenario descriptions had low

thresholds for understanding and exchange of ideas with the interviewees. Good (less hypothetical) system analysis models provide more detailed insights in causal relations of various organizational elements and aspects, however were less well received or accepted by the interviewees, this is believed to be explained by differences in exploitation and exploration focus and discourse.

This means that based upon current findings *Scenario Analysis* should be favored over *System Analysis*. It does however not mean that *System Analysis* can be skipped altogether; the case study learned that good scenarios prove more credible when being backed by good system analysis. It is therefore contended that, depending on the organization's position and sense of urgency, more emphasis is required for scenarios when the organization is exploring, and conversely more emphasis is required for system analyses when the organization is moving towards decision making where uncertainties need to be eliminated as much as possible, justifying only then the increased investments that come with system analyses. The table below summarizes the relationship between process efficiencies and how this is influenced by the organization.

Table 13, Efficiency of Contextual Vigilance design processes depending on the organizational mode.

CV Design process	Organizational mode	
	Exploring options	**Deciding on change**
System Analysis	*Low efficiency*	*High efficiency*
Scenario Analysis	*High efficiency*	*Low efficiency*

5.4 Organizational factors influencing CV policymaking

This paragraph answers the central research question 1: "*What organizational characteristics are most determining in the design process of Contextual Vigilance policies?*" The sub research questions have been answered in paragraphs 2.4, 5.1, 5.2, and 5.3, which complemented with observations during the CV policymaking case study makes it possible to formulate an answer to the abovementioned central research question. Each relevant organizational factor is discussed in the subsequent paragraphs.

5.4.1 Organizational size

One of the major organizational factors that influence Contextual Vigilance policymaking is *organizational size*. The influence of this factor is however believed to be two-sided. The richness of available knowledge, experiences, and opinions is believed to be a great and a positive asset. The majority of the interviewees were willing to participate and knowledgeable to contribute when searching for information. This availability is believed to contribute positively to the quality (effectiveness) of the analysis and consequently CV policymaking.

The information gathered is diverse, however also partial, which requires further analysis, synthesis, and reformatting into consistent models of thought. This exposes the negative consequence of organizational size for CV policymaking namely: efficiency loss due to many interactions. The interviews held, were with various positions in the organization, however all relatively at the same level. This was done intentionally such that the analysis would not have a high variation in details. Should there be follow-up rounds where the analysis are deepened further; more specialists from lower levels will be required. This will increase the time needed to gather, align, verify, and discuss the information. This (perhaps exponential increase of effort due to increasing interaction points) easily dampens the enthusiasm of a researcher, especially when he/she has to execute the research activities in addition to existing operational responsibilities, which have a direct impact on the organization's short term performance.

An additional effect of organizational size is that personnel turnover tends to be higher. Job rotation brings a lot of good, but is effectively installed to foster organizational learning. This means that employees are learning in their current position, and continue to their next position when they've learnt enough or when the new position demands for their specific competences. During this research the positions of the Vice President, Manager of Engineering, and Manager of Projects were rotated. For the research this implicated that the research subject had to be introduced again and that newcomers not necessarily shared the same interest, perspectives, or know-how as their predecessors.

The geographical spread of the organization (also an aspect of organizational size) contributes negatively to the efficiency of Contextual Vigilance policymaking. A couple of interviews had to be rescheduled because interviewees were on a one or two-week business trip to other continents. The difference in time zones did not allow much room other than postponing the interview. Once returned this research subject was not high on their agenda as well. In one particular case no interview appointment could be made during a period of two months. This person has not been interviewed at all.

These observations concern the design process of CV policies only; it is imaginable that implementation costs in large organizations also will be higher compared to small organizations. Controversy the hypothetical example of factor improvements discussed in paragraph 5.3.3 learnt that positive effects of CV policymaking can only be realized when the (labor intensive) organization is large.

5.4.2 Nature of business activities

The nature of business activities is an organizational factor that influences Contextual Vigilance policymaking. Project-based organizations demonstrate highly discontinuous and separate business activities as compared to e.g. production or manufacturing firms. Discontinuous and separate business activities make it harder to share and learn from each other. For example different project teams working for the same client (discontinuous, but not separate) have little opportunities to learn from each other because of differences in time and place because team A is not operational or involved in other activities when team B has learnt

something and has time to share. Unlike seasonal, or shift oriented work projects do not share same start points, pace, or locations, etc., which would make it easier to organize collective learning moments.

Separation of business activities on the other side (in the form of e.g. client or discipline specific activities) fosters further specialization and optimization only relevant to local circumstances. These local (non-uniform) circumstances can even be limited to project team members who have individual ways of working, based upon experience or know-how. Knowledge transfer is hindered or obscured by client secrecy arrangements, specific/fringe conditions, and ditto work agreements or tactics.

6 Conclusions & Recommendations

This chapter discusses the research's two-part conclusions and recommendations. The first paragraph discusses conclusions and recommendations regarding Contextual Vigilance policymaking case study, which can be used by the problem owner for decision making concerning Contextual Vigilance policies. The second paragraph discusses conclusions and recommendations regarding the Contextual Vigilance policymaking process, which can be used by the problem owner for implementing Contextual Vigilance policymaking processes embedded in the organizational structure.

