

CRANFIELD UNIVERSITY

HENDRO ADIARSO TJATURPRIONO

NEW PRODUCT DEVELOPMENT PORTFOLIO MANAGEMENT:
A SYSTEMATIC LITERATURE REVIEW

CRANFIELD SCHOOL OF MANAGEMENT
Management Research

MRes

Academic Year: 2011 - 2012

Supervisor: Professor Keith Goffin PhD

July 2013

CRANFIELD UNIVERSITY

CRANFIELD SCHOOL OF MANAGEMENT
Management Research

MRes

Academic Year 2011 - 2012

HENDRO ADIARSO TJATURPRIONO

New Product Development Portfolio Management:
A Systematic Literature Review

Supervisor: Professor Keith Goffin PhD

July 2013

This thesis is submitted in partial fulfilment of the requirements for the
degree of MRes

© Cranfield University 2013. All rights reserved. No part of this
publication may be reproduced without the written permission of the
copyright owner.

ABSTRACT

Product innovation is a key driver of any company's growth. The biggest challenge in managing product innovation is in determining the most promising new product development (NPD) projects from the many ideas generated, known as portfolio management. In practice, NPD portfolio management still bears some problematic issues, including focusing mainly on portfolio selection rather than managing the entire process, the vague links between the process and business strategy, and a lack of formal process. Therefore, a study that looks at NPD portfolio management through different perspectives is required.

NPD portfolio management deals with dynamic decision-making processes, involving not only selection decisions, but also decisions to delay, continue or even terminate projects. To understand this integrative process, a systematic literature review that explored four knowledge domains, i.e., NPD portfolio management, decision-making, strategy and organisational routines, was carried out. It involved 40 articles published from 1981-2012. The review focused on revealing how decision-making processes in NPD portfolio management are conducted and how they relate to the strategy process and organisational routines.

The key findings show that decisions in the NPD portfolio management process are made through interaction between cognitive and political factors, overlooking the organisational factors in the process. Furthermore, the extant literature does not explicitly explain how to link the NPD portfolio management process to the strategy process. Also, the findings indicate that the concept of organisational routines had not been used when investigating NPD portfolio management. These are the research gaps that led to the three research questions: 1) How are organisational factors involved with the cognitive and political factors in the decision-making processes in NPD portfolio management?; 2) How do the decision-making processes in NPD portfolio management link to the business strategy?; and 3) To what extent are organisational routines related to the decision-making processes in NPD portfolio management?

Keywords: New product development, portfolio management, strategy process, strategic decision-making, organisational routines.

ACKNOWLEDGEMENTS

I would like to thank all those who have supported me in accomplishing this thesis. Without their endorsement this thesis would not have been possible.

Foremost, I would like to especially express the deepest gratitude to my supervisor, Professor Keith Goffin, for giving me the opportunity to work in the Centre for Innovative Product and Services (CIPS) and encouraging me to have the freedom to develop my ideas. These chances together with his guidance have helped to lead me through the process.

I am also indebted to Dr. Chris van der Hoven, my former second supervisor, who had provided insightful discussions and assistance in the early phases of this thesis. In addition, I would like to thank my panel members for their advices and feedback, especially Prof. Cliff Bowman who recommended applying the organisational routines perspective in this thesis.

I thank the course leader, Dr. Ruth Sealy, and the Research Office team, Wendy Habgood, Irena Pidlyskij and Sandra Bettison for creating a supportive environment within the MRes programme. My special appreciation goes to Maggie Neale for fully supporting me in the CIPS to ensure this thesis was completed.

I wish to thank my mother, Setiati Atmanto, who always accompanies me with her hopes and prayer. I thank my brother and sisters for their encouragement and care.

Finally, I dedicate this work to my mother and my late father.

TABLE OF CONTENTS

ABSTRACT	i
ACKNOWLEDGEMENTS	iii
LIST OF FIGURES.....	x
LIST OF TABLES.....	xi
LIST OF ABBREVIATIONS.....	xii
Chapter 1 Introduction	1
1.1 INTRODUCTION	1
1.2 PORTFOLIO MANAGEMENT: AN OVERVIEW	1
1.3 THE CONCEPTUAL FRAMEWORK.....	2
1.4 PORTFOLIO MANAGEMENT ISSUES	4
1.5 ALTERNATIVE PERSPECTIVES ON PORTFOLIO MANAGEMENT.....	5
1.6 PURPOSE OF THE SYSTEMATIC REVIEW	7
1.7 KEY FINDINGS	7
1.8 STRUCTURE OF THE THESIS.....	8
1.9 SUMMARY.....	8
Chapter 2 Positioning the Field of Enquiry	11
2.1 INTRODUCTION	11
2.2 THE NEW PRODUCT DEVELOPMENT PROCESS.....	11
2.2.1 The Stage-Gate System	11
2.2.1.1 <i>Gate 1: Initial Screen</i>	13
2.2.1.2 <i>Stage 1: Preliminary Assessment</i>	13
2.2.1.3 <i>Gate 2: Second Screen</i>	13
2.2.1.4 <i>Stage 2: Definition</i>	13
2.2.1.5 <i>Gate 3: Decision on Business Case</i>	14
2.2.1.6 <i>Stage 3: Development</i>	14
2.2.1.7 <i>Gate 4: Post-Development Review</i>	14
2.2.1.8 <i>Stage 4: Testing and Validation</i>	14
2.2.1.9 <i>Gate 5: Pre-Commercialisation Decision</i>	14
2.2.1.10 <i>Stage 5: Commercialisation</i>	14
2.2.1.11 <i>Post implementation Review</i>	14
2.2.2 NPD Performance Measures	15
2.2.3 Environmental Factors.....	16
2.2.4 Conclusions	17
2.2.4.1 <i>Critique</i>	17
2.3 NEW PRODUCT DEVELOPMENT PORTFOLIO MANAGEMENT	17
2.3.1 Portfolio Management Definition.....	18
2.3.2 The Conceptual Framework	18
2.3.3 Product Portfolio Characteristics.....	22
2.3.4 Conclusions	22
2.3.4.1 <i>Critique</i>	23

2.4 STRATEGY	23
2.4.1 Organisational Purpose.....	24
2.4.2 Strategy Process.....	25
2.4.3 Strategy Content	26
2.4.3.1 Business Strategy.....	27
2.4.3.2 Corporate Strategy	28
2.4.4 Strategy Context	29
2.4.5 Conclusions	30
2.4.5.1 Critique.....	31
2.5 DECISION-MAKING	31
2.5.1 Decisions	32
2.5.2 Decision-Making Processes.....	34
2.5.3 Strategic Decision-Making.....	36
2.5.4 Conclusions	38
2.5.4.1 Critique.....	38
2.6 ORGANISATIONAL ROUTINES	39
2.6.1 Definition of Routines	39
2.6.2 The Internal Structure of Routines	40
2.6.3 The Role of Routines	41
2.6.4 Routines as a Source of Change and Capability.....	42
2.6.5 Conclusions	43
2.6.5.1 Critique.....	43
2.7 SYNTHESIS OF THE KNOWLEDGE DOMAINS.....	44
2.7.1 Conclusions	48
2.8 SUMMARY.....	49
Chapter 3 Methodology.....	51
3.1 INTRODUCTION	51
3.2 SYSTEMATIC LITERATURE REVIEW: AN OVERVIEW.....	51
3.2.1 Planning the Review.....	51
3.2.2 Identifying and Evaluating Studies	52
3.2.3 Extracting and Synthesising Data.....	53
3.2.4 Reporting	53
3.2.5 Utilising the Findings	53
3.3 PLANNING THE REVIEW: REVIEW PANEL.....	53
3.4 IDENTIFYING AND EVALUATING STUDIES.....	55
3.5 SYSTEMATIC SEARCH	56
3.5.1 Keywords Search.....	56
3.5.1.1 Source of Information.....	57
3.5.1.2 Identifying Keywords.....	57
3.5.1.3 Developing Search Strings	58
3.5.1.4 Keywords Search Result	59
3.5.2 Elimination of Duplicates.....	61

3.5.3 Title and Abstract Screening	61
3.5.4 Full Text Screening	62
3.6 OTHER SOURCES OF LITERATURE	62
3.7 EVALUATING STUDIES: QUALITY EVALUATION	63
3.8 SYSTEMATIC SEARCH AND EVALUATING STUDIES: RESULT SUMMARY	64
3.9 EXTRACTING AND SYNTHESISING DATA	65
3.10 SUMMARY	66
Chapter 4 Descriptive Analysis	69
4.1 INTRODUCTION	69
4.2 THE SOURCE OF THE LITERATURE	69
4.2.1 The Type of Sources	69
4.2.2 Publication Title and Quality Grading	70
4.2.3 Conclusions	72
4.3 THE PUBLICATION PERIOD	72
4.3.1 Conclusions	74
4.4 THE THEMES IN THE LITERATURE	74
4.4.1 Identification of Themes	74
4.4.2 Conclusions	76
4.5 THE TYPES OF LITERATURE	77
4.6 THE EMPIRICAL RESEARCH LITERATURE	78
4.6.1 Research Design	78
4.6.2 The Sectors of Industry	80
4.6.3 Geography	80
4.6.4 Conclusions	81
4.7 SUMMARY	81
Chapter 5 Conceptual Analysis	83
5.1 INTRODUCTION	83
5.2 STRATEGIC DECISION-MAKING IN THE NPD PORTFOLIO MANAGEMENT: SRQ 1	84
5.2.1 Portfolio Management (T ₁)	84
5.2.2 Strategic Decision-Making (T ₂)	87
5.2.3 Strategic Decision-Making in Innovation (T ₃)	88
5.2.4 Portfolio Decision-Making (T ₄)	88
5.2.4.1 <i>Key Decision Types of Portfolio Management</i>	88
5.2.4.2 <i>Decision-Making Process in Portfolio Management</i>	91
5.2.4.3 <i>The Role of Information in Portfolio Management</i>	93
5.2.5 The Subject Relevance Tree for SRQ 1	94
5.2.6 Discussion of the Findings	95
5.2.7 Conclusions	97
5.3 NPD PORTFOLIO MANAGEMENT AND STRATEGY PROCESS: SRQ 2 ..	98
5.3.1 Strategy Process (T ₅)	98

5.3.2 Strategic Decision-Making and Strategy Process (T ₆)	99
5.3.3 Front-End NPD and Strategy (T ₇)	99
5.3.4 The Subject Relevance Tree for SRQ 2	100
5.3.5 Discussion of the Findings	101
5.3.6 Conclusions	103
5.4 ORGANISATIONAL ROUTINES AND NPD PORTFOLIO MANAGEMENT: SRQ 3.....	103
5.4.1 Organisational Capabilities (T ₈)	104
5.4.2 Agency (T ₉)	104
5.4.3 Behavioural Operations (T ₁₀)	105
5.4.4 Organisational Routines (T ₁₁).....	105
5.4.4.1 <i>Changes in Routines</i>	105
5.4.4.2 <i>Routines and Organisational Capabilities</i>	107
5.4.5 Portfolio Management and Capabilities (T ₁₂)	109
5.4.6 The Subject Relevance Tree for SRQ 3	109
5.4.7 Discussion of the Findings	110
5.4.8 Conclusions	111
5.5 INSIGHTS ACROSS THE SRQS.....	111
5.6 SUMMARY	112
Chapter 6 Discussion and Conclusions.....	115
6.1 INTRODUCTION	115
6.2 DISCUSSION	115
6.2.1 Synthesis of the Descriptive Findings	115
6.2.2 Synthesis of the Conceptual Findings	116
6.2.3 Integrating the Findings into the Conceptual Framework.....	118
6.2.4 Identification of Research Gaps	120
6.2.5 Research Questions	121
6.2.6 Summary of the Synthesis of the Findings.....	122
6.3 RESEARCH DESIGN.....	124
6.3.1 Research Methodology	124
6.3.2 Sample Selection	129
6.3.3 Data Collection	130
6.4 CONCLUSIONS	132
6.5 LIMITATIONS AND FURTHER STUDY	133
6.6 SUMMARY	134
REFERENCES	137
APPENDICES.....	149
APPENDIX A TITLE AND ABSTRACT SCREENING.....	151
APPENDIX B FULL TEXT SCREENING	155
APPENDIX C OTHER SOURCES OF LITERATURE.....	157
Appendix C.1 Experts' Recommendations.....	157
Appendix C.2 Independent Selection	157

Appendix C.3 Cross-Referencing	158
APPENDIX D QUALITY ASSESSMENT OF THE ARTICLES	159
APPENDIX E THE ARTICLES SELECTED	165
APPENDIX F DATA EXTRACTION.....	169
APPENDIX G JOURNAL TITLES AND THE PUBLICATION PERIODS	235
APPENDIX H THE STUDY THEMES AND THE ARTICLES	237
APPENDIX I THE NUMBER OF STUDY THEMES PUBLISHED IN THE SPECIFIED PERIOD	241
APPENDIX J THE KEY FINDINGS OF THE LITERATURE.....	243
APPENDIX K DATA COLLECTION PLAN DETAILS	261
APPENDIX L PERSONAL LEARNING	263

LIST OF FIGURES

Figure 1.1: The Conceptual Framework of NPD Portfolio Management	3
Figure 2.1: A Stage-Gate System	12
Figure 2.2: The Structure of a Gate	13
Figure 2.3: The Enhanced Conceptual Framework of NPD Portfolio Management	19
Figure 2.4: Dimensions of Strategy and the Organisational Purpose.....	24
Figure 2.5: Strategy Process: A Holistic Framework.....	26
Figure 2.6: Corporate Strategy Framework.....	29
Figure 2.7: Strategy Pyramid.....	33
Figure 2.8: Key Elements of Organisational Routines.....	40
Figure 2.9: The Framework of the Synthesis of Four Knowledge Domains.....	49
Figure 3.1: Stages of a Systematic Review	52
Figure 3.2: The Framework of Identifying and Evaluating Studies.....	56
Figure 3.3: The Result Summary of the Systematic Search and Evaluating Studies	65
Figure 4.1: The Journal Quality Grading Proportions.....	72
Figure 4.2: The Number of Articles Reviewed from 1981-2012	73
Figure 4.3: The Number of NPD Articles in the 10 Journals from 1989-2004.....	73
Figure 5.1: The Conceptual Analysis Framework.....	84
Figure 5.2: The Framework for Project Portfolio Selection.....	86
Figure 5.3: The General Framework of Portfolio Decision Making.....	92
Figure 5.4: The Subject Relevance Tree for Systematic Review Question 1	95
Figure 5.5: The Integration of Strategic and Operative Level Innovation Activities..	100
Figure 5.6: The Subject Relevance Tree for Systematic Review Question 2	101
Figure 5.7: The Linkages of Strategic and Operative Level in NPD Projects	102
Figure 5.8: The Multilevel Entities of Organisational Capabilities	108
Figure 5.9: The Subject Relevance Tree for Systematic Review Question 3	110
Figure 6.1: The Integration of the NPD Portfolio Management Framework and the Conceptual Findings	119
Figure 6.2: An Overview of a Single Site Data Collection Plan	131
Figure 6.3: The Systematic Literature Review Outcomes.....	132

LIST OF TABLES

Table 2.1: NPD Performance Measures	16
Table 2.2: A Categorisation of Decision Characteristics.....	33
Table 2.3: Topics for Strategic Decisions.....	37
Table 2.4: The Key points of the Knowledge Domains	45
Table 3.1: Review Panel Members	54
Table 3.2: Databases of Journal.....	57
Table 3.3: List of Keywords	57
Table 3.4: Search Strings.....	58
Table 3.5: The Articles Search using the Search Strings of SRQs.....	60
Table 3.6: The Number of Articles and the Elimination of Duplicates.....	61
Table 3.7: Selection Criteria	62
Table 3.8: Quality Assessment Criteria	64
Table 3.9: Data Extraction Form	66
Table 4.1: The Type of Literature Sources	69
Table 4.2: The Journal Titles	71
Table 4.3: The Thematic Findings of the Literature Reviewed.....	75
Table 4.4: The Empirical Research Information	79
Table 6.1: The Summary of the Synthesis of the Findings.....	123
Table 6.2: Research Methodologies	126

LIST OF ABBREVIATIONS

DC	Dynamic Capabilities
NPD	New Product Development
PM	Portfolio Management
PPM	Project Portfolio Management
RBV	Resource-Based View
RQ	Research Question
SRQ	Systematic Review Question

Chapter 1 Introduction

1.1 INTRODUCTION

This thesis is a systematic literature review that discusses the literature of new product development (NPD) portfolio management. The purpose of this systematic review is to explore the current status of research in this area. This will lead to the identification of potential research avenues.

The thesis consists of seven chapters: (1) Introduction; (2) Mapping the Field of Enquiry; (3) Methodology; (4) Descriptive Findings; (5) Conceptual Findings; and (6) Discussion and Conclusions. It starts with this introductory chapter that initiates the discussion with sections on: Portfolio Management: An Overview, The Conceptual Framework, Portfolio Management Issues and Perspectives on Portfolio Management. This is then followed by the subsequent sections: Purpose of the Systematic Review, Key Findings, and Structure of the Thesis. Finally, this chapter closes with a Summary.

1.2 PORTFOLIO MANAGEMENT: AN OVERVIEW

In today's dynamic business environment, companies must continuously strive for *corporate renewal*, i.e., creating new wealth through new combinations of resources (Guth and Ginsberg, 1990), in order to survive and grow (Danneels, 2002). Some authors have recognised that the primary means of corporate renewal is product innovation (Bowen et al., 1994; Danneels, 2002; Dougherty, 1992). The *Economist* (2007), in its Special Report on Innovation, noted that “the biggest thoughts emerging from innovation research in recent years: [are that] neither idea generation nor execution is as important or as tricky as the filtering process that links the two” (p. 14). As Goffin and Mitchell (2010) indicated, this implies that the biggest challenge companies face in managing product innovation is in determining the most promising NPD projects from the many ideas generated. This is the process of selecting which set of new products will be developed, known as *portfolio management*.

Portfolio management is defined as “a dynamic decision process, whereby a business's list of active new products (and R&D) projects is constantly updated and

revised” (Cooper et al., 1999, p. 335). Besides making the right decisions in selecting and prioritising projects, portfolio management also deals with reviewing those decisions regularly and changing or even terminating projects if necessary (Cooper et al., 1999; Goffin and Mitchell, 2010; Kester et al., 2011).

The choice of projects to be selected should be largely determined by the business strategy (Cooper, 1984). Therefore, the decisions concerning the management of the pipeline of new products should be aligned with and guided by business strategy (Cooper, 2005; Cooper et al., 2001; Kester et al., 2011). Kester et al. (2011) argued that with an appropriate mix of product improvements, product line extensions, as well as entirely new products, companies could secure their long-term success.

1.3 THE CONCEPTUAL FRAMEWORK

Figure 1.1 shows a conceptual framework of NPD portfolio management, which is built based on the frameworks suggested by Cooper (1984, 2005), Terwiesch and Ulrich (2008) and Goffin and Mitchell (2010). As shown on the left-hand side of the framework, a number of ideas that emerged from market research (customer-groups and informants), internal company brainstorming or from external organisations, are filtered out, whereas some ideas are considered as being *new product concepts* (Goffin and Mitchell, 2010). The product concept, which is the “approximate description of the technology, working principles and form of the product”, concisely describes how the product will satisfy customer needs (Ulrich and Eppinger, 2004, p. 98).

New product concepts flow into a product portfolio decision-making process that undergoes a two step process: first, they are screened to be a considered portfolio of products that then enter the development process; and second, these under development products are reviewed to determine which are to be continued, postponed or terminated (Cooper, 2005; Goffin and Mitchell, 2010). To make effective selection processes in both steps, Cooper (2005) suggested applying two methods: *Stage-Gate* process and *Portfolio Review*. The former includes decision points or *gates* to evaluate the individual projects and make *Go/Kill*, prioritisation and resource allocation decisions. The latter undertakes a periodic review of the portfolio of all projects under development and makes *Go/Kill* and prioritisation decisions.

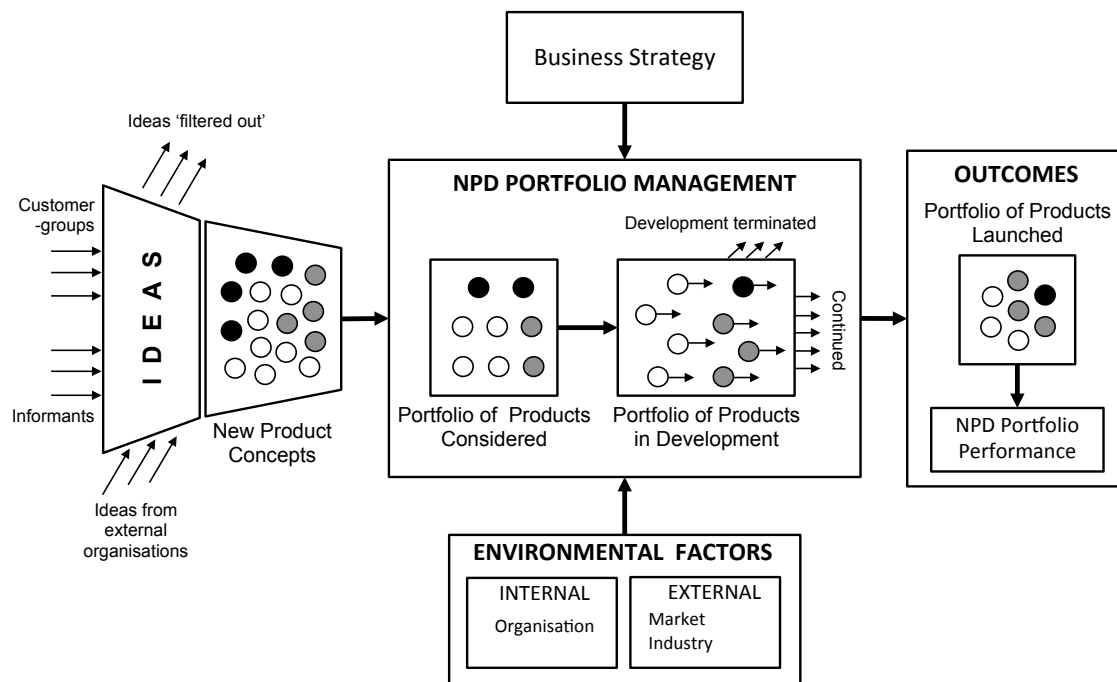


Figure 1.1: The Conceptual Framework of NPD Portfolio Management

Adapted from Cooper (1984), Goffin and Mitchell (2010) and Terwiesch and Ulrich (2008)

On the right-hand side of the framework, the *outcomes*, the portfolio of products launched, are generated from the decision processes. The end results of the NPD portfolio management are reflected in the *NPD portfolio performance* (Cooper, 1984), which are considered to be the *economic metrics* and *non-economic metrics* (Nagji and Tuff, 2012). The economic metrics consist of the financial return and market share (Brown and Eisenhardt, 1995; Krishnan and Ulrich, 2001), whereas the non-economic metrics include how the products fit with the market (Brown and Eisenhardt, 1995; Krishnan and Ulrich, 2001), the organisation's competencies (Brown and Eisenhardt, 1995) and the future technology capability (Anderson Jr. and Joglekar, 2005).