6.1 Contextual Vigilance policymaking case study

Interviews have learnt that Jacobs Nederland b.v's (JNL) susceptibility to contextual (external) change is commonly recognized. The recognition exists amongst all interviewees instinctively, however (with exception of a few) with no clear and uniform mindset. From individual perspective some factors (often client related) were suggested that could influence this undesired state. This research has aggregated these inputs, analyzed and complemented it with inputs and models found in literature to compile a list of characteristics, specific to Jacobs Nederland b.v., that influence its vulnerability to external change. These characteristics are:

- Limited autonomy;
- Conservative industry;
- Few clients, many transactions;
- Structured and formalized business activities;
- Labor intensive business model;
- Discontinuous and separate business activities;
- Self-awareness;
- Target (short term) oriented;
- Strong identity.

With exception to *Strong Identity*, all characteristics are found recognizable in follow-up interviews. That having a strong identity can limit exploration (both internally and externally) a negative side to the medal, was not recognized at first. Recent endeavor by senior management to expand business in the Middle East however made clear that such new undertakings are not easy to implement in an organization that for the last decade has been involved in framework and partnership projects, which are fundamentally different than the anticipated one-off projects in the East. This recent finding by senior management coincides with findings in this report which, apart from the different interests (expanding business by exploiting new markets versus ensuring sustained competitive advantage by exploring for threats/opportunities) underlines the significance of the findings.

These findings confirm JNL's vulnerability. but listing those characteristics does of course not prevent or mitigate vulnerability to external change. Literature research suggests that firms are vulnerable to change of the dynamic context wherein the firm is operating, when they fail in at least one of three activities: (1) detecting relevant threats and opportunities (sensing), (2) deciding on appropriate business strategy (seizing), and (3) implement change (reconfiguring). The illustration below depicts this chain of activities positioned alongside current operations in its context.

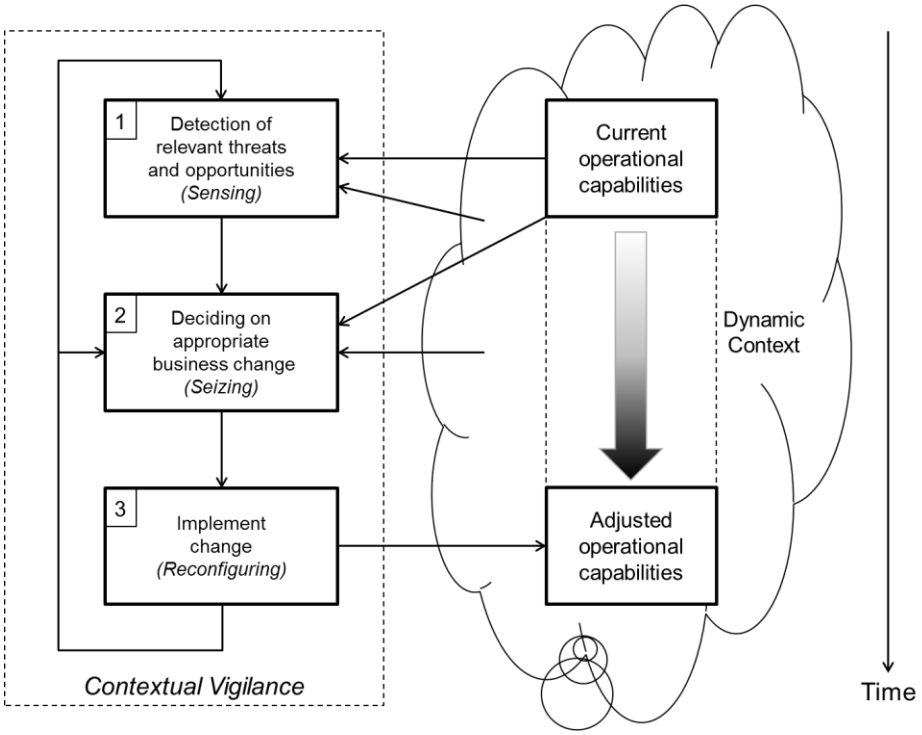

Figure 32, Adjusting operational capabilities in response of changing context, based upon detection, deciding and implementation activities.

To answer the desire to prevent the organization from surprises four candidate (high level) policy options have been compiled from literature research.

1. *Do Nothing*, minimize investments in explorative activities, and wait for others to define and test answers in case of external game changers. This is the current policy.
2. *Structural Ambidexterity*, construct structurally independent units, each having its own processes, structures, and cultures, but is part of the same organization, i.e. diversification at organizational unit level.
3. *Sequential Ambidexterity*, tilt the organization to allow repositioning/realigning itself in changing context by redefining control mechanisms, -reward systems, and -market interfaces.
4. *Contextual Ambidexterity*, introduce in the existing organizational structure enough room for employees to explore, next to normal exploitation activities, i.e. diversification at individual (employee workplace) level.