At the top of the framework, it is indicated that *business strategy* should guide the portfolio management decision, ensuring the process delivers products that reflect the strategy. At the bottom of the framework, the *environmental factors*—organisation, industry and market factors—influence the relationship between the decision processes and the outcomes (Cooper, 1984).

Clearly, the framework shows that portfolio management should be viewed as an integrated process, ranging from considering new product concepts to launching the portfolio of products. The success of the portfolio management process is measured by the performance of the overall portfolio rather than solely the individual projects. The portfolio management success impacts on both the short-term and long-term wealth of companies.

1.4 PORTFOLIO MANAGEMENT ISSUES

Despite its immense importance for management practice, portfolio management still bears some problematic issues from either practical or theoretical aspects. Some of these issues addressed include linking the process to business strategy, the lack of formal process, the focus of the product development studies and the portfolio models.

The framework in Figure 1.1 implies a formal process; however, in many companies the elements of the process are not necessarily clearly defined. For example, Kandybin (2009) indicated that despite the fact that NPD portfolio management plays a strategic role in the companies, in practice its links to business strategy are often vague or missing. Moreover, Khurana and Rosenthal (1997) reported that most of the firms they studied, lacked a complete formal process for NPD portfolio management.

Many studies have been conducted; however, they have centred on the individual product as the unit of analysis, rather than on the company's overall product portfolio (Cooper, 1984; Cooper and Kleinschmidt, 1995a; Kester et al., 2011). From the studies conducted on portfolio management, the focus has been on selecting and terminating an individual product, rather than examining the entire process (Kester et al., 2011). The emphasis of these studies has mostly centred on developing portfolio selection models (Adams et al., 2006).

Portfolio selection models seek the right allocation of resources to obtain the optimal balance in the NPD portfolio, meaning a portfolio that optimises the trade-off between returns and risks (Adams et al., 2006; Dickinson et al., 2001). These models are largely based on quantitative models for maximising the portfolio's value (Cooper et al., 1999; Kester et al., 2011). The models include optimisation models (maximising the output from a subset of available inputs), cost-benefit analysis and financial-based

models (internal rate of return, net present value and return on investment) (Adams et al., 2006). Recently, more qualitative factors have been incorporated into the models, such as scoring models, peer reviews and mental checklists (Adams et al., 2006).

Even though these models are conceptually comprehensive and promising, it has been claimed that they were not widely utilised in practice (Adams et al., 2006; Cooper et al., 1999; Hall and Nauda, 1990). Some of these models may be too complex to be implemented, and apart from that, they also suffer from a lack of context in the organisational aspects, such as the organisational decision and communication processes (Adams et al., 2006).

To summarise, the vague links between portfolio management and business strategy, the lack of an integrative perspective of portfolio management process and the emphasis on quantitative models are the main issues for existing portfolio management research. These issues might have impeded the widespread utilisation of portfolio management approaches. Having a sole perspective when looking at the portfolio management process might have caused these problems.

1.5 ALTERNATIVE PERSPECTIVES ON PORTFOLIO MANAGEMENT

Many authors have viewed portfolio management through an innovation management lens. Therefore, applying different perspectives in looking at portfolio management are needed to complement the previous studies. The alternative perspectives that might be appropriate to be considered are those that involve the organisational aspects.

Portfolio management deals with *dynamic decision process*, which involves uncertain and evolving information, dynamic opportunities, multiple goals and strategic considerations, interdependence among projects and multiple decision makers (Cooper et al., 1999, 2001). This is categorised as strategic decision-making (Harrison, 1981; Thomas, 1984) with *unstructured processes*, which refer to the processes that “have not been encountered in quite the same form and for which no predetermined and explicit set of ordered responses exists in the organisation” (Mintzberg et al., 1976, p. 246).

This view shows that investigation of portfolio management requires an incorporation of the decision process perspective. Kester et al. (2011), in their recent study, have applied the decision-making perspective in examining the portfolio

management process. They proposed a portfolio management model that includes decision-making elements and *cultural factors* as the components of the process. However, the links between the portfolio decision-making process and the strategy are not clearly shown. Therefore by clearly incorporating a strategy perspective in the process could complement their model.

Another necessary aspect for consideration is that, some studies showed that top-performing organisations managed these processes by employing formal and systematic processes, guided by clear decision criteria, as opposed to an ad hoc process (Cooper et al., 1999, 2001; Kandybin, 2009). This view can be associated with the perspective that the systematic processes that companies use for strategic decision-making can be regarded as *routines* (Dosi et al., 2000; Eisenhardt and Martin, 2000). Routines refer to “all regular and predictable behavioural patterns of firm” (Nelson and Winter, 1982, p. 14).

Organisational routines occur at the group or functional level (Dosi et al., 2000). This implies that the NPD portfolio management could contain a set of routines that builds the company’s capabilities in delivering new products. For example, brainstorming sessions are routines that facilitate the exchange of ideas among team members (Eisenhardt and Martin, 2000). Therefore, investigating the NPD portfolio management process through the organisational routines perspective can potentially enrich the understanding of how the effective NPD portfolio management is conducted¹.

To sum up, NPD portfolio management plays a vital role in corporate renewal. Managing the NPD portfolio is a complex decision-making process, because companies must allocate and balance their limited resources across the NPD projects (Chao and Kavadias, 2008; Cooper et al., 1999), while aligning those decisions with the business strategy. NPD portfolio management has been studied extensively; nevertheless, too little attention has been paid to the investigation of the entire decision-making processes (selecting, reviewing and revising or terminating). Hence, further study is required that considers an integrated perspective incorporating the organisational context: strategy and organisational routines.

¹ The recommendation of Prof Cliff Bowman, Cranfield School of Management.

1.6 PURPOSE OF THE SYSTEMATIC REVIEW

So far, Kester et al. (2011) have argued that studies of portfolio management have only looked at portfolio decision-making through one theoretical lens (single domain of knowledge) at a time. Disregarding various perspectives in the portfolio management process has caused a lack of understanding on how to manage the NPD portfolio. In order to conduct a further study on NPD portfolio management, comprehension of how strategy, decision-making and organisational routines relate to that management, is required.

This systematic review aims to explore the extant literature in NPD portfolio management that relates to decision-making, routines and strategy. The review has been conducted with specific steps that are evidence-based in nature aiming to answer the following *systematic review questions* (SRQs):

- SRQ 1. How are strategic decisions in the NPD portfolio management process made?
- SRQ 2. How does the NPD portfolio management process link to the strategy process?
- SRQ 3. How does the NPD portfolio management process relate to organisational routines?

This review is an attempt to provide an integrative framework of NPD portfolio management, which ultimately shows the potential research gaps in NPD portfolio management studies.

1.7 KEY FINDINGS

The chapters that follow will explain the key findings from the Systematic Literature Review which include:

- The NPD portfolio management field is a developing area. This is indicated by the upward trend in portfolio management publications from 1981-2012. As a developing field, theoretical-based articles have dominated these publications. In terms of industry, most studies investigated multiple industries, rather than a specific industry.

- The conceptual findings showed that, first, organisational factors have been overlooked in the NPD portfolio decision-making process. Second, the extant literature has not explored how to make NPD portfolio decisions reflect the strategy. Third, the systematic literature review showed that the concept of routines had not been applied to NPD portfolio management research.

These issues offer some new areas for investigation in NPD portfolio management research. The areas involve different theoretical lenses: strategy, decision-making and organisational routines.

1.8 STRUCTURE OF THE THESIS

This thesis is organised as follows:

- Chapter 2 describes the four main knowledge domains in which NPD portfolio management is located. The discussions in these main knowledge domains result in more focused research areas that, in turn, lead to systematic review questions.
- Chapter 3 presents the methodology of this systematic review. This includes the literature search strategy, title and abstract screening, whole text screening, quality appraisal and extraction of the information. The results of the searches are included.
- Chapter 4 discusses the descriptive findings of the literature selected. The conceptual findings of the literature are analysed in Chapter 5.
- Chapter 6 integrates the descriptive and conceptual findings, aiming to answer the review questions and reveal the research gaps; in addition, it presents the preliminary research design. Finally, it concludes this systematic literature review and identifies the limitations and further study.

1.9 SUMMARY

This chapter has presented the background to and rationale for conducting a systematic literature review on NPD portfolio management. It has shown that:

- Product innovation is a key driver of growth.
- Portfolio management deals with decisions in selecting, reviewing, and revising or terminating projects, and has been recognised as a challenging area for companies.

- The portfolio decisions need to be aligned with the right business strategy in order to result in a NPD portfolio performance that fits with corporate goals.
- Previous studies have focused on the selection criteria for individual projects rather than on how to manage the overall product portfolio.
- Previous portfolio management studies have looked at the NPD portfolio decision-making through a single theoretical lens. Hence, in this further study, a number of different theoretical lenses, such as strategy, decision-making and organisational routines, need to be incorporated to comprehend the system of decision-making in the NPD portfolio management process.

Chapter 2 Positioning the Field of Enquiry

2.1 INTRODUCTION

It has been mentioned in Chapter 1 that NPD portfolio management is an area that relates to various knowledge domains: new product development (NPD), NPD portfolio, strategy, decision-making and organisational routines. In order to reveal the position of NPD portfolio management within these domains, this chapter explores the literature of each domain and presents the interrelation between them. The discussions start by describing NPD, which is then followed by NPD portfolio management. Subsequently, strategy, decision-making and organisational routines literature are presented. The next section discusses the synthesis of the knowledge domains and sets out the review questions. Finally, this chapter closes with a summary.

2.2 THE NEW PRODUCT DEVELOPMENT PROCESS

New Product Development (NPD) is “a core business activity” (Khurana and Rosenthal, 1997, p. 103) that is defined as “the transformation of a market opportunity and a set of assumptions about product technology into a product valuable for sale” (Krishnan and Ulrich, 2001, p. 1). By continuously introducing and delivering new products, firms are able to generate profitability and growth, which in turn will build sustainability into them (Cohen et al., 2000). NPD involves decision-making along its process (Brown and Eisenhardt, 1995; Khurana and Rosenthal, 1997), which ranges from identification of market needs, assessment of external and internal technological capabilities, to a product launch and delivery (Anderson Jr. and Joglekar, 2005). To effectively manage these activities, companies need to implement a formal process, called *a stage-gate system*, in order to enable them to achieve the NPD’s performance goals (Cooper and Kleinschmidt, 1991).

2.2.1 The Stage-Gate System

Stage-gate systems view NPD as a process, which can be managed by applying process-management concepts (Cooper, 1990). The concepts suggest dividing an

NPD project into identifiable and discrete *stages* preceded by review points or *gates* (Cooper, 1994, 2001; Cooper and Kleinschmidt, 1991), as illustrated in Figure 2.1. Each stage contains a set of activities performed by different functional departments in the firm (Cooper, 2001; Cooper and Kleinschmidt, 1991). At the completion of each stage, the project enters a gate (Cooper and Kleinschmidt, 1991). This gate functions as a checkpoint in which *Go/Kill decisions*, *project prioritisations* and *project quality checks* are made based on a preset list of criteria (Cooper and Kleinschmidt, 1991).

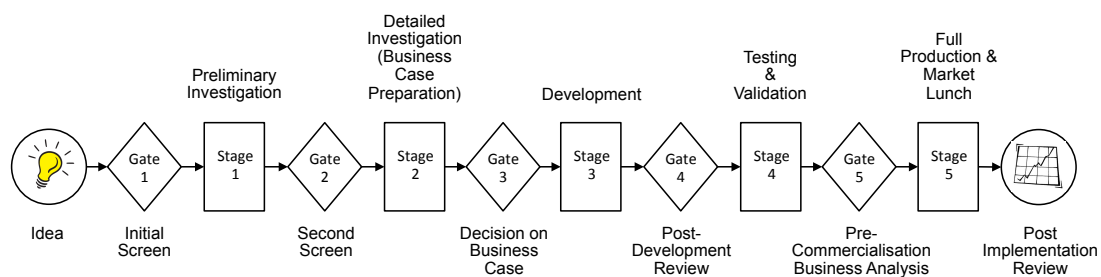


Figure 2.1: A Stage-Gate System

Source: (Cooper and Kleinschmidt, 1991)

Management make decisions at gates by following the decision structure built into each gate, which typically consists of three elements: *Deliverables*, *Criteria* and *Outputs* (Cooper, 2001), as illustrated in Figure 2.2. A set of required Deliverables, which comes out from the Output of the previous gate, is brought into the decision point. The project is then judged against Criteria, which include “*must-meet*” or “*knock-out*” questions to filter out misfit projects, and “*should-meet*” questions or “*desirable factors*”, which are scored to prioritise projects (Cooper, 2001, p. 131). Finally, defined Outputs are decided, which include a Go/Kill/Hold/Recycle decision, Action Plan and a list of Deliverables for the next gate. These decisions at gates are made by senior managers from different functions, who control resources required by the project team (Cooper, 2001).

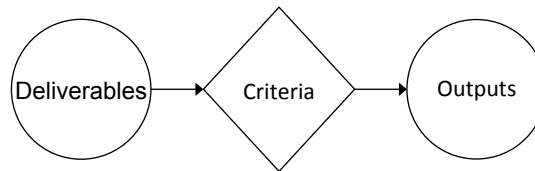


Figure 2.2: The Structure of a Gate

Source: Cooper (2001)

A typical stage-gate system with five stages and gates, as shown in Figure 2.1, starts with a new product idea and ends with a review of the product and the project's performance. The processes that occur in each stage and gate are described as follows (Cooper, 1990):

2.2.1.1 Gate 1: Initial Screen

This gate evaluates a new product idea in the light of its strategic alignment, project feasibility, level of opportunity, differential advantage, synergy with the firm's core business and resources, and market attractiveness. If the decision is Go, the project moves to Stage 1.

2.2.1.2 Stage 1: Preliminary Assessment

In this stage preliminary market and technical assessments are carried out. The former aim to work out market size, market potential and likely market acceptance. The latter assess development and manufacturing feasibility and possible cost and time to execute.

2.2.1.3 Gate 2: Second Screen

This gate re-evaluates the project based on the new information obtained in Stage 1. If the decision is Go, the project moves to Stage 2.

2.2.1.4 Stage 2: Definition

This is the final step prior to product development; therefore, the attractiveness of the project must be confirmed. The customer needs and preferences are determined as well as the potential level of competition. These customer needs, furthermore, must be translated into technically and economically feasible solutions. Ultimately, financial analysis is carried out as an input to Gate 3.

2.2.1.5 Gate 3: Decision on Business Case

This is the last gate prior to the Development stage, at which the project can still be killed. In this gate, a number of key items must be clearly defined, including: (1) Target markets; (2) Product concept, positioning strategy and benefits; (3) Product features, attributes and specification. Ultimately, the financial commitments are settled once the project passes the gate.

2.2.1.6 Stage 3: Development

In this stage, the development of the product, as well as detailed test, marketing and operations plan are carried out.

2.2.1.7 Gate 4: Post-Development Review

This gate reviews the progress and continued attractiveness of the product and project. Development work is evaluated, ensuring that the work has been completed in a quality fashion.

2.2.1.8 Stage 4: Testing and Validation

This stage examines the entire viability of the project: the product; the production process; customer acceptance; and the economics of the project.

2.2.1.9 Gate 5: Pre-Commercialisation Decision

This final gate is the entry point for full commercialisation. In this final point, the project can still be killed. The assessment focuses on the quality of the processes at the Validation Stage and their results. The assessment uses financial projections—key criteria to make the decision Go/Kill. Furthermore, in this stage the operations and marketing plans are evaluated and approved for implementation

2.2.1.10 Stage 5: Commercialisation

This final stage executes the implementation of the marketing launch plan and the operations plan.

2.2.1.11 Post implementation Review

After commercialisation, the project team will be disbanded as the product becomes “a regular product” in the firm’s line. At this point, the project and product’s performance is evaluated by comparing the latest data on revenues, costs, expenditures, profits and timing with its projections. This is also called a *post project*

review, which evaluates the strengths and weaknesses of the project and learns from them for improving the next one.

Overall, the stage-gate system provides discipline in conducting an NPD. This enables firms to gain better decisions, more focus, fewer failures and faster developments (Cooper, 1990). Such a formal process helps an NPD project to meet its performance goals (Cooper and Kleinschmidt, 1991). The relevance of the Stage-Gate to NPD portfolio management is that an effective Stage-Gate system provides tough gates and solid data integrity that lead to sound portfolio management (Cooper, 2008).

2.2.2 NPD Performance Measures

NPD performance can be measured by different metrics that focus on the various product development aspects. These metrics measure the *economic* impact such as *financial performance* and *non-economic* impact, including *process performance*, *product concept effectiveness* and *organisation* (Brown and Eisenhardt, 1995; Krishnan and Ulrich, 2001; Nagji and Tuff, 2012). Table 2.1 lists details of the performance metrics with their associated references.

Financial performance, such as *market share*, *sales/revenue* or *profitability*, is widely used as an NPD performance measure (Cooper and Kleinschmidt, 1995a, b). As shown in Table 2.1, most authors stress financial metrics as the most common measure of NPD performance. Process performance is also regarded as a primary metric that manifests the efficiency of the processes. Process performance can include *lead-time*, *productivity*, *total cost*, *service level* and *capacity utilisation*. Both financial and process metrics are typical measures used for evaluating NPD performance as they have measurable metrics (Brown and Eisenhardt, 1995; Krishnan and Ulrich, 2001).

Product concept effectiveness is concerned with the design of a product, indicating the level at which the products fulfil the company's requirements and customers' needs. It can encompass *fit with the market*, *fit with company's competencies*, *product (technical) performance* and *innovativeness*. In terms of organisation, overall *project success* can be used to represent the contribution of NPD. Except for product performance, as shown in Table 2.1, these metrics are rarely mentioned in the NPD literature, as they embody indefinite measurements that are difficult to measure.

Table 2.1: NPD Performance Measures

Performance Measure		Selected References		
Financial	Market share	(Brown and Eisenhardt, 1995)	(Krishnan and Ulrich, 2001)	
	Sales/Revenue	(Brown and Eisenhardt, 1995)	(Cooper and Kleinschmidt, 1995a)	
	Profitability	(Brown and Eisenhardt, 1995)	(Cooper and Kleinschmidt, 1995a)	(Krishnan and Ulrich, 2001)
Process	Lead time	(Brown and Eisenhardt, 1995)	(Cohen et al., 2000)	(Krishnan and Ulrich, 2001)
	Productivity	(Brown and Eisenhardt, 1995)	(Krishnan and Ulrich, 2001)	
	Total Cost	(Cohen et al., 2000)	(Krishnan and Ulrich, 2001)	
	Service level	(Krishnan and Ulrich, 2001)		
	Capacity utilisation	(Krishnan and Ulrich, 2001)		
Product concept effectiveness	Fit with market	(Brown and Eisenhardt, 1995)	(Krishnan and Ulrich, 2001)	
	Fit with firm's competencies	(Brown and Eisenhardt, 1995)		
	Product performance	(Brown and Eisenhardt, 1995) (Krishnan and Ulrich, 2001)	(Cooper and Kleinschmidt, 1995a)	(Cohen et al., 2000)
	Innovativeness	(Krishnan and Ulrich, 2001)		
Organisation	Project success	(Cooper and Kleinschmidt, 1995a)	(Krishnan and Ulrich, 2001)	

Researchers regard NPD performance as being related to the process chosen (MacCormack & Verganti, 2003). Cooper and Kleinschmidt (1995a) identified nine main drivers in the NPD process that significantly determine its performance: (1) *process*; (2) *product strategy*; (3) *resources*; (4) *management commitment*; (5) *climate for innovation*; (6) *management accountability*; (7) *strategic focus and synergy*; (8) *the quality of development teams*; and (9) *the capability of working cross-functionally*.

2.2.3 Environmental Factors

A challenge in developing new products is that companies face uncertainty in their environment. This uncertainty is caused by evolutions in *customer needs* and *technologies* that are difficult to foresee (MacCormack and Verganti, 2003). In certain industries, the environment is even more dynamic, meaning that these evolutions take place rapidly (MacCormack and Verganti, 2003). Furthermore, the environmental uncertainties can also be triggered by the information regarding the *competitors'*

technical capability (Ali et al., 1993) and, for some industrial organisations, the presence of *government regulatory control* (Duncan, 1972).

These environmental factors bring complexity to designing and managing the NPD process, which will impact on the accuracy of the NPD activities plan (Bhuiyan and Thomson, 2010). This may explain why practices in NPD under environmental uncertainty have not been well-defined yet (Krishnan and Bhattacharya, 2002).

2.2.4 Conclusions

NPD performance is determined by a number of critical drivers. One of the important drivers is the NPD process. This implies that NPD requires a formal process that utilises a process-management concept. In this approach, the NPD process, called a stage-gate system, is divided into a number of stages and gates to make Go/Kill, prioritisation and resource allocation decisions. The success of an NPD project can be measured by its financial performance, process performance, product concept effectiveness and its impact on the organisation.

2.2.4.1 Critique

There are two issues that remain unresolved in the NPD literature. First, the performance metrics are only addressed for measuring a single project performance. In practice, companies must deal with a number of NPD projects, which may have different objectives and goals. As the literature does not clearly mention how a Stage-Gate system can link to portfolio management, it therefore remains unclear how a Stage-Gate system can be applied in that management. Second, the extant NPD literature lacks discussions on how the decisions are made in the stages and gates of the NPD process. In addition, the literature gives less attention to the role of decision makers in influencing the NPD process. Understanding these two elements may enable researchers to construct better decision-making frameworks in the NPD processes.

2.3 NEW PRODUCT DEVELOPMENT PORTFOLIO MANAGEMENT

Success at the company-level or the business unit-level may be different from success at the project-level (Cooper and Kleinschmidt, 1996). Similarly, a successful single new product may have very little impact on the overall portfolio performance (Cooper, 1984). In order to capture an accurate view of a company's performance, the

analysis should go beyond looking at individual projects to looking at the whole NPD portfolio (Cooper and Kleinschmidt, 1995a). In a recent study, Barczak et al. (2009) showed that companies have progressed from managing individual projects to focusing on portfolio management. To have a better understanding of what NPD portfolio management entails, the following sections describe the definition of NPD portfolio management, its conceptual framework and the particular characteristics of a product portfolio.

2.3.1 Portfolio Management Definition

NPD portfolio management is referred to as “the set of activities that allows a firm to select, develop, and commercialize a pipeline of new products aligned with the firm’s strategy that will enable it to continue to grow profitably over the long term” (Kester et al., 2011, p. 641). It is a dynamic decision process that not only deals with selection and termination decisions, but also includes decisions to delay or continue the projects (Cooper et al., 1999; Kester et al., 2011). The process involves “uncertain and changing information, dynamic opportunities, multiple goals and strategic considerations, interdependence among projects, and multiple decision makers and locations” (Cooper et al., 1999, p. 335). It results in the strategic choices about the products which will be developed, which in turn will dictate companies’ business performance in the future (Cooper et al., 1999).

2.3.2 The Conceptual Framework

Figure 2.3 shows an NPD portfolio management conceptual framework constructed from the enhancement of the conceptual framework depicted in Figure 1.1. This second framework shows that new product concepts flow into a product portfolio decision process and come out as portfolio products launched. The quality of this portfolio is represented by NPD portfolio performance.

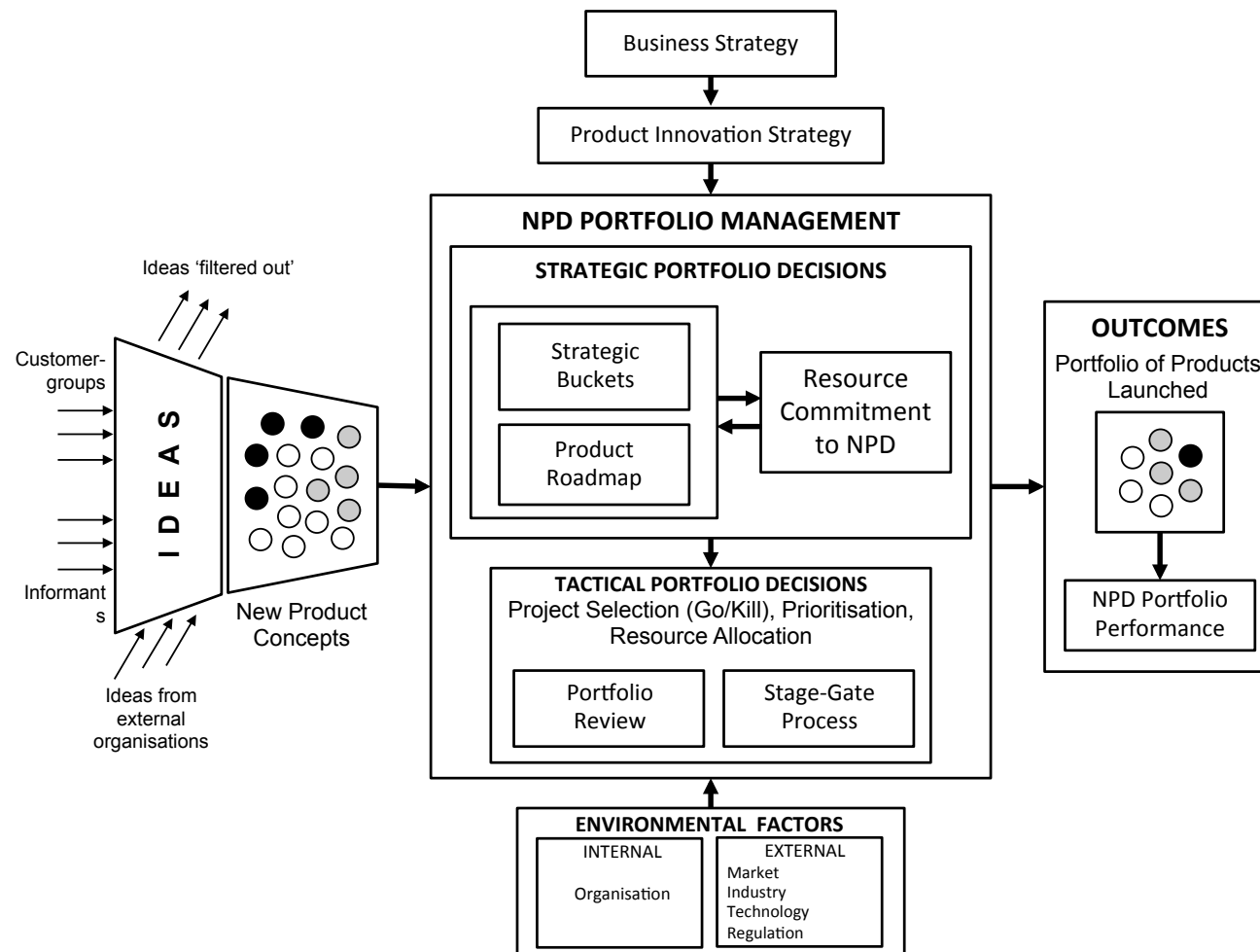


Figure 2.3: The Enhanced Conceptual Framework of NPD Portfolio Management

Adapted from Cooper (1984, 2005), Goffin and Mitchell (2010) and Terwiesch and Ulrich (2008)

At the top of the framework, business strategy is derived into its subset, *product innovation strategy* (Durmuşoğlu et al., 2008), that links business strategy with the company's product development processes (Cooper, 2005). Product innovation strategy is referred to as "a strategic master plan that guides your business's new product war efforts" (Cooper, 2005, p. 53). Therefore, a product innovation strategy must show how new products and product innovation fit into the business strategy (Cooper and Edgett, 2010). It defines the target markets, products offered and technologies applied (Cooper, 1984, 2005). Furthermore, Terwiesch and Ulrich (2008) suggested that product innovation strategy embodies the company's *value proposition*, which addresses the issues of what differentiates the company from its competitors, the process for creating the products, the company's competitive advantage and the *contingency plan* if a specific change in the competitive environment occurs.

At the centre of the framework, decision-making process in *NPD portfolio management* can be considered as a hierarchical process, which results in two levels of decisions: *strategic portfolio* and *tactical portfolio decisions* (Cooper, 2005). The former determine the commitment of resources to the NPD projects, whereas the latter focus on the selection and prioritisation of projects and the allocation of the resources required. The portfolio decisions seek the right allocation of company's limited resources for executing new product ideas (Dickinson et al., 2001) in order to achieve the fundamental portfolio management goals:

- (1) *Value maximisation* (Cooper et al., 1997, 2001), i.e. "the optimal ratio between resource input and return" (Kester et al., 2009, p. 329).
- (2) *Balanced portfolio* (Cooper et al., 1997, 2001), i.e. "a harmonious portfolio with respect to specific parameter" (Kester et al., 2009, p. 329) (for example: incremental versus radical innovation, risk versus reward (Dickinson et al., 2001; Kester et al., 2009) and market versus product line goals, or short term versus long term (Dickinson et al., 2001).
- (3) *Strategic alignment* (Cooper et al., 1997, 2001), i.e., the alignment between NPD portfolio decisions and the business's strategy.

In the strategic level decisions, the process to allocate the committed resources employs a number of tools including: *strategic buckets* and *product roadmap* (Cooper, 2005; Cooper and Edgett, 2010). The former method distributes resources

into separate buckets to ensure that the resource allocations reflect the company's strategic priorities (Cooper and Edgett, 2010). The latter maps the major new product plans, including the platform developments required for the new products (Cooper, 2005; Cooper and Edgett, 2010). With this roadmap, a company is able to translate its strategy into resource commitments. Additionally, in the form of a technology roadmap, the development or acquisition of new technologies required can be planned (Cooper and Edgett, 2010).

In the tactical level decisions, the process of project selection, prioritisation and allocating the required resources employs a *Stage-Gate system* and *portfolio reviews* (Cooper, 2005). As described in Section 2.2.1, the Stage-Gate process provides a thorough review of individual projects, and determines Go/Kill, prioritization and resource allocation decisions. The subsequent decision process is the portfolio review, which is a periodic review of the portfolio of all the projects. In the review process, senior management considers all the projects together and makes Go/Kill and prioritisation decisions (Cooper, 2005). In making decisions, Cooper (2005, p. 137) suggested examining the following key issues:

- Are all projects strategically aligned with the business's strategy?
- Are there the right priorities among projects?
- Are there some projects that should be killed? Or should accelerated?
- Is there the right balance of projects?
- Are there enough resources?
- Are the projects worked on sufficiently to achieve the business goals?

At the bottom of the framework, in addition to organisation, industry and market, technology (MacCormack and Verganti, 2003) and regulation (Duncan, 1972) are considered to be the elements of environmental factors. These factors induce environmental dynamics which influence the NPD portfolio decision-making process.

On the right-hand-side of the framework, the result of product portfolio decisions is the product portfolio itself, which ultimately determines NPD portfolio performance. The cumulative performance of NPD projects determines the corporate performance (Anderson Jr. and Joglekar, 2005). Anderson Jr. and Joglekar (2005), furthermore, pointed out that product portfolio decisions affect not only short-term

financial objectives, but also the company's *future market position* and *technological capability*.

2.3.3 Product Portfolio Characteristics

NPD portfolio management presents a difficult challenge because resources must be allocated between innovation projects, while each project may represent conflicting strategic directions (Chao and Kavadias, 2008; Cooper et al., 1999). In addition, the complexity is also caused by the occurrence of a “*combinatorial state*”, meaning that the products with different economic return functions interact with each other, utilising shared resources (Loch and Kavadias, 2002, p. 1227). This indicates the existence of interdependencies among NPD projects, in which an individual product outcome depends on the outcome of other products in the portfolio (Dickinson et al., 2001; Roberts, 1999). Researchers indicate four types of frequently occurring interdependency:

- (1) *Resource* (Verma and Sinha, 2002), i.e. the effects of the learning curve cause the development times for similar types of products to be shortened.
- (2) *Development cost*, i.e. the combined cost of a development activity for two products is not equal to the sum of the individual costs because of resource sharing (Blau et al., 2004).
- (3) *Financial return*, i.e. synergism or cannibalism of products in the marketplace (Blau et al., 2004; Roberts, 1999; Terwiesch and Ulrich, 2009).
- (4) *Technical success*, i.e. the technical performance of a preceding product affects the probability of technical performance of the succeeding products (Blau et al., 2004).

Portfolio management is largely about managing interdependencies among NPD projects (Terwiesch and Ulrich, 2009) and this must be conducted on a regular basis. Too often, interdependencies in the product portfolio have been inadequately considered (Ali et al., 1993).

2.3.4 Conclusions

NPD portfolio management is an integrated process, ranging from considering new product concepts to launching a portfolio of products, aiming for value maximisation, balanced portfolio and strategic alignment. It involves two levels of decision-making:

strategic portfolio decisions and tactical portfolio decisions. These decisions deal with selecting or terminating and delaying or continuing the projects.

Portfolio decision-making processes must cope with uncertain and evolving information, multiple goals and strategic considerations, interdependence among projects, and multiple decision makers. The decisions search for a series of trade-offs among maximising expected economic returns, minimising risk, and ensuring diversity in the product mix for a given level of resources (Blau et al., 2004). The success of NPD portfolio management is measured by the performance of the overall NPD projects, which, ultimately, will impact on both the short-term and long-term wealth of companies.

2.3.4.1 Critique

The extant literature lacks attention regarding a number of important issues. First, previous studies have focused only on the rational aspects of decision-making, either in strategic portfolio decisions or tactical portfolio decisions. They have paid less attention to the behavioural aspect of decision-making (how decision-making processes occur). Consequently, the organisational factors, such as organisational structure, the cognitive and behavioural characteristics of decision makers, and power and politics, have not been sufficiently considered.

Second, NPD performance described in the literature mostly represents the performance of a single NPD project, whereas the overall performance of the NPD portfolio is still not clearly specified. The performance of a portfolio is not equal to the aggregate of the performance of each NPD project. This is because of the presence of interdependencies among NPD projects. Therefore, to measure the success of an NPD portfolio, the analysis must move from only looking at the product level to looking at its impact on the business unit or at a corporate level.

2.4 STRATEGY

As mentioned earlier, the decisions concerning NPD portfolio management should be aligned with the company's strategy. This implies that there should be links to the NPD portfolio management process from the company's strategy. In order to identify such potential links, it is necessary to understand the nature and role of *strategy* within a company.

A firm requires a well-defined direction of scope and growth if it intends to increase its revenue and profit (Ansoff, 1965). Such direction, represented in the form of decision rules and guidelines, is defined as strategy (Ansoff, 1965). In striving to set a direction, firms must compete with their rivals for customers and, ultimately, a position (Rumelt et al., 1994). This perspective also suggests that strategy is about firms making decisions to perform activities differently, or to perform different activities to their rivals (Porter, 1996). As can be seen in Figure 2.4, *organisational purpose* drives a firm to perform a “journey”—strategy process—to get to “the attractive destination”—strategy content (Chakravarthy and White, 2002, p. 182). In the commercial world, three main dimensions of strategy have been identified: *strategy process*, *strategy content* and *strategy context* (de Wit and Meyer, 2004). Organisational purpose and these strategy dimensions are discussed in the following sections.

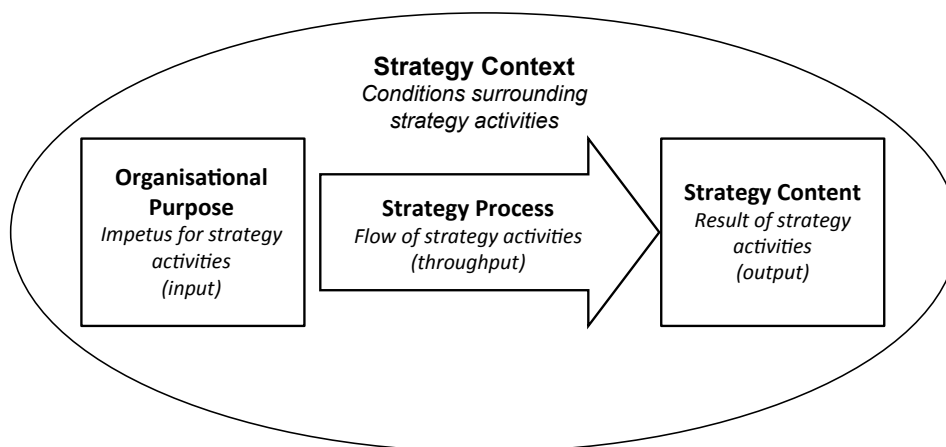


Figure 2.4: Dimensions of Strategy and the Organisational Purpose

Source: de Wit and Meyer (2004)

2.4.1 Organisational Purpose

Organisational purpose is the central element of the *corporate mission* (de Wit and Meyer, 2004). Together with other elements, i.e. *business definition*, *organisational beliefs* and *organisational values*, it gives direction to strategic decision-making (de Wit and Meyer, 2004). In particular, organisational purpose can be regarded as a fundamental principle against which strategic options can be evaluated (de Wit and Meyer, 2004).

2.4.2 Strategy Process

The *strategy process* is the way in which strategies emerge and evolve (de Wit and Meyer, 2004). It is concerned with *how*, *who* and *when* questions of strategy: “how is, and should strategy be made, analysed, dreamt-up, formulated, implemented, changed and controlled; who is involved; and when do the necessary activities take place?” (de Wit and Meyer, 2004, p. 5). While strategy content addresses the attractive destinations to which a firm aspires, strategy process describes the journey to reach these destinations (Chakravarthy and White, 2002). Furthermore, the process deals with how a firm achieves and maintains its strategic position (Chakravarthy and Doz, 1992).

Strategy process is a *decision-making process*, involving the rational application of knowledge to a selected problem (Chakravarthy & White, 2002). It copes with the “behavioural interaction of individuals, groups and/or organisational units, within or between firms” (Chakravarthy and Doz, 1992, p. 6). The process deals with the utilisation of right decision processes and administrative systems for achieving and maintaining the firm’s strategic position (Chakravarthy and Doz, 1992).

The framework of the strategy process depicted in Figure 2.5 shows three key relationships. The first part, at the bottom of the framework, shows how a firm’s *strategy* and its *business context* dictate a *firm’s performance*. The next part, at the centre of the framework, demonstrates the relationships between *decisions*, *actions* and *strategy*. Decisions and actions are regarded as the core elements of strategy making and the implementation process. These core elements are attributable to changes in the firm’s organisational context and business context (Chakravarthy and White, 2002). The third part, at the top of the framework, reveals how a firm’s *organisational context* builds the premises for decisions and actions.

The strategy process is distributed across multiple levels of an organisation and leads over time to an actual strategy (Chakravarthy and White, 2002; Noda and Bower, 1996). It covers various levels of an organisation and links different processes: the *cognitive process* of individual decision makers, the *psychological* and *political* processes within groups or individuals, the *organisational rules* and *routines* that govern the decisions and actions of organisational members and the *environmental factors* that dictate the sustainable success of firms (Chakravarthy and

White, 2002). Furthermore, as Figure 2.5 illustrates, the strategy process affects the firm's *strategy dynamic*, which determines whether the firm is to improve, consolidate or change its strategy position (Chakravarthy and White, 2002). Chakravarthy and White (2002) further indicated that, from an evolutionary perspective, the nature of the strategy process relates to an *emergent* process. This concept will be described in more detail in the section on *decision-making processes*.

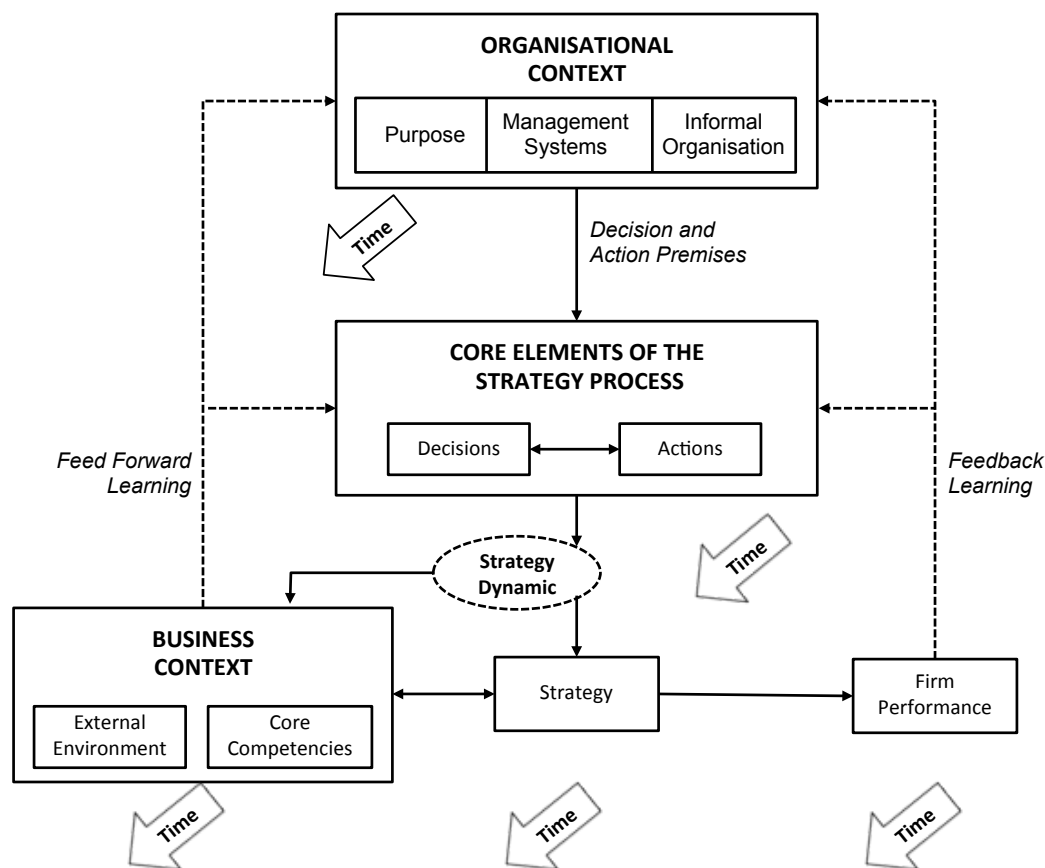


Figure 2.5: Strategy Process: A Holistic Framework

Source: Chakravarthy and White (2002)

2.4.3 Strategy Content

The literature on strategy typically divides strategy content into two distinct levels: *business* and *corporate strategy* (Bowman and Helfat, 2001). The main strategic responsibilities of these two levels are different (Finlay, 2000). The former is concerned with the approaches in which a single-business firm or an individual business unit of a larger firm competes within a particular industry (Bowman and

Helfat, 2001). Finlay (2000, p. 7) specified that business strategy considers the questions: “how do we compete?” and “which capabilities do we need to develop?” In contrast, the latter is concerned with the approaches in which a corporation manages a group of businesses together (Bowman and Helfat, 2001). It deals with the questions: “what businesses should we be in?” and “which competences do we need to develop?” (Finlay, 2000, p. 7).