These policy options have different levels of investments, characteristics, and consequences, which are difficult to disentangle and to compare. To support decision-making scenario analysis has been applied, using (1) *market cooperation*, and (2) *control autonomy* as influencing external factors to determine how they influence policy outcomes. This revealed mixed results because the four policy options flipped rankings almost per scenario, revealing their sensitivity to these external factors. Most robust policy option in terms of both short and long term criteria, without creating new path dependencies, is found to be *Contextual Ambidexterity*. *Structural-* and *Sequential Ambidexterity* have distinct futures wherein they are believed to yield best results, but these futures are not current and both policy options are accompanied with significant investments that cannot easily be reversed.

Closer to current practiced Logical Incrementalism decision-making, lies *Contextual Ambidexterity* which introduces exploration at workplace level, which (1) is better manageable in terms of investment and intensity, because it is easier to vary the required attention dispersed over workplaces then to vary on organizational units/structures, and (2) to keep the initiatives hidden perhaps both externally and internally, such that no unwanted signals are broadcasted that may cause undesired confusion.

Contextual Ambidexterity as a policy concept can be related to two existing global Jacobs initiatives being: (1) Beyond Zero ®, and (2) .Inclusion. *Beyond Zero* ® is in terms of policy principle comparable since it introduces safety, and safety awareness as a culture at workplace level in the organization. Employees are given (and expected to spend) time to share safety related topics which forces those involved to actively engage and discuss safety related matter such that employees, families, and client relations are alerted and prepared for every days' safety related issues and situations. *Inclusion* is in terms of mechanism very comparable since Inclusion emphasizes on fostering cross-functional, cultural teams that are able to solve uncommon issues/situations better because of team' diversity. Inclusion's current emphasis is however on project execution, and not on organizational survival.

Contextual Ambidexterity is because of its robust performance, low implementation cost, risk, and its complementary character to existing corporate initiatives, the recommended policy option, especially where there is not enough support/certainty to invest in more organized options such as *Structural-* or *Sequential Ambidexterity* that have negative short term and uncertain future performance. *Contextual Ambidexterity* should however not be regarded as a single step and final solution. As discussed in paragraph 4.4 *Contextual Ambidexterity* does not provide full control for senior management. It merely engages awareness and engagement at workplace level such that the level of *sensing* is raised with relative low investments, not necessarily the level of *seizing* and *reconfiguring*.

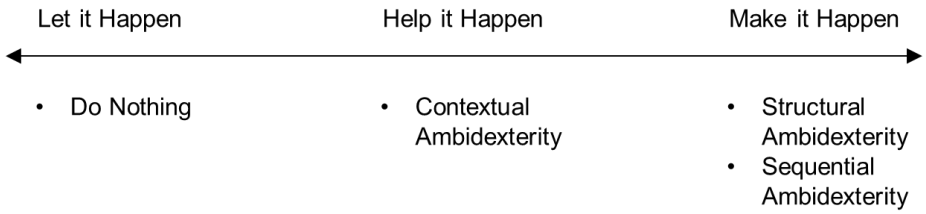

Figure 33, Policy options positioned alongside the level of control, discussed in paragraph 4.4.

Complementary to practicing *Contextual Ambidexterity*, it is recommended that senior management monitors the most influencing external factors *market cooperation* and *control autonomy* and consider switching to *Sequential-* or *Structural Ambidexterity* when external markets split up, depending on the level of control autonomy allowed by Jacobs Corporate.

With respect to implementation of a *Contextual Ambidexterity* policy, it is recommended to expand the curriculum of the existing Inclusion workshops with games that contain externally driven game changing cases and assignments in order to see how well *sensing*, *seizing*, and *reconfiguring* capabilities are currently available. This will provide a low cost first insight into actual state of current knowledge, attitudes and behavior.

6.2 Contextual Vigilance policymaking process

Executing the Contextual Vigilance case study learnt that in general interviewee's recognized the organization's vulnerability to external change, however do not have a clear idea on how to mitigate for or hedge against such vulnerabilities.

The case study also learnt that factors like organizational size and the nature of business activities in project-based firms in general have a negative influence on the efficiency of CV policymaking. These factors are however believed to be inherent characteristics that cannot be influenced in order to increase the efficiency of CV policymaking. The organization will continue to grow and continue executing projects as the main means of business activities.

One possibility to cope with the burdens of large project-based organizations is identified during this research. This concerns the focus on a knowledge creation/sharing culture which essentially is an additional responsibility next to existing operational responsibilities. Especially in a collective setting, knowledge creation and sharing must be managed proactively else people soon will fall back in exploitation mode and precious explorative momentum is lost.

When the organization is geared into deciding on change it is expected that more emphasis is required and justified on *System Analysis* activities, aimed to test and proof relevant understandings identified during explorative phases. This implicates that (based upon the assumption that Jacobs Nederland b.v. currently does not need to decide on organizational change) investments on *System Analysis* activities can better be postponed till really required, and it's more worthwhile to prepare for such an event by emphasizing on *Scenario Analysis* workshops since they contribute more efficiently to the exchange and spread of understandings and reasoning across various levels of the organization.