2.4.3.1 Business Strategy

The business strategy literature includes two main views: models of strategy emphasising the exploitation of *market power* and models of strategy *emphasising efficiency* (Hirsch, 1991 cited in Chakravarthy and Doz, 1992). The *market power models* consider that profits flow from restrictions on competition, which are obtained by building entry barriers (Teece et al., 1997). This view deems that the sources of competitive advantage are sited at the level of industry, or groups within an industry (Teece, 1984; Teece et al., 1997). There are two approaches that are categorised as market power models: the *competitive forces* approach introduced by Porter (1980) and the *strategy conflict* approach (Teece et al., 1997).

Porter’s approach reveals five industry-level forces—entry barriers, threat of substitution, bargaining power, of suppliers, and rivalry among players—that determine the attractiveness of an industry in terms of its inherent profit potential (Teece et al., 1997). This approach focuses on firm’s actions to impede those competitive forces or to influence them for its advantage (Porter, 1980). By impeding the competitive forces the firm will earn the economic rents (Teece et al., 1997).

The *strategy conflict* approach uses *game theory* to analyse competitive interactions between rival firms and to reveal the way to influence the behaviour and actions of rival firms and the market (Teece et al., 1997). Applying game theory to business strategy was initiated by Shapiro (1989), in his article titled ‘The Theory of Business Strategy’. He argued that the extensive form of game theory, based on the concept of Nash equilibrium, can be used to model the strategic interactions among competing firms. This approach provides accuracies in analysing the nature of competition (Shapiro, 1989).

The *efficiency models* consider that competitive advantage comes from the excellent systems or routines inside the firm, built by processes and positions (Teece

et al., 1997). The efficiency paradigm underlines that competitive advantage comes from firm-level efficiency advantages (Teece et al., 1997). This includes a *resource-based view* and *dynamic capabilities* framework (Teece et al., 1997).

Resource-based view refers to Penrose's conception in 1959 that firm's resources should be well utilised for creating growth (Teece et al., 1997). This is a product-resources paradigm, which regards entry barriers as being established using resource position barriers (Penrose, 1995). To strengthen the position, a firm needs to have a balance between the exploitation of existing resources and the development of new ones (Wernerfelt, 1984).

Dynamic capabilities framework sees that the changing of environment propels firms to renew their competences (Wernerfelt, 1984). This framework emphasises developing a firm's ability to integrate, build and reconfigure internal and external competences to cope with the changing environment (Teece et al., 1997). The capabilities referred to comprise a set of specific and identifiable processes such as product development, strategic decision-making and alliancing (Teece et al., 1997).

2.4.3.2 Corporate Strategy

Bowman and Helfat (2001) asserted that corporate influence on profitability results from factors associated with the affiliation of multiple businesses within individual corporations. They indicated that the scope of the firm, including the selection of industries in which to operate, is a significant factor that theoretically affects profitability. Ultimately, the evidence from their study suggested that corporate strategy does matter.

Corporate strategy is about what the parent organisation can and should do to add value (Finlay, 2000), hence successful corporate strategy is determined by the value created by that organisation (Campbell, 2003). In creating value, the parent organisation must compete with other parent organisations and intermediaries for the ownership of the businesses (Campbell, 2003). Consequently, a parent organisation needs to be better at creating value than the rivals, or in other words it must have a '*parenting advantage*' (Campbell, 2003).

Similarly to competitive advantage in business strategy, parenting advantage is a criterion for guiding corporate strategy development (Campbell, 2003). As shown in the conceptual framework (Figure 2.6), by incorporating the understandings about the

current characteristics of the parent, the opportunities of the businesses currently owned, the rival parents businesses, and the future trends, then the parent organisation can make decisions regarding which business to include in the portfolio and how the parent organisation should be designed (Campbell, 2003).

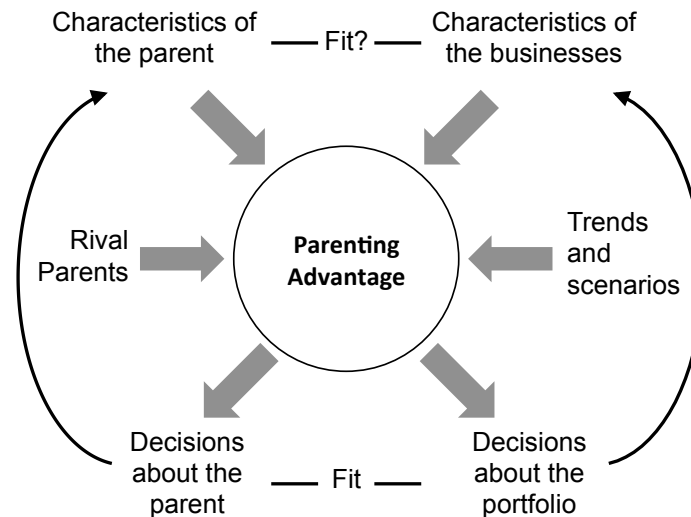


Figure 2.6: Corporate Strategy Framework

Source: Campbell (2003)

A further critical issue, which has attracted researchers' attention, is about linking corporate strategy to managerial decisions and actions (Camillus, 1981). By reviewing the literature, he identified that translating strategy into action involves distinct stages that comprise corporate strategy, business strategy, action planning, budgeting and executive action. The linkages of these stages are influenced by three factors: *organisation structure*, *organisational process*, and the *content of plans* (Camillus, 1981). He further indicates that the structure and content linkages between action planning and budgeting, and the content linkage between business strategy and action planning are the weakest links, which is indicated by the small number of studies that have been conducted in these areas.

2.4.4 Strategy Context

As stated earlier, the context of organisation and its environment influences the process of strategy formulation and implementation. It is important to understand what constitutes the context in which a firm forms its strategy process and content.

Strategy context refers to “the set of circumstances under which both the strategy process and the strategy content are determined” (de Wit and Meyer, 2004, p. 5). It is concerned with the *where* of strategy, i.e. with which firm and in which environment the strategy process and strategy content are associated (de Wit and Meyer, 2004). This denotes that strategy context is an important moderator of the interactions between strategy process and strategy content (Ketchen Jr et al., 1996). Context is both internal and external to the organisation, and covers three different aspects: *organisational*, *industry* and *international context* (de Wit and Meyer, 2004).

De Wit and Meyer (2004) described how organisational context deals with the issue of whether the organisational circumstances or the manager largely determine the strategy process and content. Industry context addresses the issue of whether companies must comply with the industry’s rules or whether they have discretion to choose their own strategy and even change the industry condition. International context is concerned with whether companies require adaptations to the international context or whether they can choose their strategy process and content irrespective of the international context.

2.4.5 Conclusions

Strategy is a company’s direction of scope and growth that is represented in the form of guidelines and decision rules. It is comprised of strategy content, strategy process and strategy context. Strategy content defines the strategic position to which a company aspires, whereas strategy process describes the process to achieve and maintain its strategic position. The interactions between strategy process and strategy content are moderated by strategy context, which is referred to as the organisation and the environment in which the strategy process and strategy content are associated.

Strategy content considers two sources of competitive advantage. First, competitive advantage is sited at the level of industry or groups within an industry. Competitive forces (Porter, 1980) and strategy conflict (Shapiro, 1989) are the approaches that demonstrate the implementation of this view. Second, competitive advantage comes from the excellent systems or routines inside the firm. Resource-based view and dynamic capabilities are the frameworks that utilise this view.

Strategy process regards the decision-making process (decision and action) as its core elements. The process involves the behavioural interactions of individuals and

groups within a company or between companies. It aims to achieve and maintain the companies' strategic position by the utilisation of right decision processes and management systems.

Linking strategy to action involves distinct stages: corporate strategy, business strategy, planning and budgeting, and implementation. The linkage of these stages requires three factors: organisation structure, organisational process, and the content of plans.

2.4.5.1 Critique

There are a number of issues that emerge when associating strategy with portfolio management. First, as mentioned earlier, the links between NPD portfolio management and business strategy are established through innovation strategy. However, deriving innovation strategy from business strategy is still only vaguely addressed in the strategy or innovation literature. This might explain the existence of missing links between business strategy and NPD portfolio management. As Camillus (1981) stated, there have been few studies conducted to investigate the linkage between business strategy and action planning.

Second, strategy literature shows that strategy dictates a firm's performance; however, it does not present the links between strategy and the process that generates the performance. Similarly, in the context of portfolio management, the literature fails to explain how business strategy relates to portfolio performance.

Third, the core element of the strategy process is decision-making; however, the literature does not indicate the sort of decisions made in the outputs of the process. Accordingly, it is still unclear how to associate the decision-making process in NPD portfolio management with the decision-making process in the strategy process.

2.5 DECISION-MAKING

The strategy process requires decision-making as a core element. This implies that decision-making is central to the activities in managing an organisation. As stated earlier, NPD portfolio management is a *decision-making process* (Cooper et al., 1999, 2001; Goffin and Mitchell, 2010; Kester et al., 2011) for determining resources allocation decisions (Adams et al., 2006; Dickinson et al., 2001). Understanding how the NPD portfolio management is conducted requires an understanding of how

decisions are made. This section discusses the field of decision-making, which addresses primarily the aspects that have attracted the researchers' attention: the *decision* itself, *decision-making process* (Harrison, 1981) and *strategic decision-making* (Glueck, 1974).

2.5.1 Decisions

A study conducted by Eilon (1969) showed that most literature on management and decision theory had failed to present a specific definition of what was meant by a *decision*. The definition of the decision activity itself was often associated with making a choice between alternative courses of action (Eilon, 1969). Later on, Mintzberg et al. (1976), suggested that a decision is defined as “a specific commitment—usually a commitment of resources—to action” (p. 246). This definition implies that a decision is unique, meaning that each decision is intended for dealing with particular circumstances.

Some authors in the field of decision theory categorise decisions in various ways. For example, Simon (1977) distinguished decisions into two types: *programmed (well-structured)* and *non-programmed (ill-structured)*. Mintzberg (1973) grouped them into three distinct types: *entrepreneurial*, *adaptive* and *planning*. Harrison (1981) indicated that among those categorisations there are similarities. He suggested grouping them into two basic categories: *Category I*, characterised by “routine, recurring, and certain decisions”, and *Category II*, characterised by “non-routine, non-recurring, and uncertain decisions” (p. 12).

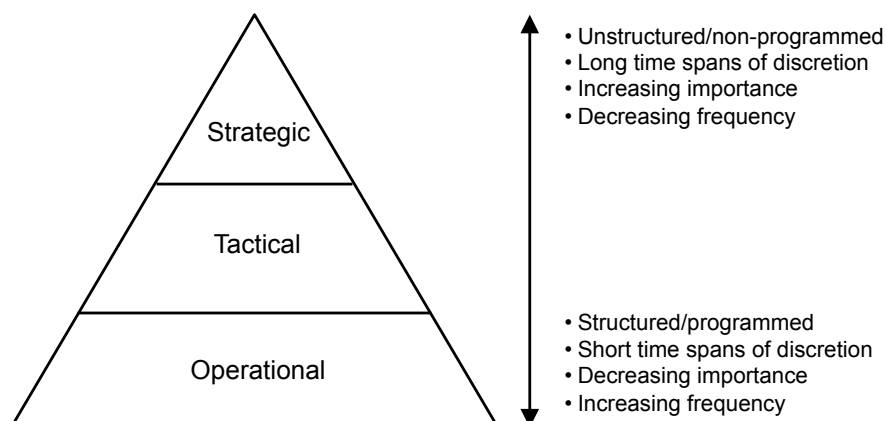
Table 2.2 shows these categories with the detailed information according to their classifications, structure and strategy. Apart from this categorisation, in the so-called *strategy pyramid* (Figure 2.7), decisions can be distinguished from the level of organisation at which the decisions are made: *strategic*, *tactical* and *operational* (French et al., 2009). Strategic decisions set the direction and a broad framework decisions, whereas tactical and operational decisions take those details (French et al., 2009). As shown in Figure 2.7, strategic decisions cope with unstructured/non-programmed problems characterised with long time spans of discretion, high importance and less frequent occurrences. In contrast, tactical and operational decisions do the opposite.

Table 2.2: A Categorisation of Decision Characteristics

	Category I Decisions	Category II Decisions
Classifications	Programmable; routine; generic, computational; negotiated; compromise	Non-programmable; unique; judgemental; creative; adaptive; innovative; inspirational
Structure	Procedural; predictable; certainty regarding cause/effect relationship; recurring; within existing technologies; well-defined information channels; definite decision criteria; outcome preferences may be certain or uncertain	Novel, unstructured, consequential, elusive, and complex; uncertain cause/effect relationships; non-recurring; information channels undefined; incomplete information; decision criteria may be unknown; outcome preferences may be certain or uncertain
Strategy	Reliance upon rules and principles; habitual reactions; prefabricated response; uniform processing of computational techniques; accepted method for handling	Reliance on judgement, intuition, and creativity; individual processing; heuristics problem solving techniques; rules of thumb; general problem solving processes

Source: Harrison (1981)

Category I decisions are normally made at the *tactical* and *operational level* (French et al., 2009). Category II decisions are to be taken at the *strategic level* of the organisations (Harrison, 1981; Simon, 1977). Middle managers deal mostly with category I decisions, although in certain circumstances they are also involved in category II decisions (Harrison, 1981). In the later discussions in this thesis, category I decisions will be termed *tactical* and/or *operational* decisions, category II as *strategic*.

**Figure 2.7:** Strategy Pyramid

Source: French et al. (2009)

To sum up, decision-makers deal with two types of decision: strategic and tactical or operational. These types of decision relate to the problems or situations faced by the decision-makers. Unstructured or non-programmed situations lead to strategic decisions whereas structured or programmed situations need tactical/operational decisions.

2.5.2 Decision-Making Processes

Decision-making is the key activity in managing an organisation (Harrison, 1981), yet the way managers make decisions is still only partially understood (Bazerman, 1990; Eccles and Wood, 1972). This is because in the real world, making decisions is often conducted in unstructured way (Harrison, 1981). Despite that fact, understanding how a process-oriented approach arrives at a decision is of benefit for organisations in order to improve their managerial decision-making process (Harrison, 1981).

The decision-making process is “a set of actions and dynamic factors that begins with the identification of a stimulus for action and ends with the specific commitment to action” (Mintzberg et al., 1976, p. 246). Ansoff (1965) and Simon (1977) suggested a similar series of activities by which these actions are undertaken: finding the opportunity for making a decision, formulating alternative courses of action, choosing among courses of action, and evaluating past choices. These stages are interrelated and interwoven in that each stage may have significant effects on the others (Eilon, 1969; Simon, 1977).

From the process perspective, early authors suggested that decision-making can be viewed through a *psychological* approach and a *political* process (Rowe, 1989). The psychological perspective sees an individual as an information processing system that shows *rational* or *logical behaviour* in selecting the alternatives (March and Simon, 1963). Therefore, this perspective is often referred to as the *rational perspective*. In this perspective, an individual is regarded facing a *bounded rationality* constraint, which implies that an individual is bounded by their limited capacity for comprehending all the alternatives for a given decision (Simon, 1976). In this situation, the decision-makers would not seek an optimal decision, but it would be rather more realistic to find a satisficing one (March and Simon, 1963; Simon, 1976).

The rationality of decision-makers can decrease because of an uncertain environment (Eisenhardt and Zbaracki, 1992). This may raise the effect of bounded-

rationality on the decisions. In this situation, decision makers need to use more information and create more diverse viewpoints in order to improve the rationality (Eisenhardt and Zbaracki, 1992)

In the political perspective, the key assumption addressed is that organisations are a coalition of people from varying levels with conflicting interests (Eisenhardt and Zbaracki, 1992; Rowe, 1989). These conflicts lead to politics only when power is centralised (Eisenhardt and Bourgeois III, 1988). Thus, in this perspective, decisions are viewed as the result of the process of making choices conducted by the coalition of decisions makers who have different goals (Eisenhardt and Zbaracki, 1992). The choice made reflects the preferences of the powerful people (Eisenhardt and Zbaracki, 1992). However, Eisenhardt and Bourgeois III (1988) and Eisenhardt (1999) indicated that the use of politics tends to lead to poor company performance.

More recently, there is a view put forward that the orderly decision-making process which involves procedural rationality is rarely performed in practice (Bazerman, 1990; Chakravarthy and White, 2002; French et al., 2009). The process is, instead, driven by events and development in the surrounding environment (French et al., 2009). This view is known as the *emergent* or *evolutionary* perspective of decision-making (Chakravarthy and White, 2002; French et al., 2009).

French et al. (2009) indicated that the emergent perspective is closely associated with the decision-making that involves *intuitive* and *judgement* approaches. Bazerman (1990) argued that, in practice, managers rely more on intuitive judgement in making decisions because they make large numbers of decisions every day, and therefore “systematic and time-consuming demands” of rational decision-making are not feasible to be applied (Bazerman, 1990, p. 5). Nevertheless, solely relying on judgement is too risky, because judgement is a complex phenomenon that is dependent on luck and uncertainty, influenced by personal style and various other variables (Tychy and Bennis, 2007, cited in Moenaert et al., 2010).

French et al. (2009) proposed to bridge both views, by suggesting that both rational and emergent decision-making exist in all organisations. The emergent perspective is more appropriate to be employed in the period in which changes are still within the prediction; whereas, rational decision-making is useful when changes

are not perfectly aligned any more with the strategic directions. Therefore, these two perspectives apply in the organisation and the interplay between them occurs.

To sum up, some scholars have suggested that decision-making is conducted in an orderly manner that arrives at a choice of action. In this view, psychological (based on rational behaviour) and political perspectives are considered to apply in this decision-making process. Furthermore, other scholars believed that the emergent events also affect the decision-makers in carrying out the process. As a result, these three perspectives—psychological, political and emergent or evolutionary—together exist in organisations' decision-making process.

2.5.3 Strategic Decision-Making

Strategic decisions (Category II decisions in Table 2.2) attract the most attention, because these decisions significantly affect an organisation's performance (Glueck, 1974). Eisenhardt (1999) stated that strategic decision-making is the “fundamental capability” of organisations that can be utilised for achieving excellent performance (p. 72). Therefore, strategic decision-making has been of importance in the field of organisation theory and management (Astley et al., 1982). The main focus of this field is on the situations embodied in the strategic decision-making process and on how the decision makers deal with these situations.

Strategic decisions deal with *unstructured processes*, which refer to the “decision processes that have not been encountered in quite the same form and for which no predetermined and explicit set of ordered responses exists in the organization” (Mintzberg et al., 1976, p. 246). Strategic decision-making is, therefore, characterised as a complex and multi-organisational level phenomenon, involving simultaneously many individual decisions (Fahey, 1981). For example, Hickson et al. (1986), as shown in Table 2.3, identified ten foremost strategic decision topics in organisations.

Mintzberg et al. (1976) argued that a decision maker could deal with the unstructured situations by factoring them into a number of standard and structured elements. Furthermore, a set of *general procedures* or *routines* can be applied to solve these elements. This means that a structured and rational approach underlies individuals in making strategic decisions (Mintzberg et al., 1976).

Table 2.3: Topics for Strategic Decisions

	Topic category	Examples
1	Technologies	Equipment and/or premises e.g., whether to invest in new machinery and buildings, buy 'new generation' aircraft, close geriatric wards
2	Reorganisations	Internal restructurings, e.g., whether to insert regional level between branches and headquarters, merge departments, change overseas branches into subsidiaries ('domestication' in host nations)
3	Controls	Planning, budgeting, and requisite data processing, e.g., what the five-year 'strategic plan' or 'annual business plan' are to be, whether to purchase a computer.
4	Domains	Marketing and distributions, e.g., whether to bypass wholesalers and distribute direct, introduce 'no-charge' banking, standardise a name for all branches of the company.
5	Services	New, expanded, or reduced services, e.g., whether to launch a novel form of interdisciplinary university degree, increase municipal housing, decrease European air services.
6	Products	New products, e.g., whether to launch a new beer, a new glass-impregnated cement, or generate electricity
7	Personnel	Job assessment, training, unions, e.g., whether to make a first productivity agreement, use consultant to regrade all staff, resist unionisation
8	Boundaries	Purchases of, and merging with, other organisations, e.g., whether to buy subsidiary company, merge colleges.
9	Inputs	Finance and other supplies, e.g., whether to raise funds by a share issue or (local government) by lottery, or change the sources of supply of components
10	Locations	Site and sites dispersal, e.g., whether to build a new plant abroad, to move company's principal offices, to reduce dispersal (by closing branches)

Source: Hickson *et al.* (1986)

Furthermore, Fahey (1981) suggested that it is required to collectively involve the rational and political dimensions. His research findings indicate that political processes can critically impact on any stage of the decision-making system or any phase of a specific decision process.