This is in line with the recommendation to implement *Contextual Ambidexterity* in order to raise the level of contextual vigilance because employees and units learn to divide their attention between core operating responsibilities and knowledge creation activities. With such additional organizational traits, the organization will be more agile in developing and appropriating new ways of working based upon externalized (otherwise tacit) information which will prove valuable in large diversified project-based organizations.

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Nederlandse samenvatting (summary in Dutch)

Dit rapport is geschreven voor het afronden van de Master of Science deeltijdopleiding Engineering & Policy Analysis (EPA) van Technische Universiteit Delft, faculteit Techniek Bestuur & Management (TBM). Het onderzoek is uitgevoerd van Maart 2013 tot Juli 2014.

In de afgelopen decennia zijn vele gerenommeerde organisaties opgekomen en vervolgens weer verdwenen, omdat de markten waarin ze ooit opbloeiden zijn veranderd. Vele factoren kunnen een rol spelen waarom gevestigde organisaties moeite hebben om tijdig te reageren op externe veranderingen (ook wel bekent als game-changers). Weinig organisaties zijn er in geslaagd te overleven door op tijd nieuwe bedrijfsmodellen en -strategieën te adopteren. Nog minder organisaties zijn erin geslaagd om te profiteren van dergelijke situaties, en sprongen voorwaarts te maken door adequaat om te gaan met externe veranderingen.

Jacobs Nederland BV, onderdeel van het Amerikaanse Jacobs Engineering Group Inc, bevindt zich momenteel niet in dergelijke turbulente tijden. Het hoger management vermoedt echter dat de organisatie voor externe veranderingen kwetsbaar is, en vraagt zich af of dit waar is en, zo ja, hoe men de organisatie het beste kan voorbereiden, vandaar de titel van dit onderzoeksrapport: "*Achieving Sustained Competitive Advantage for Project-Based Organizations: Case Study on How Best to Prepare for the Future?",* ofwel: "*Het bereiken van Duurzame Concurrerende Voorsprong voor Projectgebaseerde Organisaties: Een Casestudy Hoe het Best voor te Bereiden op de Toekomst?*".

Er bestaan er lacunes in de kennis van het hoger management van Jacobs Nederland bv (de probleem eigenaar) met betrekking tot welke kwetsbaarheden er precies bestaan, welke maatregelen hierbij mogelijk zijn in de vorm van Contextuele Waakzaamheid beleid, waarbij het bereiken van de belangrijkste organisatiedoelstellingen: groei, klantrelaties, en veiligheid (waarbij een goede relatie met aandeelhouders, klanten, en medewerkers) gewaarborgd blijft.

De probleemstelling verwijst naar ongewenste potentiële toekomsten die misschien zelfs niet eens zullen gebeuren; het staat momenteel niet op de agenda van de dagelijkse bedrijfsvoering (wat een goede zaak is voor afstudeerprojecten). De probleemstelling spreekt de verkennende vaardigheden van de organisatie aan, om zich vervolgens ex ante (voorwaartse koppeling) voor te kunnen bereiden (zoals geïllustreerd in het schema hiernaast) terwijl het meer gebruikelijk is om te reageren op de ex post (terugkoppeling) uitkomsten, die inherent minder onzekerheid kennen, maar helaas ook laat beschikbaar zijn. Voorwaartse koppeling past invoer variabelen voortijdig aan zodat op basis van storingen en/of kansen het systeem een concurrentiesprong voorwaarts kan maken in vergelijking met degenen die dit niet tijdig en/of niet voldoende doen.

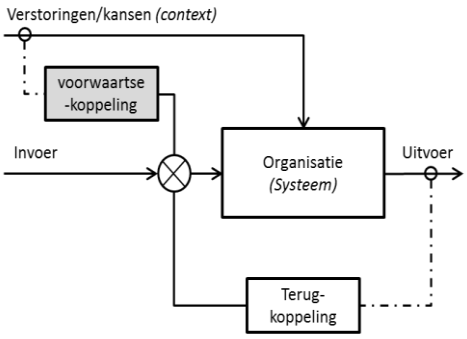

Figure 34, Voorwaarts- en –terugkoppeling sturingslussen.

Dit is een universeel concept; maar organisaties hebben moeite in het vinden van een optimum bij het verdelen van haar middelen tussen ex post en ex ante aansturing. Beide vormen vereisen andere kennis en -competenties. Voorwaartse sturing vergt goede systeem en contextuele kennis, het meten van storingen en dito besluitvorming (d.w.z. visie en leiderschap). Sturing op basis van terugkoppeling vereist een goede systeemkennis, meting van de uitgangen en optimalisatie technieken (i.e. analyse en beheer).

De ontwikkeling van een voorwaarts gestuurde aansturingssysteem kan de probleem eigenaar helpen met het verminderen van haar kwetsbaarheid voor externe veranderingen, maar roept direct de vraag op welke wijze en schaal passend zou zijn, zodanig dat een dergelijke ontwikkeling aanvaardbaar is voor zowel korte- als lange termijn organisatiedoelstellingen. Vanuit het perspectief van een adviseur/implementator is het interessant om te weten te komen waarom organisaties kunnen falen in het zich toe-eigenen deze universele kennis. Welke organisatorische factoren zijn meest bepalende in ontwerp & implementatie? Is het de markt, wetgeving, technologie, organisatiekenmerken zoals cultuur, schaal, competenties, geschiedenis, besluitvorming, korte termijn doelen, informele structuren, onzekerheid, stabiliteit, concurrentie, partnerships, etc.?

Dit onderzoek gaat in op deze complexe probleemstelling en heeft wetenschappelijke literatuur, interviews met probleemeigenaar, belanghebbenden, en -experts gebruikt als input voor de analyse en ontwerp van beleidsopties die, met gebruik van Systeem Analyse als een kader, zijn vastgelegd, ter verduidelijking en rationalisatie van deze complexe probleemstelling. De validiteit van de onderzoeksuitkomsten is niet getoetst door middel van organisatie-experimenten of relevante empirische casussen omdat dit respectievelijk onwenselijk en niet voor handen is. De uitkomsten zijn echter doorgenomen en beoordeeld met de probleem eigenaar, de vice president operaties van Jacobs Nederland b.v. Het onderzoek is waarde- of normgebaseerd.

Dit rapport draagt bij aan de huidige inzichten in het bereiken van duurzaam concurrentievoordeel voor projectmatige organisaties zoals Jacobs Nederland b.v, door gebruik te maken van verkennende activiteiten. Duurzaam concurrentievoordeel betekent om zowel nu als in de toekomst concurrerend zijn. Voor het waarborgen van het laatste, kunnen voorbereidingen worden gemaakt zodat een organisatie tijdig en adequaat kan reageren op externe veranderingen; een proces wat ik in dit rapport Contextuele Waakzaamheid noem. Het richt zich op het verhogen van de overlevingskansen van de organisatie op de lange termijn, en meer in het bijzonder over de wijze waarop projectgebaseerde organisaties een dusdanig beleid kunnen formuleren dat voorbereidingen voor een onbekende toekomst mogelijk zijn, zonder dat dit te veel van de korte termijn operationele doelstellingen weghaalt. Het gaat om de bekende gelijkenis van de gans met gouden eieren besproken door Stephen Covey (Covey, 2004) waar er sprake is van een delicaat evenwicht tussen winstmaximalisatie (Productie) nu, versus verzekering van de winst van morgen (Productie Capaciteit).

Dit onderzoek geeft een eerste inzicht in het gebruik van exploratietechnieken en -formats ten behoeve van *Contextuele Waakzaamheid* voor projectgebaseerde organisaties zoals Jacobs Nederland b.v., welke externe factoren beleidsvorming beïnvloeden, welke beleidsopties worden gesuggereerd in wetenschappelijke literatuur, en weerspiegeld de huidige inzichten en meningen met betrekking tot hoe deze beleidsopties in mogelijke toekomsten presteren door gebruik te maken van scenarioanalyse methode. Scenarioanalyse wordt doorgaans toegepast ter ondersteuning van besluitvorming van toekomstgerichte technologische investeringen in het publieke domein gebaseerd op STEMP-gerelateerde (Sociaal, Technologisch, Economisch, Milieu, en/of Politieke) factoren die invloed hebben op beleidbepaling. Dit onderzoek introduceert een casestudy waarin scenarioanalyse is toegepast ter ondersteuning van organisationele besluitvorming ten aanzien van strategiebepaling gebruik makend van organisatierelaties en -markt als factoren die invloed hebben op beleidsbepaling, hetgeen wordt beschouwd als een bijdrage aan organisatiestudies ten aanzien van besluitvorming en strategiebepaling en toekomstgeoriënteerde studies.

Analyse van de interviews en observaties heeft naar voren gebracht dat Jacobs Nederland b.v. kwetsbaar is voor veranderingen als gevolg van de volgende kenmerken:

- Beperkte autonomie;
- Conservatieve industrie;
- Einig klanten, veel transacties;
- Arbeidsintensief business model;
- Gestructureerde en formaliseerde bedrijfsactiviteiten;
- Onderbroken en aparte zakelijke activiteiten;
- Target (korte termijn) georiënteerd;
- Zelfbewustzijn;
- Sterke identiteit.

Literatuur suggereert dat bedrijven kwetsbaar zijn voor veranderingen van de dynamische context waarin de onderneming actief is, als ze falen in tenminste één van deze drie activiteiten: (1) het detecteren van relevante bedreigingen en kansen (sensing), (2) te beslissen over passende bedrijfsstrategie (seizing), en (3) veranderingen doorvoeren (reconfiguring). De onderstaande afbeelding toont deze keten van activiteiten gepositioneerd naast de huidige operaties in zijn context.