Study conducted by (Thomas, 1984) is aligned with the proposition of (Fahey, 1981). Thomas (1984) examined the application of decision theory analysis, viewed as normative model for rational choice, for approaching the unstructured strategic decision problems. In his study, he indicated that analytical models can support strategic decision processes in the formulation and analysis of unstructured problems. However, these models need modifications because the problems, the range of options, the implementation and the intervention process itself, all have organisational

implications. He further suggested linking the analytical models to political and bargaining processes within the organisations.

To sum up, even though strategic decision processes are immensely complex and dynamic, they are still amenable to the conceptual structuring of the problem (Mintzberg et al., 1976). Structuring the strategic decisions should emphasise problem diagnosis and formulation, since they determine the subsequent course of action (Mintzberg et al., 1976). Then a set of general procedures or routines can be applied to solve the structured elements of the problem.

2.5.4 Conclusions

There are two types of decision: strategic and tactical (or operational). These types of decision relate to the problems or situations faced by the decision-makers. Unstructured or non-programmed situations lead to strategic decisions, whereas structured or programmed situations need tactical/operational decisions. The process of making decisions can be viewed through three perspectives: psychological (based on rational behaviour), political and emergent or evolutionary. These perspectives altogether exist in organisations' decision-making process.

Strategic decisions are considered to be the most important. Even though they are complex, with unstructured problems, they can be managed using structured approaches. The structured elements of the problems that are created by these approaches can then be tackled by employing routines.

2.5.4.1 Critique

A number of issues have emerged in associating decision-making with portfolio management. First, as portfolio management involves both strategic and tactical decisions, understanding is required about how these two levels of decisions are made simultaneously. However, the extant literature does not identify this issue.

Second, three perspectives of the decision-making process (psychological, political and emergent or evolutionary) may exist in NPD portfolio management. Nevertheless, most portfolio management literature discusses only the psychological (rational) one. It is, therefore, necessary to investigate further in which situation each perspective applies and how the interplay between them affects the portfolio decision processes.

2.6 ORGANISATIONAL ROUTINES

As stated earlier, the evolutionary perspective considers the strategy process as a more emergent process, in which its decision-making processes are driven by the development of the surrounding environment. Nevertheless, decision-making within the strategy process can be institutionalised by establishing *organisational routines* (Chakravarthy and White, 2002).

Routines are regarded as the centre of the analysis of organisational and economic change (Nelson and Winter, 1982). They are referred to as “all regular and predictable behavioural patterns of firm” (Nelson and Winter, 1982, p. 14). In a similar way, Dosi et al. (2000, p. 4) defined routines as “units or ‘chunks’ of organised activity with a repetitive character”. These include activities that range from well-specified technical routines for producing things, to policies concerning, for example, investment, research and development (R&D), and business strategies for product diversification (Nelson and Winter, 2002). To elaborate what routines are, it is important to describe their meaning, internal structure, roles in organisations, capacity as the source of change, and organisational capabilities.

2.6.1 Definition of Routines

Three definitions of organisational routines can be found in the literature: (1) *behaviour patterns (recurrent interaction pattern)*; (2) *rules (standard operating procedures, heuristics, etc.)*; (3) *dispositions* (Becker and Zirpoli, 2008). Becker (2004), particularly, pointed out that the recurrent interaction patterns refer to collective recurrent activity patterns. This implies that routines link *structure* and *action* or an organisation and the process (Pentland and Rueter, 1994).

Furthermore, theorists have argued that organisational routines are generative, dynamics systems, not static objects (Feldman and Pentland, 2003; Pentland and Feldman, 2005; Pentland and Rueter, 1994). Routines are continuously emerging systems with internal structures and dynamics (Pentland and Feldman, 2005). The internal structure of a routine can produce a wide range of different outcomes on the continuum between ‘very stable’ and ‘constantly changing’, depending on circumstances (Pentland and Feldman, 2005)

2.6.2 The Internal Structure of Routines

Routines can be characterised as the *ostensive* aspect, i.e. the “abstract patterns that participants use to guide, account for and refer to specific performances of routine” (Pentland and Feldman, 2005, p. 795). On the other hand, routines can also be represented by the *performative* aspect, i.e. the “actual performances by specific people at specific times, in specific places” (Pentland and Feldman, 2005, p. 795). As shown in Figure 2.8, these two aspects are *mutually constitutive*, denoting that the ostensive aspect not only guides performances, it is also generated from those performances (Pentland and Feldman, 2005).

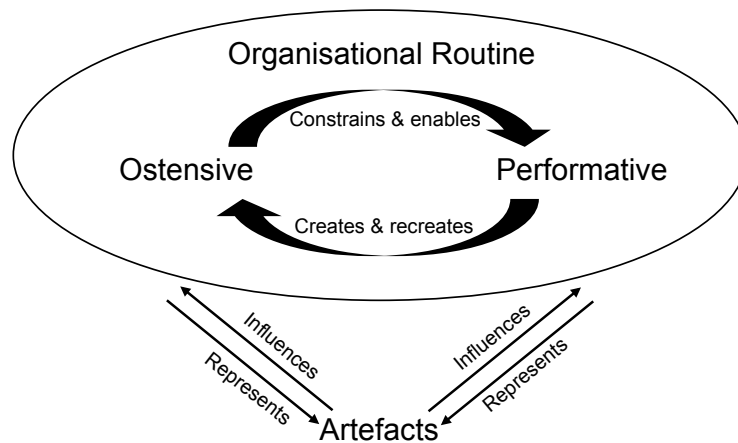


Figure 2.8: Key Elements of Organisational Routines

Source: Pentland and Feldman (2008)

Structuration theory proposes that structure is created and recreated through the actions taken by agents; meanwhile, the actions taken are constrained and enabled by structure (Giddens, 1984). This theory can be applied to explain the recursive relationship between ostensive and performative aspect in that the performances create and recreate the ostensive aspect and the ostensive aspect constrains and enables the performances (Feldman and Pentland, 2003).

The ostensive and performative aspects of an organisational routine can be codified, enabled and constrained by the so-called *artefacts*, as illustrated in Figure 2.8 (Pentland and Feldman, 2005). Artefacts are the representation of the cognitive structures of individuals, such as scripts (written rules and procedures), as well as the physical and social structures of the organisation, such as factory and office (Pentland

and Feldman, 2005; Pentland and Rueter, 1994). Artefacts such as rules and written procedures can represent the ostensive aspect of a routine, whereas artefacts such as work logbook and database can be regarded as the archival trace of the performative aspects (Pentland and Feldman, 2005; Pentland and Rueter, 1994).

Artefacts may represent either the ostensive aspects or the performative aspects of a routine; or simply influence either the ostensive aspects or the performative aspects (Pentland and Feldman, 2008). These authors argued, however, that the influence role does not necessarily change the overall pattern. For instance, in a budgeting routine, filling out the forms, which is considered to be a new action, does not necessarily lead to collaborative decisions that form new patterns of the routine (Feldman, 2003).

2.6.3 The Role of Routines

Becker (2004) pointed out that routines contribute to the organisations by providing four features. First, routines enable *coordination*, which is sourced from: the capacity to support a high level of simultaneity; giving regularity and unity; making many simultaneous activities mutually consistent; providing each actor with knowledge of the behaviour of the others; providing instructions in the form of programmes; and establishing a *truce* for reducing conflict among participants, all of which lead to getting the work done (Feldman and Pentland, 2003).

Second, routines provide some degree of *stability* of behaviour. This feature refers to the notion that others' behaviour can be formed (Becker, 2004). Third, routines enable *economising on limited cognitive resources*. As these resources are limited, they are usually dedicated to non-routine events, whereas the repetitive events are handled semi-consciously (Becker, 2004; Simon, 1976). The semi-conscious processing of repetitive events involves less cognitive resources, since routines help in reducing the options and guiding the search for a solution (Becker, 2004).

Fourth, routines *bind knowledge*. Nelson and Winter (1982, p. 99) stated “that the routinisation of activity in an organization constitutes the most important form of storage of the organization's specific operational knowledge”. The knowledge stored may represent some intelligent form in which organisations accumulate the history of their experience (Shapira, 1994). Teece and Pisano (1994) and (Feldman and Pentland, 2003), therefore, suggested that the organisational knowledge resides as

routines. As a knowledge repository, routines also store tacit knowledge. This differentiates routines from other forms of knowledge repositories such as databases and documents (Becker, 2004).

2.6.4 Routines as a Source of Change and Capability

Many authors asserted that routines are considered to be sources of stability and unchanging patterns of action (Feldman and Pentland, 2003). On the other hand, they are regarded as an important source of flexibility and change (Feldman and Pentland, 2003; Nelson and Winter, 1982). Feldman (2000, p. 626), therefore, suggested that “routines are not inert, but are as full of life as other aspects of organizations”.

Change in organisational routines can be viewed as an *exogenous change*, which is the change imposed from the outside of routines, by managers or by the environment (Feldman and Pentland, 2008). A manager that has control over a routine can make decisions to change it in order to achieve specific goals (Feldman and Pentland, 2008). From the environmental side, market changes or new technologies are the environmental forces that enable driving the change (Tushman and Romanelli, 1985).

In contrast, the interactions between ostensive and performative aspects provide a concept of change that comes from within organisational routines. This change is a result of engagement in the routine itself, called *endogenous change* (Feldman, 2000; Feldman and Pentland, 2003; Feldman and Pentland, 2008). From the perspective of the model of *variation* and *selective retention* (Campbell, 1965 cited in Feldman and Pentland, 2003), performances are variations that are selectively retained in the ostensive aspect of the routine (Feldman and Pentland, 2003). This variation and selective retention framework leads to a view that a routine has an inherent endogenous capacity to create and retain novel patterns of action (Feldman and Pentland, 2003).

A collection of routines is considered as a *high-level routine* that represents organisational capability (Winter, 2000). Thus, Dosi et al. (2000) and Eisenhardt and Martin (2000) asserted that routines can be viewed as the building blocks of a firm’s *dynamic capabilities*, which is “the firm’s ability to integrate, build, and reconfigure internal and external competencies to address rapidly changing environments” (Teece et al., 1997, p. 516).

2.6.5 Conclusions

Organisational routines can be regarded as: (1) behaviour patterns (recurrent interaction pattern); (2) rules (standard operating procedures, heuristics, etc.); (3) dispositions. This implies that routines link *structure* and *action* or an organisation and the process. There are four main roles of routines: coordinating; stabilising behaviour; economising on limited cognitive resources; and, binding knowledge.

The structure of a routine consists of an ostensive and a performative aspect. These aspects are mutually constitutive, denoting that the ostensive aspect not only guides performances, it is also generated from the performances. The ostensive and performative aspect of an organisational routine can be codified, enabled and constrained by the so-called artefacts.

Routines are regarded as an important source of flexibility and change in an organisation. Change in organisational routines can be viewed as exogenous, which is the change imposed from the outside of the routines. In contrast, it can be regarded as endogenous, which is the change resulting from engagement within the routines themselves.

A collection of routines is considered to be a high-level routine that represents an organisational capability. Routines, therefore, can be viewed as the building blocks of a firm's dynamic capabilities, which is the ability to develop internal and external competencies to address changing environments.

2.6.5.1 Critique

There are a number of issues that emerge when considering organisational routines from a portfolio management perspective. First, there is no literature, so far, that addresses the relationships between organisational routines and NPD portfolio management. Thus, it is unclear whether this management involves organisational routines in its processes.

Second, the NPD portfolio decision-making process results in portfolio performance, which ultimately impacts on the company's performance. However, the discussion in the literature does not mention the role of routines in affecting the organisation's performance. Accordingly, it is still unclear what the roles of routines in NPD portfolio management are and what relationships exist between them.

2.7 SYNTHESIS OF THE KNOWLEDGE DOMAINS

This section synthesises the key points of four knowledge domains: NPD portfolio management, strategy, decision-making, organisational routines. The NPD domain is not mentioned, as the focus of attention has converged into the NPD portfolio management domain. The synthesis is undertaken by relating these knowledge domains into three parts of relationships: (1) NPD portfolio Management and Decision Making; (2) NPD portfolio Management, Decision Making and Strategy; and (3) NPD portfolio Management, Decision Making, Strategy and Organisational Routines. As a result, this synthesis reveals three Systematic Review Questions (SRQs) and it is summarised in Table 2.4.

The NPD portfolio decision is a dynamic process. Over time, it includes decisions on selection, termination and on whether to delay or to continue the projects (Kester et al., 2011). The aim is to achieve the right allocation of a firm's limited resources for executing new product ideas (Dickinson et al., 2001), striving for three fundamental corporate goals: *value maximisation*, *balanced portfolio* and *strategic alignment* (Cooper et al., 1997, 2001).

The nature of the problem in the NPD portfolio process is complex, uncertain and dynamic, involving multiple goals and strategic considerations, interdependence among projects and multiple decision makers (Cooper et al., 1999, 2001). Referring to the decision typology (Harrison, 1981; Mintzberg et al., 1976; Thomas, 1984), the type of decision involved in such problems is a strategic one. In practice, however, portfolio decisions include both strategic and tactical decisions (Cooper, 2005).

The strategic decision-making process, however, involves the group of decision makers in that the role of politics and power is present in the process (Eisenhardt and Bourgeois III, 1988; Eisenhardt and Zbaracki, 1992). It is, therefore, insufficient to merely employ rational approaches. Various approaches need to be incorporated to address the complexity of the decision nature, for which Fahey (1981) and Thomas (1984) suggested that the strategic decision-making process should collectively engage rational, political and behavioural approaches.

Table 2.4: The Key points of the Knowledge Domains

Key points					
NPD	NPD Portfolio Management (PM)	Strategy (S)	Decision-Making (DM)	Organisational Routines (OR)	Synthesis
<ul style="list-style-type: none"> • Process is the critical driver • NPD requires a formal process, e.g. Stage-Gate system • NPD performance measures: financial, process, product concept effectiveness and organisation 	<ul style="list-style-type: none"> • Decisions involved: selecting or terminating and delaying or continuing (accelerating) projects • Decision Objectives: right allocation of resources to pursue value maximisation, balanced portfolio and strategic alignment • Nature of problems: dynamic, complex, multiple goals, interdependence among projects, multiple decision makers • Two levels of decision-making: strategic and tactical decisions 	<ul style="list-style-type: none"> • Dimensions: strategy process, content and context • Strategy content defines strategic position. • Sources of competitive advantage in strategy content: industry (e.g. competitive forces and strategy conflict) and firm (e.g. resource based-view and dynamic capabilities) • Strategy process describes the process to achieve and maintain its strategic position by utilising the right decision processes • In the strategy process, the decision-making process is the core element • Different decision-making processes: cognitive, psychological and political, and organisational rules and routines • Strategy context moderates the interaction between strategy process and strategy content 	<ul style="list-style-type: none"> • Decision types: strategic for unstructured problems and tactical (or operational) for structured problems • Strategic decision-making perspectives: rational, behavioural, evolutionary (emergent) and political. • Strategic decision-making can be managed using structured approaches 	<ul style="list-style-type: none"> • Definition: behaviour patterns (recurrent interaction pattern), rules and dispositions • Routines link structure and action • The roles of routines: coordinating, stabilising behaviour economising on limited cognitive resources and binding knowledge • The structure consists of ostensive and performative elements, which are mutually constitutive. • Artefact is the codification of ostensive and performative elements • Routines can be the source of flexibility and change • Organisational capability is formed by a collection of routines • Routines are the building blocks of dynamic capabilities 	<p>PM-DM</p> <ul style="list-style-type: none"> • The study on portfolio management needs to incorporate the descriptive models of strategic decision-making (SDM), which collectively involve rational, behavioural, evolutionary (emergent) and political perspectives • SRQ 1: How are strategic decisions in the NPD portfolio management process made? <p>PM-DM-S</p> <ul style="list-style-type: none"> • The portfolio decisions made should be aligned with the business strategy through innovation strategy • The decision-making process relates to strategy process (SP) • The links between business strategy and NPD portfolio management are still vaguely addressed in the literature • SRQ 2: How does the NPD portfolio management process link to the strategy process? <p>PM-DM-S-OR</p> <ul style="list-style-type: none"> • Strategy process is an evolutionary (emergent) process

Key points					Synthesis
NPD	NPD Portfolio Management (PM)	Strategy (S)	Decision-Making (DM)	Organisational Routines (OR)	
					<ul style="list-style-type: none"> • Decision-making within the strategy process can be institutionalised by establishing its routines • Routines literature suffers from addressing the impacts of routines on firm's performance • SRQ 3: How does the NPD portfolio management process relate to organisational routines?

The research on the NPD portfolio management has been mainly focused on the selection of projects applying rational and normative approaches (Cooper et al., 1999; Kester et al., 2011). The central issue in the extant literature is on analysing the relationship between the influenced factors and the NPD performance. The models developed tend to be prescriptive, which are rarely applied in practice (Bazerman, 1990). The discussions have paid less attention to the descriptive aspect of decision-making (how decision-making processes occur). Consequently, the organisational factors, such as organisational structure, the cognitive and behavioural aspect of decision makers, and power and politics, have not yet been considered.

In order to better comprehend the NPD portfolio decision-making process, it is required to also include the descriptive models, resulting from the actual observation of the NPD portfolio decision process (March and Simon, 1963; Simon, 1957). These models enable both rational, political and emergent decision-making and the interplay between them to be engaged (French et al., 2009). Accordingly, it is required to further explore the question of ***“How are strategic decisions in the NPD portfolio management process made?”***

The decisions made should be aligned with the business strategy. This alignment ultimately affects the firm's performance, represented by its strategic position (Anderson Jr. and Joglekar, 2005). Achieving such alignment is perplexing, as the NPD projects typically present conflicting strategy directions (Chao and Kavadias, 2008; Cooper et al., 1999). This issue relates to the strategy process domain, which considers how a firm performs the right decision processes and management systems to strengthen the firm's strategic position (Chakravarthy and Doz, 1992). It deals with the behavioural interactions of individuals, groups, or organisational units within the firms (Chakravarthy and Doz, 1992).

The links between NPD portfolio management and business strategy are established through innovation strategy. However, deriving innovation strategy from business strategy is still vaguely addressed in the strategy or innovation literature. Moreover, even though the strategy literature shows that strategy dictates firm performance, the strategy process framework (Figure 2.5) does not reveal the interface process that enables strategy to control firm performance. The relationship between

business strategy and portfolio performance, therefore, is also still unrevealed. These show the missing link between business strategy and NPD portfolio management. It has been indicated by Camillus (1981) that understanding the linkage between business strategy and action planning is one of the weakest points in the strategy studies. Accordingly, it is necessary to further enquire into the question of “***How does the NPD portfolio management process link to the strategy process?***”

The evolutionary perspective considers the strategy process as more emergent, in which its decision-making processes are driven by the development of the surrounding environment. This implies that NPD portfolio management, indicated as one of the decision-making processes embodied in the strategy process, largely deals with evolutionary decision-making. Despite undergoing the evolutionary process, the decision-making within the strategy process can be institutionalised by establishing its routines (Chakravarthy and White, 2002). In this context, routines link *structure* and *action* or an *organisation* and the *process* (Pentland and Rueter, 1994). Routines in NPD portfolio management could play the roles of *coordinating*; *stabilising behaviour*; *economising on limited cognitive resources*; and *binding knowledge* in the decision-making process.

The concept of routines that embarks from an evolutionary perspective contrasts with the notion that the NPD portfolio decision-making process involves rational, behavioural, evolutionary (emergent), and political perspectives. The issue raised is whether routines can be applied to explain the whole portfolio decision-making process or only to explain its evolutionary part. Moreover, the discussion in the routines literature does not mention the role of routines in affecting organisation performance. In contrast, the NPD portfolio decision process is largely concerned with the portfolio performance, which ultimately impacts on the company’s performance. Accordingly, it is required to further ask the question “***How does the NPD portfolio management process relate to organisational routines?***”

2.7.1 Conclusions

The synthesis of four knowledge domains has revealed the interrelationships between them, as shown in the framework in Figure 2.9 and those interrelationships led to the identification of three *Systematic Review Questions (SRQs)* as shown in the same figure.

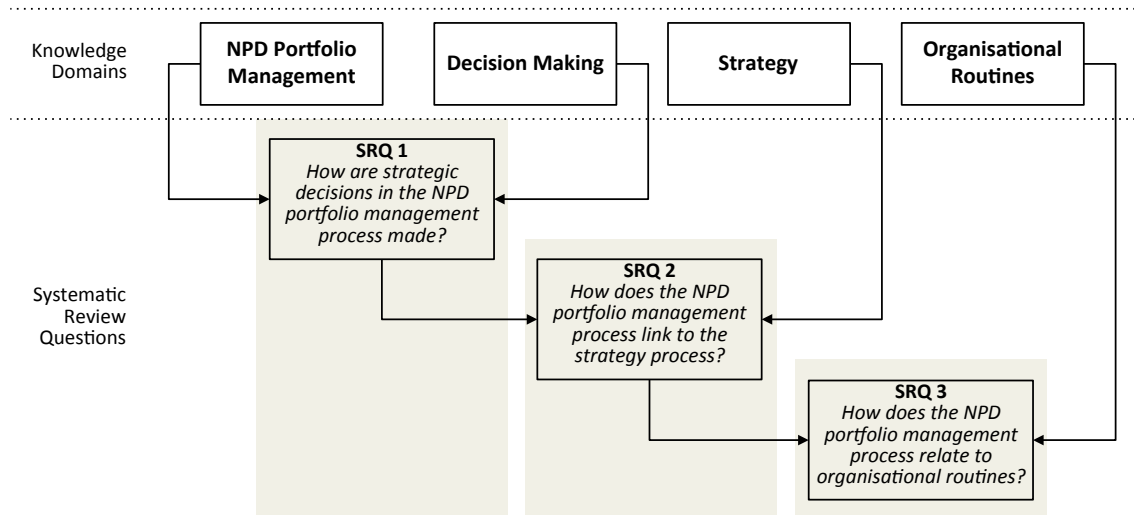


Figure 2.9: The Framework of the Synthesis of Four Knowledge Domains

The SRQs denote that this systematic literature review should explore the literature from the specific knowledge domains, i.e. *NPD portfolio management*, *strategic decision-making*, *strategy process* and *organisational routines*. In the following chapters, this literature will be collected and reviewed to answer the research questions.

2.8 SUMMARY

This chapter has presented the scoping study of the main literature domains that embrace the NPD portfolio management subject. It has shown that:

- NPD requires a formal process to enable the NPD project to achieve its performance goals.
- NPD portfolio management involves the decisions of selecting or terminating and delaying or continuing (accelerating) projects. They are constituted by two levels of decision-making: *strategic portfolio decisions* and *tactical portfolio decisions*.
- The strategy process is a decision-making process, involving the rational application of knowledge to approach problems.
- Several perspectives exist in organisational decision-making processes: rational, behavioural, evolutionary (emergent) and political.
- Routines link the organisation and its processes, thus the collection of routines represents the organisational capability.

- The Systematic Review Questions identified are:
 - SRQ 1. How are strategic decisions in the NPD portfolio management process made?
 - SRQ 2. How does the NPD portfolio management process link to the strategy process?
 - SRQ 3. How does the NPD portfolio management process relate to organisational routines?

Chapter 3 Methodology

3.1 INTRODUCTION

This chapter describes the methodology applied in conducting the systematic literature review. It consists of nine sections: (1) a section that describes an overview of the Systematic Literature Review; (2) the Review Panel members who have assisted in carrying out the study; (3) Identifying and Evaluating Studies; (4) Systematic Search; (5) Other Sources of Literature; (6) Evaluating Studies; (7) the Result Summary of Systematic Search and Evaluating Studies; (8) Extracting and Synthesising Data. Finally, this chapter closes with a summary.

3.2 SYSTEMATIC LITERATURE REVIEW: AN OVERVIEW

A literature review determines the success of academic research (Hart, 1998). By conducting a literature review a researcher is able to map and assess the existing knowledge domains, and to identify research questions to develop the existing body of knowledge further (Tranfield et al., 2003a). Through a literature review, a progressive narrowing of the research topic takes place, which gives a practical consideration to research (Hart, 1998). The literature review process is a key tool in management research as it is used to manage the diversity of knowledge for a particular academic inquiry (Tranfield et al., 2003a). This systematic literature review is conducted through systematic stages, that consist of Planning Review, Identifying and Evaluating Studies, Extracting and Synthesising Data, Reporting and Utilising the Findings, as shown in Figure 3.1.

3.2.1 Planning the Review

Stage 1, *Planning the Review*, is initiated by *forming a review panel* that consists of various experts in areas of both methodology and theory (Tranfield et al., 2003a). The next step is to undertake scoping studies to *map the field of study*. It assesses the relevance and size of the literature, delimiting the subject area (Tranfield et al., 2003a). In this thesis, scoping studies have been presented in Chapter 2. The last step is *producing a review protocol*, which contains “a conceptual discussion of the

research problem and a statement of the problem's significance..." (Tranfield et al., 2003a, p. 215).

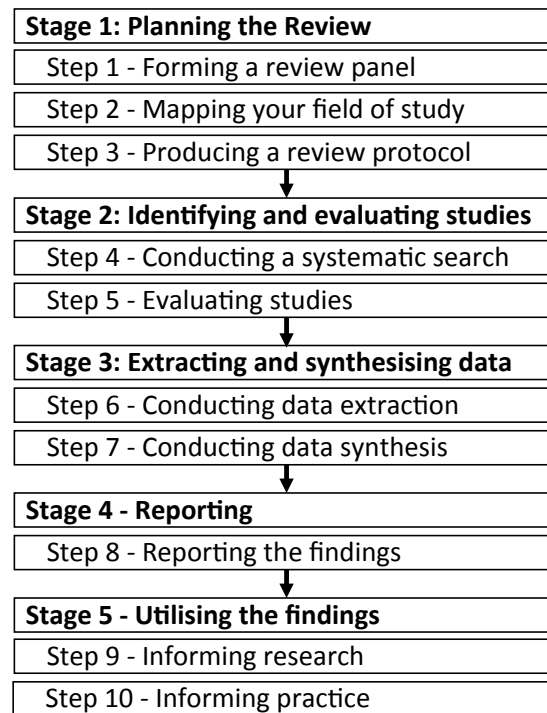


Figure 3.1: Stages of a Systematic Review

Source: Pilbeam (2012)²

3.2.2 Identifying and Evaluating Studies

Stage 2, *Identifying and Evaluating Studies*, begins with *conducting a systematic search* by identifying keywords and search strings, which are derived from the Systematic Review Questions (SRQs) presented in Chapter 2 and discussions with the review panel members. These search strings are then used to search all studies, including not only published publications, but also unpublished works. The result of this step is a list of articles and papers that will be reviewed. The next step, *evaluating studies* employs inclusion and exclusion criteria to select articles or papers of an adequate quality for the review.

² Presentation given by Colin Pilbeam PhD, *Systematic Review: Planning and Locating*, MRes/Research Methodology Course, Cranfield School of Management, 5th March 2012.

3.2.3 Extracting and Synthesising Data

Stage 3, *Extracting and Synthesising Data*, starts with *conducting data extraction* that includes general information (title, author, publication details), study features and specific information (details and methods) from the selected articles or papers (Tranfield et al., 2003a). Subsequently, *conducting data synthesis* deals with summarising, integrating and cumulating the findings of the review to present a *descriptive* and *thematic (conceptual)* analysis of the field. The former (presented in Chapter 4) shows the descriptive account of the field, for example, the age profile of the articles, the geographical source of the studies, the sectoral division of the field or the categories of the studies (Tranfield et al., 2003a). The latter (presented in Chapter 5) discusses the established contributions of the field and identifies key emerging themes (Tranfield et al., 2003a). Finally, the synthesis step outlines both analyses and discusses the findings (explained in Chapter 6) to identify research questions.

3.2.4 Reporting

Stage 4, *Reporting*, reports *the findings* that present the overall process of review in a formal report. The report contains the following sections: *Introduction, Methodology, Findings, Discussion* and *Conclusion* (Pilbeam, 2012)³.

3.2.5 Utilising the Findings

Stage 5, *Utilising the Findings*, encompasses *informing research* and *informing practice* steps. This final stage describes the implications of the systematic literature review for research and practice—presented in Chapter 6.

From the above-mentioned stages, the following sections will present the review panel, systematic search and other sources of literature, and evaluating studies steps. Extracting and synthesising data will be discussed in Chapters 4 and 5.

3.3 PLANNING THE REVIEW: REVIEW PANEL

Several experts in various areas have given advice during the process of this systematic literature review. These experts, as review panel members, are faculty members of Cranfield School of Management and Lally School of Management &

³ Presentation given by Colin Pilbeam PhD, *Systematic Review: Extracting and Synthesizing*, MRes/Research Methodology Course, Cranfield School of Management, 14th May 2012.

Technology, Rensselaer Polytechnic Institute, USA. The list of review panel members and their roles is shown in Table 3.1 and the following paragraphs describe the roles of each member in detail.

Table 3.1: Review Panel Members

Name	Organisation	Role
<i>Internal</i>		
Prof. Keith Goffin, PhD	Cranfield School of Management	Supervisor
Chris van der Hoven, PhD	Cranfield School of Management	Former Supervisor
Prof. Cliff Bowman, PhD	Cranfield School of Management	Strategic Management expert
Andrey Pavlov, PhD	Cranfield School of Management	Organisational Routines expert
Colin Pilbeam, PhD	Cranfield School of Management	Systematic Review expert
Heather Woodfield	Cranfield School of Management	Information Specialist
<i>External</i>		
Prof. Gina Colarelli O'Connor, PhD	Lally School of Management & Technology, Rensselaer Polytechnic Institute, USA	Breakthrough Innovation and Organisational Routines expert

Prof. Keith Goffin, PhD is a professor in *innovation and new product development*. He is the first supervisor who has given guidance regarding working on a PhD project. In the context of the literature review, he gave advice on data extracting, forming a thesis framework, building a writing style and reviewed the writing. He gave insight on the portfolio management framework and recommended literature on portfolio management (listed in Appendix C). Additionally, he gave encouragement and moral support.

Chris van de Hoven, PhD is a visiting fellow at Cranfield School of Management. He was the second supervisor who had given guidance towards working on a PhD project. In the context of the literature review, he gave advice on the portfolio management framework and its references, giving additional direction on data extracting and also reviewed the writing. Apart from this, he too gave encouragement and moral support.

Prof. Cliff Bowman, PhD was a review panel member at the *scoping study* stage. During the scoping study's discussions, he advised focusing the exploration of

the *strategy* domain on *strategy process*. He advised further to incorporate a *routines* domain as the theoretical lens for investigating the NPD portfolio management process. In relation to that, he recommended exploring the *routines* articles from Martha S. Feldman and Brian T. Pentland. These articles were used to map the field of organisational routines in the scoping study.

Andrey Pavlov, PhD is a faculty member in the Centre for Business Performance, Cranfield School of Management, who has been undertaking research in the organisational routines area. He recommended studying the *routines* article from Markus Becker (2004), titled "Organizational Routines: A Review of the Literature". This article is included in the scoping study.

Colin Pilbeam, PhD is a lecturer in Scoping Study and Systematic Review. He provided guidance in conducting the systematic review process. He also gave advice in determining the literature domains and developing the map of the field of study.

Heather Woodfield is an information specialist in management research. She introduced how to utilise the information database and provided assistance in developing the *search strings* for finding the inquired articles from the database.

Prof. Gina Colarelli O'Connor, PhD was a keynote speaker at the 19th *International Product Development Management Conference*, June 2012, Manchester Business School, UK, at which she presented a topic regarding *Transformational Routines*. She gave her views on involving *routines* in NPD portfolio management research and recommended nine articles related to *routines* (seven journal articles, one working paper and one book section) for this review. These articles are listed in Appendix C.

3.4 IDENTIFYING AND EVALUATING STUDIES

The framework in Figure 3.2 shows the identifying and evaluating stage that consists of a *systematic search* and *evaluating studies* steps. In addition to these, three other sources of literature are incorporated: *experts' recommendations*, *cross-referencing* and *independent selection* (selection based on the author's considerations). These articles are then assessed for their quality in the *quality evaluation* step. The following sections discuss in detail the systematic search, other sources of literature and evaluating studies process, and finally present their results summary.

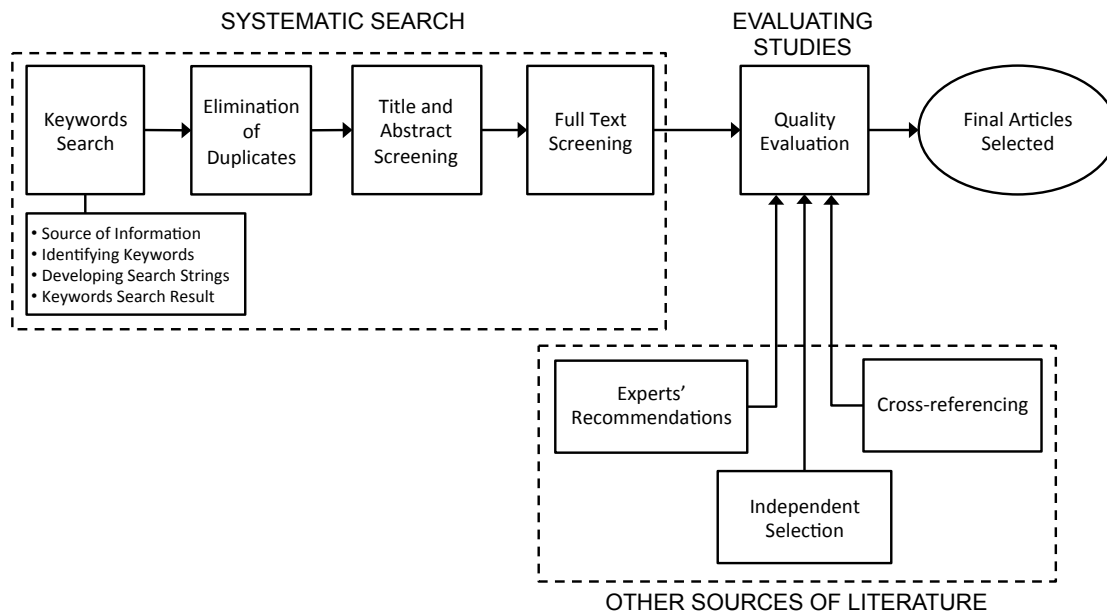


Figure 3.2: The Framework of Identifying and Evaluating Studies

Adapted from Pilbeam (2012)⁴

3.5 SYSTEMATIC SEARCH

A systematic process consists of a *keywords search*, *elimination of duplicates*, *title and abstract screening*, and *full text screening*. A keywords search is a series of procedures to discover articles related to the subjects addressed in the review questions. This process results in a long list of articles, which might still contain duplicate articles. After filtering out the duplicates, then the title and abstract screening process selects relevant articles while discarding the irrelevant ones. Finally, these considered articles are examined further by reviewing the whole text to select the more relevant articles and to discard those that are less relevant. The following sections explain in detail these three processes.

3.5.1 Keywords Search

A keywords search conducts a series of procedures: determining the *source of information*, *identifying keywords*, *developing search strings* and *reporting the search results*. The process results in a list of considered articles that will be screened further. The detailed processes of these procedures are described in the following sections.

⁴ Presentation given by Colin Pilbeam PhD, *Systematic Review: Planning and Locating*, MRes/Research Methodology Course, Cranfield School of Management, 5th March 2012.

3.5.1.1 Source of Information

The main sources of information were electronic journals from three digital databases: *ABI-ProQuest*, *EBSCO*, and *Scopus*, as shown in Table 3.2. These databases are available in Cranfield University's Library and Information Services. In addition to academic journals, books or book sections and working papers recommended by the review panel members, are also included as sources of information.

Table 3.2: Databases of Journal

Database	Reason for Selection
ABI-ProQuest	Stores almost the whole range of publications.
EBSCO	Provides complete publications in business and management.
Scopus	Has particular collections in technology and management related subjects.

3.5.1.2 Identifying Keywords

As stated in Chapter 2, the systematic review questions (SRQs) raise the subjects that are associated with four knowledge domains: *NPD portfolio management*, *strategic decision-making*, *strategy process* and *organisational routines*. Accordingly, to locate the search for all articles related to these knowledge domains, a number of keywords were identified. The keywords chosen, as listed in Table 3.3, are the terms that have similar meanings to the knowledge domains. These terms were identified from the literature referred to in the scoping study and discussions with supervisors.

Table 3.3: List of Keywords

SRQs' Knowledge Domains	Keywords
NPD portfolio management	New product development portfolio Product development portfolio Product portfolio Innovation portfolio Project portfolio Portfolio planning
Strategic decision-making	Strategic decision-making Unstructured decision-making Ill-structured decision-making Ill-defined decision-making Non programmable decision making
Strategy process	Strategy process Strategy making process Strategic process Administrative systems
Organisational Routines	Routines Patterns Regularities Rules Organisational procedures

3.5.1.3 Developing Search Strings

Based on the keywords presented in Table 3.3, the *search strings* were developed according to each database's rules and commands. The search strings of each knowledge domain for each database are presented in Table 3.4.

Table 3.4: Search Strings

Knowledge Domain	String No	Search Strings
NPD portfolio management	1	<p>ABI-ProQuest (portfolio[*1] w/1 (Product[*1] OR "product[*1] development" OR "new product[*1] development")) OR (portfolio[*1] w/1 (innovat* OR plann* OR project[*1]))</p> <p>EBSCO (portfolio# N1 (Product# OR "product# development" OR "new product# development")) OR (portfolio# N1 (innovat* OR plann* OR project#))</p> <p>Scopus (portfolio# w/1 (product# or "product# development" OR "new product# development")) OR (portfolio# w/1 (innovat* or plann* or project#))</p>
Strategic decision making	2	<p>ABI-ProQuest (decision OR "decision-making") w/0 (strateg[*2] OR unstructured or "ill-structured" or "ill-defined" OR nonprogrammable)</p> <p>EBSCO (decision OR "decision-making") NO (strateg## OR unstructured or "ill-structured" or "ill-defined" OR nonprogrammable)</p> <p>Scopus (decision OR "decision-making") w/0 (strateg## OR unstructured or "ill-structured" OR "ill-defined" OR nonprogrammable)</p>
Strategy process	3	<p>ABI-ProQuest (strateg[*2] w/1 process*) OR ("administrative system[*1]") OR ("strategy making" w/1 process[*2])</p> <p>EBSCO (strateg## N1 process*) OR ("administrative system#") OR ("strategy making" N1 process##)</p> <p>Scopus (strateg## w/1 process*) OR ("administrative system#") OR ("strategy making" w/1 process##)</p>
Organisational Routines	4	<p>ABI-ProQuest Routine[*1] OR pattern[*1] OR regularit[*3] OR rule[*1] OR "organizational procedure[*1]"</p> <p>EBSCO routine# OR pattern# OR regularit### OR rule# OR "organizational procedure#"</p> <p>Scopus routine# OR pattern# OR regularit### OR rule# OR "organizational procedure#"</p>

Each SRQ was addressed by joining the search strings in Table 3.4 to make a combined form of search strings, as shown in Table 3.5. Literature that addresses the first systematic review question (SRQ 1) was searched using the combination of search strings 1 AND 2. Literature that discusses SRQ 2 was searched using the combination of search strings 1 AND 2 AND 3. The last systematic review question (SRQ 3) was explored in literature that was located by search strings 1 AND 2 AND 3 AND 4.

3.5.1.4 Keywords Search Result


The search process was conducted by entering the combined search strings, shown in Table 3.5, into *ABI-ProQuest*, *EBSCO*, and *Scopus* respectively and resulted in a list of articles. The right section of Table 3.5 presents the number of articles that match the search criteria (search strings) for each SRQ in the respective database. The column with the title ‘Number of Hits’ describes the number of matched articles for four different types of search-field:

- 1) *Title*, features the search in the title of articles.
- 2) *Abstract*, features the search in the abstract of articles.
- 3) *All fields*, features the search in all fields: Title, Abstract, Author, Subject and Publication Title.
- 4) *All fields +Text*, features the search in all fields and the whole text of articles.

As shown in Table 3.5, the SRQ 2 and SRQ 3’s searches with the search-fields of *Title*, *Abstract* and *All fields*, located very few numbers of articles. In the *Scopus* database, the search for SRQ 1, SRQ 2 and SRQ 3 generated no hits. In contrast, except for *Scopus*, the SRQ 1, SRQ 2 and SRQ 3’s searches with the *All+Text* search-field gave a significant number of articles.

Table 3.5: The Articles Search using the Search Strings of SRQs

Systematic Review Question	Combined Strings	Database	Number of Hits			
			Title	Abstract	All	All+ Text
SRQ 1 How are strategic decisions in the NPD portfolio management process made?	1 AND 2	ABI-ProQuest	5	63	109	2,407
		EBSCO	2	64	117	2,419
		Scopus	-	-	-	13
		Subtotal				239
SRQ 2 How does the NPD portfolio management process link to the strategy process?	1 AND 2 AND 3	ABI-ProQuest	-	2	5	514
		EBSCO	-	1	1	481
		Scopus	-	-	-	10
		Subtotal				1,005
SRQ 3 How does the NPD portfolio management process relate to organisational routines?	1 AND 2 AND 3 AND 4	ABI-ProQuest	-	-	-	402
		EBSCO	-	-	-	410
		Scopus	-	-	-	2
		Subtotal				814
		Total				2,058


 The number of articles collected

As the objective of the search was to obtain adequate numbers of articles for each SRQ, the articles were selected from different search-fields. As shown in Table 3.5, for SRQ 1 in *ABI-ProQuest* and *EBSCO*, the articles were selected from the *All* search-field, whereas for SRQ 1 in *Scopus*, the articles were selected from the *All+Text* search-field. For SRQ 2 and SRQ 3 in *ABI-ProQuest*, *EBSCO* and *Scopus*, the articles were selected from the *All+Text* search-field. As a result, the total number of articles collected for further screening added up to 2,058, which are listed in the grey area of Table 3.5.

3.5.2 Elimination of Duplicates

The process of eliminating duplicates was conducted in two steps. The first elimination aimed to filter out the duplicates that were contributed by three databases (*ABI-ProQuest*, *EBSCO* and *Scopus*), whereas the second elimination was applied to the whole articles to remove the duplicates that came out from three SRQs (SRQ 1, SRQ 2 and SRQ 3).