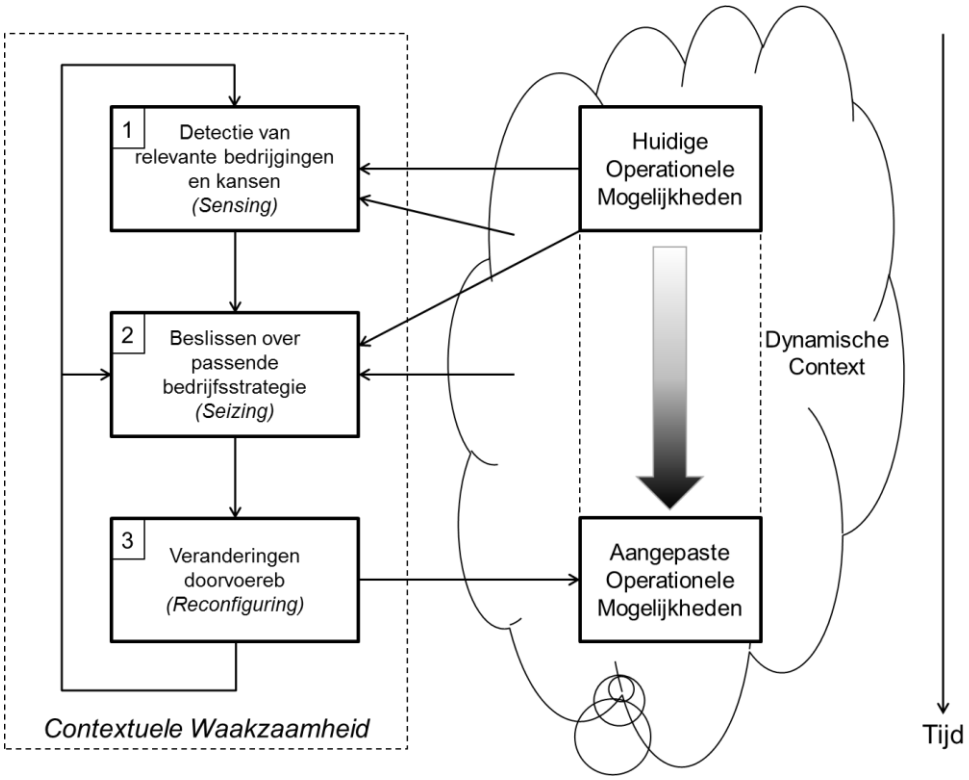

Figure 35, Aanpassen van operationele mogelijkheden in antwoord op veranderende context, gebaseerd op detectie, besluitvorming en implementatie activiteiten.

Om de behoefte om verrassingen te voorkomen te beantwoorden zijn vier kandidaat (hoog abstractieniveau) beleidsopties samengesteld op basis van literatuuronderzoek.

1. *Niets doen*, investeringen in exploratieactiviteiten minimaliseren, en wachten totdat anderen hun antwoorden hebben getest in geval van externe veranderingen. Dit is het huidige beleid.
2. *Structurele Ambidexteriteit*, het inrichten van zelfstandige eenheden, elk met zijn eigen processen, structuren en culturen, maar die deel uit blijven maken van dezelfde organisatie, dus diversificatie op de organisatie-eenheid.
3. *Volgordelijke Ambidexteriteit*, dit betreft het kantelen van de organisatie om zich te herpositioneren / heroriënteren in de veranderende context door het herdefiniëren van controlemechanismen, beloningssystemen, en marktinterfaces.
4. *Contextuele Ambidexteriteit*, het introduceren van genoeg ruimte voor medewerkers om te verkennen, naast de normale exploitatieactiviteiten in de bestaande organisatiestructuur, dus diversificatie op individueel (werknemer werkplek) niveau.

De term *ambidexteriteit* heeft onder andere betrekking op het vermogen om bijvoorbeeld zowel links als rechtshandig gelijkvaardig te zijn. In de context van organisaties verwijst het naar het vermogen van de organisatie om even goed te zijn in het managen van productieprocessen (exploitatie) en het managen van innovatie en verander (exploratie) activiteiten.

Deze vier beleidsopties hebben verschillende investeringniveaus, kenmerken en gevolgen, die niet eenvoudig te ontwarren en te vergelijken zijn. Om besluitvorming te ondersteunen is scenarioanalyse toegepast, waarbij op basis van externe factoren: (1) externe marktsamenwerking, en (2) interne controleautonomie zijn gebruikt om te zien hoe deze van invloed zijn beleidsresultaten. Dit leidde tot gemengde resultaten, omdat de vier beleidsopties bijna per scenario van voorkeurspositie veranderden, dit onthult hun gevoeligheid voor deze externe factoren. Meest robuuste beleidsoptie voor zowel korte als lange termijn criteria, zonder het creëren van nieuwe afhankelijkheden, blijkt Contextuele Ambidexteriteit zijn.

Contextuele Ambidexteriteit is, vanwege zijn robuuste prestaties, lage implementatiekosten, risico, en aanvullende karakter op bestaande initiatieven, de aanbevolen beleidsoptie. Met name wanneer er niet genoeg steun/zekerheid aanwezig is om te investeren in meer georganiseerde opties zoals Structurele- of Volgordelijke Ambidexteriteit, welke negatieve korte termijn en onzekere toekomstige prestaties hebben. Contextuele Ambidexteriteit mag echter niet worden beschouwd als de enige stap en uiteindelijke oplossing. Contextuele Ambidexteriteit geeft geen volledige controle voor het senior management. Het bevordert bewustzijn en betrokkenheid op werkplek niveau zodanig dat *detectie* wordt verhoogd met relatief lage investeringen, en niet het niveau van de *besluitvorming* en *implementeren*.