Table 3.6: The Number of Articles and the Elimination of Duplicates

SRQ	Initial	1 st Elimination	2 nd Elimination
SRQ 1	239	219	
SRQ 2	1,005	718	
SRQ 3	814	403	
Total	2,058	1,340	

As shown in Table 3.6, the first elimination of duplicates reduced the number of articles of SRQ 1's search from 239 to 219, SRQ 2's search from 1,005 to 718 and SRQ 3's search from 814 to 403. In total, the number of articles was reduced from 2,058 to 1,340. Then the second elimination removed the duplicates in the whole collection of articles, so that the number of articles decreased from 1,340 to 912.

3.5.3 Title and Abstract Screening

The preceding step had produced 912 articles, which then entered into the step of *Title and Abstract Screening*. The objective of screening is to filter out the irrelevant articles in order to obtain highly relevant articles. In this step, each of the 912 articles was evaluated by scrutinising its *Title*, *Abstract* and *Subject/Keywords*, using the inclusion

and exclusion criteria shown in Table 3.7. This evaluation selected 59 articles that were considered to be relevant to the SRQs. These articles are listed in Appendix A.

3.5.4 Full Text Screening

The purpose of the *full text screening* process is to assess the relevance of the articles selected to the questions posed in the review (Khan and Kleijnen, 2001, cited in Pilbeam, 2012)⁵. This process re-evaluated the 59 articles from the *Title and Abstract Screening* step, by examining the whole text of the articles in terms of their relevance to the SRQs. Similarly, with the *Title and Abstract Screening*, the article selection was based on the inclusion and exclusion criteria listed in Table 3.7. The process selected 21 articles, which are listed in Appendix B.

Table 3.7: Selection Criteria

Criteria Description	Inclusion Criteria	Exclusion Criteria
Language	English	Any other language
Type of Publication	Academic papers, working papers	Newspapers, magazines
Subjects	Product /project portfolio management, decision-making, strategy process and routines	Any other subjects
Field of knowledge	Management, technology management, social studies	Psychology, computer science, natural science
Methodology of study	Theoretical and empirical	Mathematical modelling
Industry	Manufacturing	Services, Banking and Finance, Tax, Credit, Information technology
Level of analysis	Organisation, group decision-making, managers	Individual decision-making

3.6 OTHER SOURCES OF LITERATURE

As shown in Figure 3.2, in addition to the *systematic search*, other sources—*experts' recommendations*, *independent selection* and *cross-referencing*—contributed articles, papers and book sections in the review. Experts' recommendations articles were provided from the recommendations of the review panel members, whereas independent selection articles were selected from the author's database of articles. The selection of

⁵ Presentation given by Colin Pilbeam PhD, *Systematic Review: Selecting and Appraising*, MRes/Research Methodology Course, Cranfield School of Management, 19th March 2012.

these articles was based on the relevance of the articles to the SRQs. The third source, cross-referencing articles, were obtained by reviewing the references listed in the articles which emerged from the systematic searches, experts' recommendations and independent selection.

The experts' recommendations articles contributed 11 articles (nine journal articles, one working paper and one book section), while independent selection and cross-referencing articles provided six and two articles respectively. In total, they contributed 19 articles. The list of articles provided by these three sources is listed in Appendix C.

3.7 EVALUATING STUDIES: QUALITY EVALUATION

The final step in the stage of *Identifying and Evaluating Studies* is *Quality Evaluation*. This step conducts an appraisal process on the quality of articles, in terms of their *contribution, theory, methodology* and *data analysis* (if applicable) as described in the *quality assessment criteria* (Table 3.8). The appraisal result determines whether an article can be included in the review or not.

In this step, the 19 articles from the systematic search and 21 articles from other sources (13 experts' recommendations, five independent selections, three cross-referencing) were assessed and scored using the scale of 0 for *Absence* to 4 for *High* (Table 3.8). This evaluation considered that all 40 articles were adequately qualified to step to the next stage of review, i.e. *extracting and synthesising*. The assessment result of each article is presented in Appendix D.

Table 3.8: Quality Assessment Criteria

Element to Consider	Level				
	0-Absence	1-Low	3-Medium	4-High	Not Applicable
Contribution	The article does not provide enough information to assess this criteria	The paper adds little to body of knowledge in this area	Contribution to knowledge is trivial in importance and significance	Significant addition to current knowledge; fill an important theory gap	This element is not applicable to this paper
Theory	The article does not provide enough information to assess this criteria	Literature review is inadequate; Failure to motivate study with practical implications; No underlying economic story	Theoretical base is acceptable; Having practical rationales for study to some extent	Excellent review of prior literature; Strong theoretical basis; Study has important implications for practitioners	This element is not applicable to this paper
Methodology	The article does not provide enough information to assess this criteria	The idea of study is poorly executed; Inappropriate quantitative methods; Failure to justify proxies for economic variables	Justified research design; Acceptable proxies for economic variables; The idea of study is not fully executed	Research design adequately examines the theoretical argument; Proxies are adequately defined	This element is not applicable to this paper
Data Analysis	The article does not provide enough information to assess this criteria	Data sample insufficiency; Weak connection between statistical results and economic theory; Inconclusive statistics	Appropriate data sample; Statistical results relate to economy story; Adequate statistics but inadequate explanation	Adequate data sample; Statistical results support theoretical arguments; Well explained statistics; Include limitation analysis	This element is not applicable to this paper

Source: Pilbeam (2012)⁶

3.8 SYSTEMATIC SEARCH AND EVALUATING STUDIES: RESULT SUMMARY

The foregoing sections have described the processes conducted in the systematic search and in evaluating the studies. The summary of the results of all steps in these processes is presented in Figure 3.3. In this figure, N represents the result of each step, which is the number of articles selected.

⁶ Presentation given by Colin Pilbeam PhD, *Systematic Review: Selecting and Appraising*, MRes/Research Methodology Course, Cranfield School of Management, 19th March 2012.

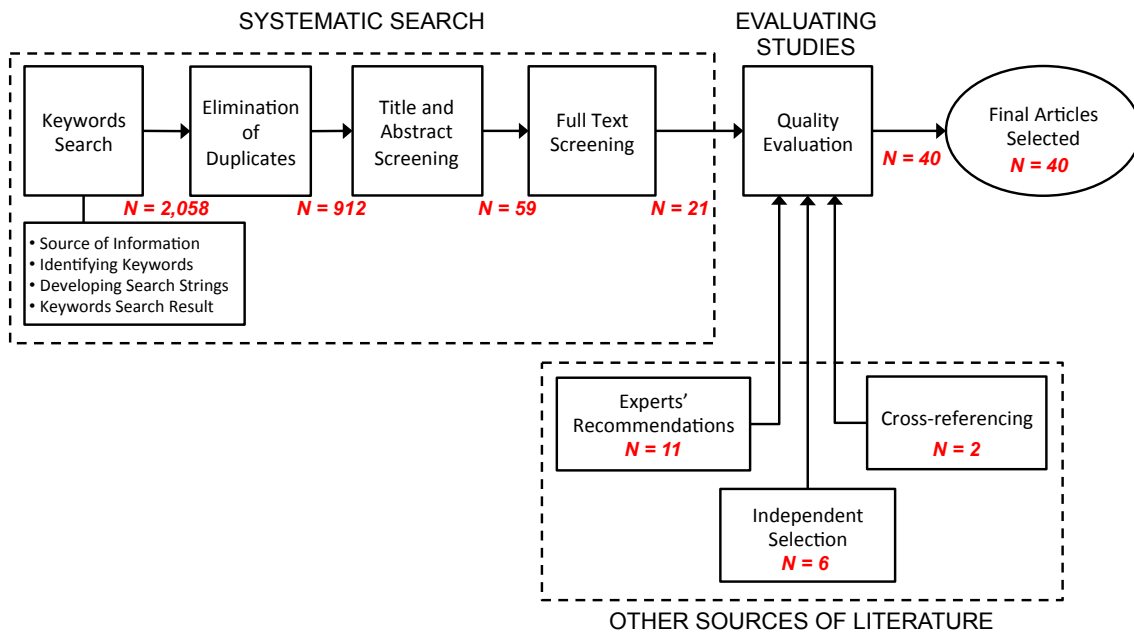


Figure 3.3: The Result Summary of the Systematic Search and Evaluating Studies

The keywords search generated 2,058 articles that matched the search criteria. By eliminating the duplicates, the number of articles was reduced to 912. These articles were then evaluated by reviewing their Title, Abstract and Subject/Keywords to assess their relevance to the SRQs, resulting in 59 articles. The re-evaluation that was conducted by reviewing the whole text of each article, considered 21 articles. Finally, these 21 articles and 19 articles from other sources—*experts' recommendations*, *independent selection* and *cross-referencing*—were assessed for their quality. The result showed that all 40 articles were qualified for this review.

3.9 EXTRACTING AND SYNTHESISING DATA

The final stage is *Extracting and Synthesising data*, which consists of *Data extraction* and *Data Synthesis* steps. The key information from each article was gathered by employing a *data extraction form*, which is shown in Table 3.9. The data extracted from the 40 articles are presented in Appendix F.

Table 3.9: Data Extraction Form

Full citation of the article	
Type of Article	<i>Empirical or theoretical</i>
Research question/ Aim	
Theory	
Methodology	<i>Qualitative or Quantitative</i>
Unit of Analysis	<i>Corporate, Strategic Business Unit (SBU)</i>
Participants	<i>Directors or Managers</i>
Industry	<i>Types of industry</i>
Geography	<i>Country in which the study is conducted</i>
Hypothesis/ Proposition	<i>(if applicable)</i>
Data Collection	<i>Survey or interview or observation</i>
Data Analysis	
Findings	
Conclusion	
Further research	

Adapted from Boaz, Hayden and Bernard (1999) cited in Pilbeam (2012)⁷

These extracted data were synthesised to provide descriptive and thematic (conceptual) information (both are discussed in Chapters 4 and 5 respectively). With this information, the review identified “what we know” and “what we don’t know” questions that ultimately led to revealing the research questions (Pilbeam, 2012)⁸. These discussions are described in Chapter 6.

3.10 SUMMARY

This chapter has presented the methodology for conducting a systematic literature review. It has shown that:

- Systematic literature review consists of five stages: planning the review, identifying and evaluating studies, extracting and synthesising data, reporting, and utilising the findings.

⁷ Presentation given by Colin Pilbeam PhD, *Systematic Review: Extracting and Synthesizing*, MRes/Research Methodology Course, Cranfield School of Management, 14th May 2012.

⁸ Presentation given by Colin Pilbeam PhD, *Systematic Review: Extracting and Synthesizing*, MRes/Research Methodology Course, Cranfield School of Management, 14th May 2012.

- Systematic search utilises the keywords search to generate a list of considered articles. These considered articles go through two stages of assessment by evaluating the Title, Abstract and Subject/Keywords and the whole text.
- Evaluating studies appraises the quality of articles that result from the systematic search steps.
- Systematic search selected 21 articles and other sources of literature (experts' recommendations, independent selection and cross-referencing) contributed 19 articles. After having a quality appraisal, these 40 articles were considered to be qualified for this systematic literature review.

Chapter 4 Descriptive Analysis

4.1 INTRODUCTION

This chapter presents the review of the key characteristics of the literature. The review aims to analyse the profile of the literature selected and the body of knowledge represented. The information obtained from this analysis can be combined with the *conceptual analysis* presented in Chapter 5, to explain the current state of research on NPD portfolio management. The characteristics of the literature are described in four main parts: (1) the *source of literature*; (2) the *publication period*; (3) the *literature theme*; and (4) the *research design*. Finally, this chapter closes with a summary.

4.2 THE SOURCE OF THE LITERATURE

As described in Chapter 3, the systematic literature review incorporated literature from various sources, which encompassed journals, a book section and a working paper. By examining these sources, a profile of the literature can be delineated. This section discusses the *types of sources*, the *publication titles* and the *quality grading*.

4.2.1 The Type of Sources

As shown in **Table 4.1**, journal articles accounted for 95% of the overall 40 pieces of literature reviewed, whereas the book section and working paper contributed 2.5% each. This shows that the literature search was strongly focused on academic journals rather than books, as the review intended to consider those that represented the recent development in this area. The two other sources, the book section and the working paper, were included as a result of experts' recommendations.

Table 4.1: The Type of Literature Sources

Source Type	Number	Percentage
Journal Articles	38	95 %
Book Section	1	2.5 %
Working Paper	1	2.5 %
Total	40	100%

The number of articles selected, i.e. 40, is considered to be relatively low, compared to 815 NPD articles published by the 10 journals⁹ in the period of 1989-2004 (Page and Schirr, 2008). This appears to show that the field is still underdeveloped. However, it is slightly premature to come to this assumption from only looking at the low number of articles found. Thus, the following sections examine the profile of these literature sources from different angles.

4.2.2 Publication Title and Quality Grading

The 38 journal articles were published by various academic journals, which are listed in Table 4.2. This table shows the journal title, number of articles found, *journal quality grading* and the source of articles (systematic search, independent selection, expert recommendation and cross-referencing). The journal quality grading, from the *Cranfield School of Management Journals Ranking 2012*¹⁰, grades the quality of journals according to the following scale: 4* = world leading; 3* = internationally excellent; 2* = internationally recognised; 1* = national. Apart from this, the book section and working paper are retained in the list in order to consistently show the total number of articles selected.

The *Journal of Product Innovation Management (JPIM)*, *Organization Science* and *International Journal of Project Management* dominated the journal articles reviewed with 7 (17.5%), 5 (12.5%) and 4 (10%) articles respectively. This confirms that *JPIM* is the core journal in this review, publishing the most relevant and substantial studies on NPD portfolio management. Similarly, the *International Journal of Project Management* reported a significant number of studies on this field. The journal *Organization Science* highly contributed to this review through an expert's recommendation¹¹, reporting a study theme on *organisational routines*. In relation to this, Section 4.4 The Themes in the Literature investigates further the relevance of the *theme* in the review.

⁹ Journal of Product Innovation Management, Research Technology Management, R&D Management, Journal of Marketing, Journal of Marketing Research, Industrial Marketing Management, Administrative Science Quarterly, Academy of Management Journal, Academy of Management Review and Strategic Management Journal

¹⁰ Cranfield School of Management (2012), Journal Recommendations for Academic Publication, 9th Edition, Research Information, Cranfield SOM, Cranfield.

¹¹ Prof. Gina Colarelli O'Connor, PhD., Lally School of Management & Technology at Rensselaer Polytechnic Institute, NY

Table 4.2: The Journal Titles

Journal Title	Number of Articles	%	Quality Grading	SS	IS	ER	CR
<i>Academy of Management Journal</i>	1	2.5	4*				1
<i>American Journal of Sociology</i>	1	2.5	NA			1	
Book section	1	2.5	NA			1	
<i>Creativity and Innovation Management</i>	1	2.5	2*	1			
<i>Group & Organization Management</i>	1	2.5	3*	1			
<i>Harvard Business Review</i>	1	2.5	4*			1	
<i>Industrial Marketing Management</i>	1	2.5	3*	1			
<i>International Journal of Innovation & Technology Management</i>	1	2.5	NA	1			
<i>International Journal of Innovation Management</i>	1	2.5	2*	1			
<i>International Journal of Management Reviews</i>	1	2.5	3*	1			
<i>International Journal of Project Management</i>	4	10	2*	3	1		
<i>International Journal of Technology Management</i>	1	2.5	3*	1			
<i>Journal of Management</i>	2	5.0	4*		1	1	
<i>Journal of Management Studies</i>	1	2.5	4*	1			
<i>Journal of Operations Management</i>	1	2.5	4*	1			
<i>Journal of Product Innovation Management</i>	7	17.5	4*	4	2		1
<i>Long Range Planning</i>	2	5	3*		2		
<i>Management Decision</i>	1	2.5	1*	1			
<i>Manufacturing & Service Operations Management</i>	1	2.5	NA			1	
<i>Organization Science</i>	5	12.5	4*			5	
<i>Project Management Journal</i>	1	2.5	2*	1			
<i>Research Technology Management</i>	1	2.5	3*	1			
<i>Sloan Management Review</i>	1	2.5	4*	1			
<i>Strategic Management Journal</i>	1	2.5	4*	1			
Working paper	1	2.5	NA*			1	
Total	40			21	6	11	2

Note: SS = Systematic Search; IS = Independent Selection; ER = Expert Recommendation; CR = Cross-Referencing

Figure 4.1 and Table 4.2 show that the systematic literature review involved 20 (50%) articles published in the 4* grade journals. The 3* and 2* grade journals contributed seven articles (17.5%) each, while there is only a single 1* journal with one (2.5%) article. In particular, the journals that dominated the review, *Journal of Product Innovation Management* and *Organization Science* are graded as 4* journals, whereas the *International Journal of Project Management* is graded as 2*.

In addition, Table 4.2 shows that two articles are a book section and a working paper; another three articles included in this review, were not listed in *Cranfield School of Management Journals Ranking 2012*. Thus, it is shown in Figure 4.1 that quality grading for five (12.5%) articles was not available.

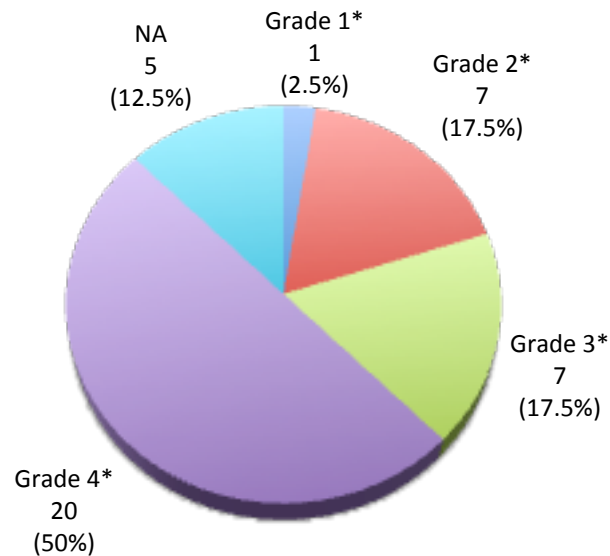


Figure 4.1: The Journal Quality Grading Proportions

These figures demonstrate that the issues raised by the Systematic Review Questions were explored in highly rated journals, with the exception being the *International Journal of Project Management* (2*). The high representation of this journal in the review is discussed further in Section 4.4 The Themes in the Literature.

4.2.3 Conclusions

It can be concluded that the number of the articles selected was considered to be low, which might indicate that the areas of studies were underdeveloped. Furthermore, most studies were published in three, which will be referred to as “core” journals: the *Journal of Product Innovation Management*, *Organization Science* and *International Journal of Project Management*. It should be noted that two of these are regarded as world leading (4*) journals, whereas the third, *International Journal of Project Management*, is only considered as an internationally recognised (2*) journal.

4.3 THE PUBLICATION PERIOD

The articles reviewed were published in 1981-2012. By dividing the overall period into six periods, as shown in Figure 4.2, the articles’ publications were investigated to analyse the development of the area and identify trends. Additionally, for comparison, the development of NPD articles in the 10 listed journals in the period from 1989-2004 is also presented in Figure 4.3.

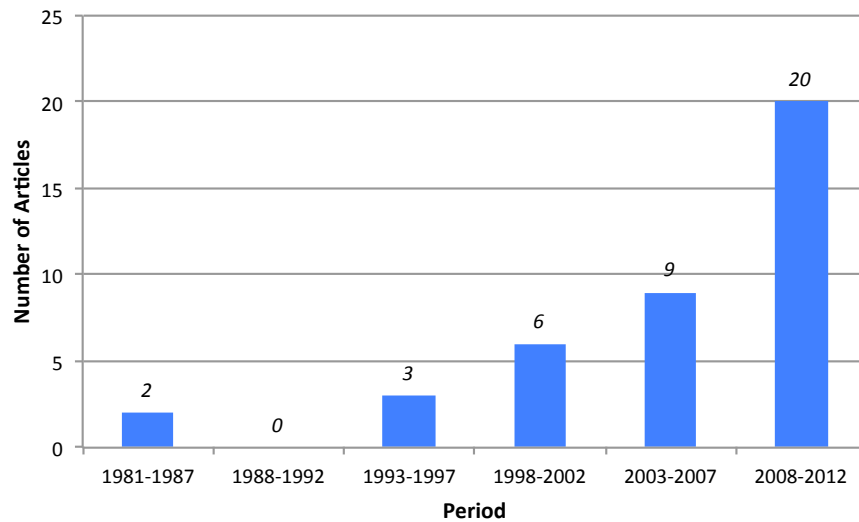


Figure 4.2: The Number of Articles Reviewed from 1981-2012

Figure 4.2 shows that, from 1981-2012, the most articles reviewed were recent, with 50% being from 2008-2012. In contrast, as shown in Figure 4.3, the development of NPD articles in 1989-2004 shows a steady growth—on average over 38 articles per year (Page and Schirr, 2008). This suggests that while the studies on the NPD field have steadily developed, the studies on the issues raised in this review are new and emerging. These emerging studies were largely published in the three core journals — *Journal of Product Innovation Management*, *Organization Science* and *International Journal of Project Management* (See Appendix G).