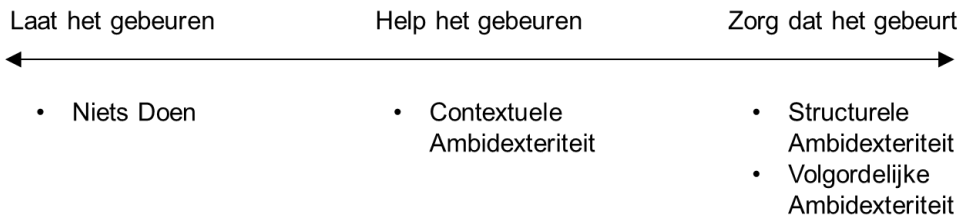

Figure 36, Beleidsopties gepositioneerd t.o.v. het niveau van invloed, zoals besproken in paragraaf 4.4.

Complementair aan het beoefenen Contextuele Ambidexteriteit, is het aanbevolen dat het hoger management de meest invloedrijke externe factoren: externe marktsamenwerking en interne controle autonomie bewaakt en overweegt om over te schakelen naar Volgordelijke- of Structurele Ambidexteriteit, wanneer externe markten opsplitsen, afhankelijk van het niveau van controle autonomie toegestaan door Jacobs holding.

Met betrekking tot de uitvoering van het Contextuele Waakzaamheids beleid, is het raadzaam om het curriculum van de bestaande Inclusion workshops uit te breiden met materiaal dat betrekking heeft op externe veranderingen in combinatie met opdrachten, om te zien hoe goed *detectie*-, *besluitvorming*-, en *implementatiecapaciteiten* momenteel beschikbaar zijn. Dit zal een goedkoop eerste inzicht verschaffen in de actuele stand van de kennis, houding en gedrag.

De Contextuele Waakzaamheid casestudy heeft aangetoond dat de grootte van de organisatie en de typische uitvoering van bedrijfsactiviteiten in projectorganisaties een negatieve invloed heeft op de efficientie van CV beleidsvorming. Deze factoren worden echter als inherente eigenschappen beschouwd die niet beïnvloedbaar zijn om de efficiëntie van CV

beleidsvorming te verhogen. Algemeen wordt aangenomen dat de organisatie verder zal groeien en dat het projecten zal blijven uitvoeren als hoofd bedrijfsactiviteit.

Zoals reeds aangeven is de validiteit van dit onderzoek is gebaseerd op wetenschappelijke literatuur en een beperkt aantal interviews. Dit onderstreept de kwetsbaarheid van deze onderzoeksresultaten en dat verder onderzoek noodzakelijk is om de invloed van meningen te beperken en meer richting feitgebaseerd onderzoek te gaan. Het is echter twijfelachtig of feitgebaseerd onderzoek echt haalbaar is zonder kostbare en risicovolle organisatie experimenten (of ondernemingschap). Als eerste stap is het daarom aanbevolen om workshops te organiseren met de huidige geïnterviewden en hun lager management waarin de projecteerde scenario's en beleidsopties worden besproken en getest in spelgebaseerde settings om deze verder aan te scherpen voor een betere validiteit van en betrekking met de organisatie. Een eerste stap richting Contextuele Ambidexteriteit.!

Appendix A, List of abbreviations/acronyms

BaC	Budget at Completion
CEO	Central Executive Officer
CoP	Community of Practice
CPF	Cost Plus Fee
CV	Contextual Vigilance
EPA	Engineering Policy Analysis
EPC	Engineering, Procurement, and Construction
EPS	Earnings per Share
EPCm	Engineering, Procurement, Construction, and Maintenance
FTE	Full-Time equivalent
G&A	General and Administrative expenses
GVP	Group Vice President
JNL	Jacobs Nederland b.v.
NAM	Nederlandse Aardolie Maatschappij
NYSE	The New York Stock Exchange
OECD	Organization for Economic Cooperation and Development: a group of rich countries that work together to increase world trade
SOP	Standard Operating Procedures
STEEP	Social, Technological, Economic, Environmental, and Political
TAR	Turnaround
TIC	Total Installation Cost
TUD	Technical University Delft
TPM	Technology, Policy and Management
USA	United States of America

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Appendix B, Jacobs' business philosophy

This appendix discusses Jacobs' business philosophy which is advocated throughout the organization. The following quote is derived from the corporate website (www.Jacobs.com, 2013):

> *"Two important philosophies support our business model: a multidomestic approach and a boundaryless approach. In our multidomestic approach we work in many countries from locally staffed offices that share a common set of values and a single vision, while maintaining one-on-one contact with individual clients. This provides customized service suited to the locale. To better serve our clients, we position ourselves in countries where they plan to invest in the future. Our global diversity enables us to provide those clients an established local presence and strong business knowledge, reducing risk and ensuring project success.*
>
> *To be the best we can be in each location, we also apply a boundaryless approach. This means that we augment local expertise with the best technology and brightest talent the company has to offer regardless of home office location. So our diversity extends beyond geographic reach and technical capabilities to our people. Our success is tied to being flexible and boundaryless: In every case, we must be ready to do whatever it takes to achieve the best solution for our client."*

This underlines that local control is fostered, but when necessary local offices should adhere to the common interest and 'lend' its local expertise and resources to other locations when this is in benefit to overarching interests. In this it is equally necessary that any employee at any level shares the same set of common values. How this publicly is formulated can be read on the corporate website (www.Jacobs.com, 2013):

Figure 37, Jacobs' three core values triangle.

"Jacobs culture begins with three core values:

1. *We are a relationship-based company*

   This first core value is also our fundamental business strategy: We focus on forging strong, long-term relationships with our clients, as we consider sound client relationships the most important contributor to our success. We cement these relationships by providing superior customer value and by continuously improving our performance.

2. *Growth is an imperative*

   Our clients' needs drive our business, so we grow in pace with their growth. Indeed, the neck-and-neck global marketplace demands growth. And profitable growth is what all our stakeholder groups--client, employee, and shareholder--desire most from us. Our goal is to grow our business by 15 percent, every year.

3. *People are our greatest asset*

   Employee talent is the cornerstone of our success: Their expertise and capabilities win us the work, perform the work, create value for our clients, and generate loyalty in our investors. So we create an environment where our employees meet fresh, exciting challenges and experience the satisfaction of a job well done. Ours is also an environment that is flexible to change and open to innovation. At Jacobs, every employee contributes to value-added performance.

Jacobs' culture is deepened by an extraordinary dedication to a safe working environment for our employees, contractors, and clients, and a safer world for them and their families. We are an ethical company. We expect our employees and business partners to follow the highest principles of business conduct, integrity, and ethics as they carry out their responsibilities. Our company is committed to sustainable development. We work together with clients to reduce their carbon footprint, energy use, and the overall environmental impact of projects.

Our fundamental business strategy is building long-term client relationships. With more than 60 years in the industry, we have attracted and retained clients by providing superior customer value—in fact, over 80 percent of our work is repeat business from loyal clients."

The three core values summarize the essence of Jacobs' goals (growth) and business model (by means of long term client relations and a good workforce). As a consequence these notions need to be operationalized by local offices.

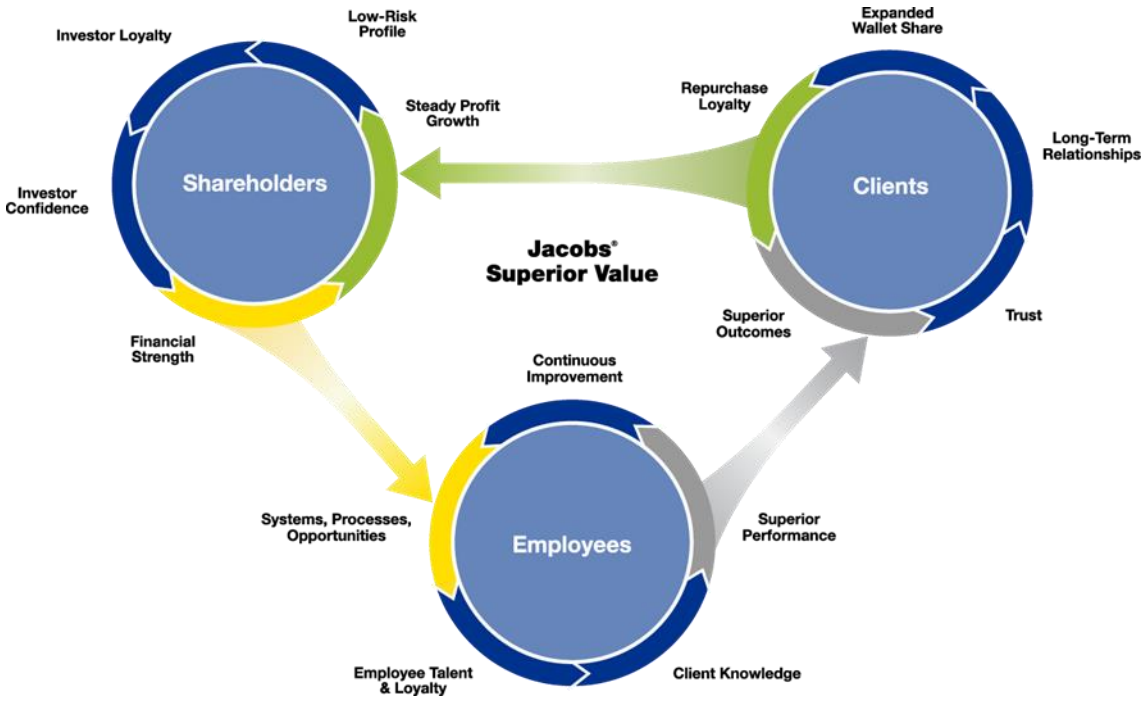

Figure 38, Jacobs' three stakeholders and their interests.

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Appendix C, Interview Reports (external)

This annex is published externally since it may contain confidential names and opinions of employees.

A copy can be requested at the author.