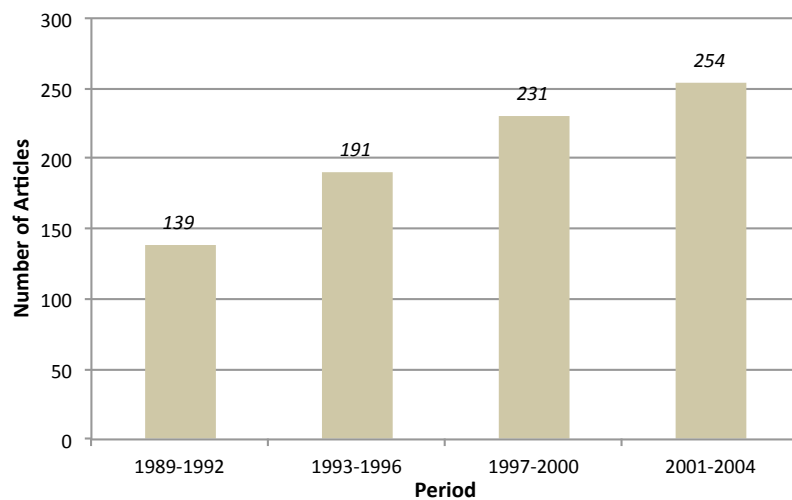


Figure 4.3: The Number of NPD Articles in the 10 Journals from 1989-2004

Source: Page and Schirr (2008)

4.3.1 Conclusions

It can be concluded that the articles that reported studies on the issues posed in the review questions have increased from 1981-2012, particularly in the period 2008-2012. This trend indicates that the fields of studies have been recently developing. These recent studies were mostly published in the core journals: the *Journal of Product Innovation Management*, *Organization Science* and *International Journal of Project Management*.

4.4 THE THEMES IN THE LITERATURE

Different themes were identified in the literature. These themes will be discussed by relating them to the Systematic Review Questions determined in Chapter 2: (1) How are strategic decisions in the NPD portfolio management process made? (SRQ 1); (2) How does the NPD portfolio management process link to the strategy process? (SRQ 2); and (3) How does the NPD portfolio management process relate to organisational routines? (SRQ 3).

4.4.1 Identification of Themes

By clustering the articles reviewed, 12 main themes of literature were identified. These themes were then classified according to the respective Systematic Review Question pertaining, as shown in Table 4.3. This table presents the *themes* and their corresponding Systematic Review Question, the *theme description*, the *number of articles* represented and their *percentage*, as well as the *types of literature* and the *empirical research methodology* that are discussed in Section 4.5 The Types of Literature and 4.6 The Empirical Research Literature (In addition, the articles corresponded to these themes are listed in Appendix H).

Table 4.3 shows that answering the first Systematic Review question (SRQ 1) led to four themes: (1) Portfolio Decision-Making; (2) Portfolio Decision-Making; (3) Strategic Decision Making; and (4) Strategic Decision-Making in Innovation. The Portfolio Decision-Making theme appears to be relevant to SRQ 1. Moreover, this theme was significant with nine (22.5%) of articles, which were published in the periods 2003-2007 and 2008-2012. Particularly in 2008-2012, the publications significantly increased (see Appendix I). These trends suggest that the topic of developing strategic decisions in portfolio management is a developing area.

Table 4.3: The Thematic Findings of the Literature Reviewed

	Theme	Description	No. of Art	%	Type of Literature			Research Design		
					PR	TH	ER	Qual	Quant	Mixed
Systematic Review Question 1 <i>How are strategic decisions in the NPD portfolio management process made?</i>	Portfolio Decision-Making	Studies on how decisions are made simultaneously across the full set of NPD projects in development.	9	22.5%	1		8	5	2	1
	Portfolio Management	Focuses on decisions in selecting, reviewing, revising or terminating projects.	7	17.5%	2	4	1			1
	Strategic Decision Making	Focuses on how strategic decisions and actions occur in organisations.	3	7.5%		1	2		2	
Systematic Review Question 2 <i>How does the NPD portfolio management process link to strategy process?</i>	Strategic Decision-Making in Innovation	Studies on the key factors in evaluating the strategic innovation projects.	1	2.5%			1			1
	Front-End NPD and Strategy	Focuses on the front-end phases of NPD that are moderated by the corporate's strategy.	4	10.0%			4	2	2	
	Strategy Process	Studies on the overall process of organisational decision-making and organisational change.	2	5.0%		2				
Systematic Review Question 3 <i>How does the NPD portfolio management process relate to organisational routines?</i>	Strategic Decision-Making and Strategy Process	Studies on the process of strategy making.	1	2.5%			1	1		
	Organisational Routines	Studies Routines as the genetic foundation of organisation capabilities.	7	17.5%		3	4	4		
	Organisational Capabilities	Studies organisational capabilities, their evolution and their influences on firm performance.	3	7.5%		2	1	1		
	Behavioural Operations	Studies that use a behavioural approach to view the underlying drivers of operating system performance.	1	2.5%		1				
	Agency	Studies on the components of human <i>agency</i> and the interplay among them within different structural contexts of action.	1	2.5%		1				
	Portfolio Management and Capabilities	Studies on the application of dynamic capabilities to portfolio management.	1	2.5%		1				
	Total		40		3	15	22	13	6	3
					(7.5%)	(37.5%)	(55%)	(59.1%)	(27.3%)	(13.6%)

Note: PR = Practice; TH = Theoretical; ER = Empirical Research
Qual = Qualitative; Quant = Quantitative

The Second Systematic Review Question (SRQ 2), which raises the issue of linking the NPD portfolio management process with the strategy process, was considered to be answered by three themes: (1) *Front-End NPD and Strategy*; (2) *Strategy Process*; and (3) *Strategic Decision-Making and Strategy Process*. The *Front-End NPD and Strategy* theme with four (10%) articles could be the best surrogate for responding to SRQ 2. Nevertheless, in general, all themes are inadequately relevant to SRQ 2. This suggests that the subject of linking portfolio management and strategy process is an emerging area.

The third Systematic Review Question (SRQ 3), which poses the issue of relating organisational routines to the NPD portfolio management process, was considered to be addressed in five other themes: (1) *Organisational Routines*; (2) *Organisational Capabilities*; (3) *Behavioural Operations*; (4) *Agency*; and (5) *Portfolio Management and Capabilities*. Except for the articles from O'Connor (2008) and Tranfield et al. (2003b), which were selected through the *systematic search* process (see Chapter 3), all articles categorised in these themes were included through experts' recommendations and independent selection. This implies that the systematic search process failed to identify the existence of the area of study.

Moreover, these articles do not pertain directly to the NPD portfolio management domain. Hence, it can be suggested that the studies on investigating *NPD portfolio management* using *organisational routines* perspective has not yet been done. In Chapter 5 Conceptual Findings, this issue is explored further to identify possible relationships between these three fields.

4.4.2 Conclusions

It can be concluded that:

First, the issue of how the strategic decisions are made in the NPD portfolio management process (SRQ 1) was addressed in the theme of *portfolio decision-making*, which was increasingly studied and recently published in the various grades of journals. This suggests that this area of study has been developing in recent years.

Second, the issue of linking the NPD portfolio management process with the strategy process (SRQ 2) was inadequately addressed in any of the *Front-End NPD and Strategy*, *Strategy Process*, and *Strategic Decision-Making and Strategy Process*

themes. The study in this theme is far too narrow for accurately addressing the issue raised. This suggests that the issue in SRQ 2 is an emerging area of study.

Third, the issue of relating organisational routines to the NPD portfolio management process (SRQ 3) was not directly addressed in any of the *Organisational Routines*, *Organisational Capabilities*, *Behavioural Operations* or *Structuration* themes. This suggests that the issue of investigating the link between NPD portfolio management and the strategy process using the organisational routines perspective is a new area of study.

4.5 THE TYPES OF LITERATURE

Wallace and Wray (2011, p. 59) distinguished four types of literature: *theoretical*, *empirical research*, *practice* and *policy*, with the following characteristics:

1. *Theoretical* describes models and theories for interpreting and explaining pattern in practice.
2. *Research* reports systematic enquiries into policy and practice.
3. *Practice* is written by informed professionals who evaluate others' practice and by practitioners who evaluate their own practice.
4. *Policy* recommends changes in practice that are desired by policy-makers, thereby implying a negative evaluation of present practice.

In this review, as shown in Table 4.3, three types of literature were identified: *practice* (7.5%), *theoretical* (37.5%) and *empirical research* (55%). The portions of the *theoretical* literature are still high, so it can be assumed that the issues raised in the Systematic Review Questions are emerging fields.

Furthermore, it can be seen from Table 4.3 that the theme of *portfolio decision-making* mainly contained the *empirical research* literature. This supports the earlier suggestions that the *portfolio decision-making* theme was a developing field.

These propositions, however, need to be investigated from other angles. Accordingly, the following sections review the profile of the literature further by focusing on the *empirical research* literature.

4.6 THE EMPIRICAL RESEARCH LITERATURE

This section reviews the *empirical research* literature (22 articles) by identifying its three elements: the *research designs*, *industry sectors* and *geography*. By extending Table 4.3, the descriptive information of these elements was identified, and is presented in Table 4.4.

4.6.1 Research Design

Creswell (2009, p. 3) defined research designs as “plans and procedures for research that span the decisions from broad assumptions to detailed methods of data collection and analysis”. These decisions include *strategies of enquiry*, also called *research methodologies* (Mertens, 1998, cited in Creswell, 2009), and specific methods of data collection, analysis and interpretation. In this review, the investigation was centred on the research methodologies, which specify the types of *qualitative*, *quantitative* and *mixed methods* models applied in the research.

While a quantitative approach is the best method to apply for testing a theory or explanation, a *qualitative* approach is best applied when a phenomenon needs to be understood and the research on it has not been adequately conducted (Creswell, 2009). Furthermore, a mixed method can be applied when either the quantitative or qualitative approach by itself is unable to best explain a research problem (Creswell, 2009).

Table 4.3 shows that 13 (59.1%) articles reported *qualitative* research, whereas 6 (27.3%) articles represented the *quantitative* research and 3 (13.6%) articles used the *mixed method* research. As the *qualitative* research dominated the studies, it can be suggested that little research has been conducted on the research problems addressed in the literature reviewed. In other words, the research problems explored in this review are an emerging field.

Table 4.4: The Empirical Research Information

Method	Research Design ¹²		#	Sector	#	%	Geography	#	%
	#	Methodology							
Qualitative	13	Single Case	3	Multi industry	6	27.3%	US	5	22.7%
		Multiple Case	10	Telecommunication	2	9.1%	Finland	2	9.1%
				Building materials	1	4.5%	Europe & US	1	4.5%
				Home products manufacturing	1	4.5%	US & Japan	1	4.5%
				Industrial product	1	4.5%	Europe	1	4.5%
				Semiconductor	1	4.5%	Italy	1	4.5%
				Waste collection	1	4.5%	UK	1	4.5%
							Global	1	4.5%
Quantitative	6	Survey	4	Multi industry	3	13.6%	US	2	9.1%
		Experimental	2	Industrial	1	4.5%	Finland	2	9.1%
				Petrochemical	1	4.5%	Denmark	1	4.5%
				NA	1	4.5%	Global	1	4.5%
Mixed	3	Sequential	3	Multi industry	2	9.1%	US	1	4.5%
				Telecommunication	1	4.5%	Australia	1	4.5%
							Belgium and Netherland	1	4.5%
Total	22								

Note: # = Number of studies

¹²Refers to Creswell, J. W. (2009), *Research Design: Qualitative, Quantitative and Mixed Methods Approaches*, (3rd ed), Sage Publications, Inc., Thousand Oaks, California.

In addition, Table 4.4 shows that all *qualitative* research applied *case study methods*. This indicates that these studies aimed to understand the phenomena by capturing the real-life process; as (Yin, 2009) suggested, case methods are best applied to investigate contemporary phenomena in specific contexts, involving situations in which the boundaries between the phenomena and the contexts are not clearly discernible.

4.6.2 The Sectors of Industry

Table 4.4 shows that most studies (50%) were conducted in a *multi industry*. *Telecommunication* and *industrial* contributed with 13.6% and 9.1% of studies respectively. The other industries equally contributed 4.5% of studies. *Waste collection* is not a manufacturing company; nevertheless, it was included in the review as recommended by the expert¹³, to represent the *organisational routines* theme.

The composition of the industries studied suggests that *telecommunication* was increasingly considered as the object of the research. This might be because of the dynamic nature of this industry, which influenced the NPD portfolio management process. Studying this phenomenon might bring new understanding to managing the NPD portfolio decisions process.

4.6.3 Geography

Table 4.4 shows the distribution of the geographical locations in which the *research* studies were carried out. It can be seen that most *empirical research* studies were conducted in the United States and Finland, with eight (36.4%) and four (18.2%) studies respectively. The remaining studies were distributed throughout European countries and Australia, and also conducted globally. On the other hand, no study has been done in Asian countries, except one that was conducted in Japan. This suggests that portfolio management practices in Asian countries have drawn little attention to be studied.

¹³ Prof. Gina Colarelli O'Connor, PhD., Lally School of Management & Technology at Rensselaer Polytechnic Institute, NY

4.6.4 Conclusions

It can be concluded that:

First, the portions of the *theoretical* literature are still high. This indicates that the issues raised in the Systematic Review Questions are emerging studies. The *portfolio decision-making* theme was mainly the *empirical research* type of study. This suggests that the *portfolio decision-making* theme that represented the issue of how the strategic decisions are made in the NPD portfolio management (SRQ 1) is a developing field.

Second, the *qualitative* research dominated the studies in the literature reviewed. This indicates the research problems explored in this review are emerging fields. Furthermore, the studies on *portfolio decision-making* and *organisational routines* mainly applied *qualitative* methodology. This suggests that the *portfolio decision-making* and the *organisational routines* themes were considered as recently developing fields.

Third, while most *empirical research* studies were conducted in a multi industry, the research in a single industry was dominated by the telecommunications industry. This suggests that the telecommunications industry has increasingly drawn attention for portfolio management research.

Finally, the *empirical research* studies in this review were mostly conducted in the United States and Finland. The remaining studies were distributed throughout European countries and Australia, and also conducted globally. In contrast, little research has been done in Asian countries.

4.7 SUMMARY

This chapter has presented the descriptive analysis of the literature reviewed. It has shown that:

- The number of the articles selected is considered to be relatively low, which might indicate that the field is still underdeveloped. The *core journals* of the literature reviewed were the *Journal of Product Innovation Management*, *Organization Science* and *International Journal of Project Management*.

- The trend of the literature publications shows that the fields of studies have been recently developing. In addition, the most recent studies were published in the *core journals*.
- The SRQ 1 was addressed in the *portfolio decision-making* theme, which was a developing field. The SRQ 2 was inadequately addressed in any theme. Finally, the SRQ 3 was not directly addressed in any theme.
- The *qualitative* research dominated the studies conducted in the literature reviewed. This indicates that the research problem explored in this review was an emerging field.
- Most *empirical research* studies were conducted in a *multi industry*, whereas in a single industry, telecommunications was considered the highest. Furthermore, the *empirical research* studies were mostly conducted in the United States and Finland. In contrast, few studies have been done in Asian countries.

Chapter 5 Conceptual Analysis

5.1 INTRODUCTION

This chapter presents the analysis of the key findings of the review of the literature reviewed. It shows the relationships between the different knowledge domains which were considered—NPD portfolio management, strategy process and organisational routines. The stages of this conceptual analysis are presented in the framework shown in Figure 5.1.

Hart (1998) suggested that by classifying the content of the literature, the connections between ideas contained in the literature can be identified. Accordingly, prior to analysing the key findings, as shown in Figure 5.1, the literature was divided into themes. This stage was completed in Chapter 4, which resulted in 12 themes (shown as T₁ to T₁₂ on Figure 5.1). The key features of each article—journal title, research design, sample and key findings—were identified and then each article was critically reviewed. The results of this careful analysis article-by-article are given in Appendix J. From the article-by-article analysis, a synthesis per theme was made, which is presented for each review question in this chapter. Further, the way the different themes were related was identified using a *Subject Relevance Tree*¹⁴. The three subject relevance trees were then used as the basis for answering the Systematic Review Questions

The conceptual analysis of the findings is presented in five main sections: (1) How strategic decisions area made in the NPD portfolio management (SRQ 1); (2) How the strategic decisions in the NPD portfolio management are linked with the strategy process (SRQ 2); (3) The role of organisational routines in the NPD Portfolio Management process (SRQ 3); (4) Insights Across the SRQs; and (5) Summary.

¹⁴ Hart, C. (1998), *Doing a Literature Review: Releasing the Social Science Research Imagination*, Sage Publications Ltd., London.

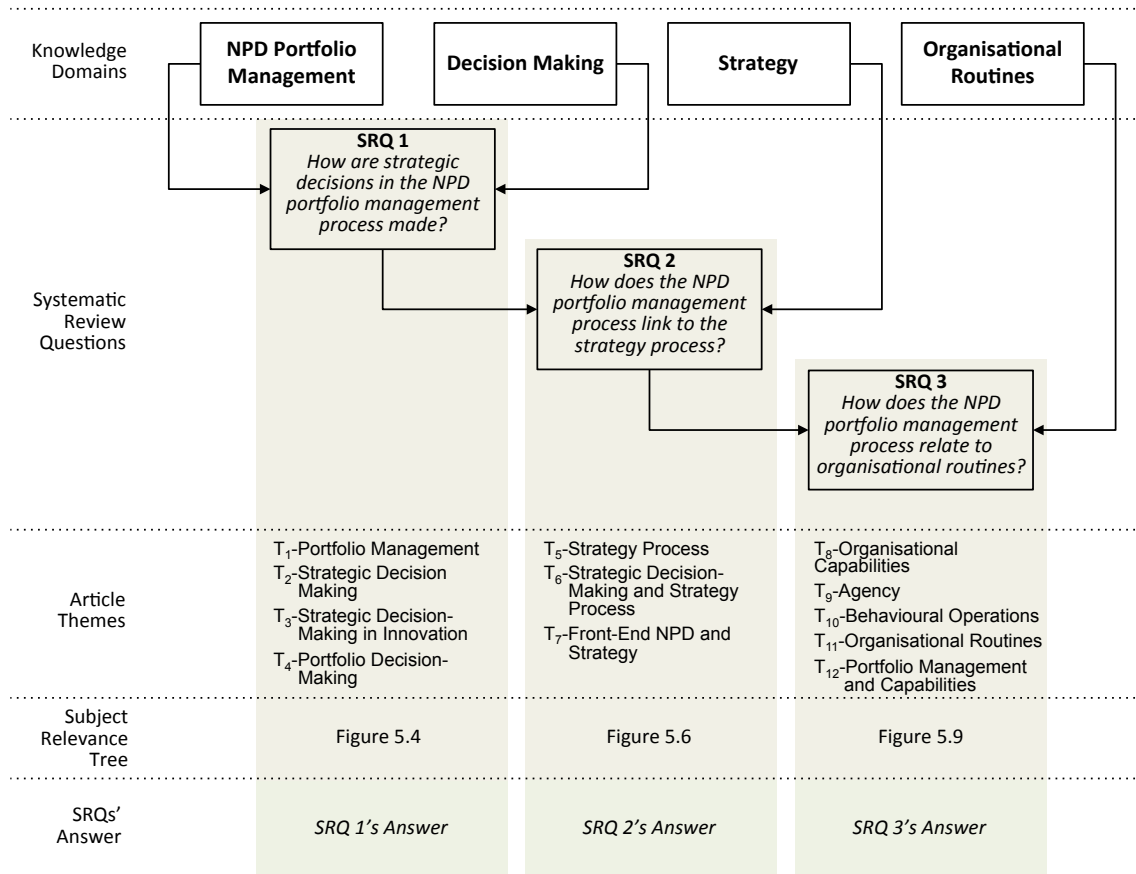


Figure 5.1: The Conceptual Analysis Framework

5.2 STRATEGIC DECISION-MAKING IN THE NPD PORTFOLIO MANAGEMENT: SRQ 1

As shown in Figure 5.1, the issues raised in the first Systematic Review Question (SRQ 1) — “How are strategic decisions in the NPD portfolio management process made?” — are addressed in four literature themes: Portfolio Management (T₁), Strategic Decision-Making (T₂), Strategic Decision-Making in Innovation (T₃) and Portfolio Decision-Making (T₄). In this section, each theme will be discussed in detail, and the relationship between these themes will be shown in the Subject Relevance Tree.

5.2.1 Portfolio Management (T₁)

The objective of portfolio management is to allocate resources to achieve the optimal balance between returns and risks of the product portfolio under uncertain situations (Cooper et al., 1999; Goffin and Mitchell, 2010; Kester et al., 2011). Studies on portfolio management have been mainly focused on portfolio selection rather than on

portfolio management as a whole (Adams et al., 2006). Among these studies, this review identified different streams of study that centre on the development of *prescriptive tools* (Adams et al., 2006; Cooper et al., 1999), and *integrated frameworks* (Archer and Ghasemzadeh, 1999; Cooper, 2008) for supporting decision makers in selecting a product portfolio. In addition, studies on the implementation of portfolio management in practice have also drawn the interest of some scholars (Cooper et al., 1999, 2000; Nagji and Tuff, 2012). These three streams are discussed further in this section.

Various tools have been developed to perform the portfolio selection process. The development of project selection tools began with a model using *return on investment* as the primary decision criterion (Adams et al., 2006), e.g. financial model and financial indices, probabilistic financial models, options pricing theory (Cooper et al., 1999). Further, the development advanced to building models such as mathematical tools, and economic and benefit. These models are categorised as quantitative models that use financial criteria as their performance measures. Cardozo and Wind (1985) argued that financial-based models offer advantages as they emphasise the main objective of the corporate level, which is maximising the level of return for any level of risk and minimising risk for any level of return.

Further, the development has recently progressed towards portfolio models that incorporate qualitative factors in the decision process, such as *scoring models and checklists*, *analytical hierarchy approaches*, *behavioural approaches*, which use subjective perceptions for selecting the portfolio (Adams et al., 2006; Cooper et al., 1999). The empirical research, however, shows that financial-based models do not yield the best results; rather, the scoring models tend to result in better portfolios in different performance metrics (Cooper et al., 1999).

Subsequently, while previous development focused on building mathematical models, other scholars have paid attention to integrated frameworks (Archer and Ghasemzadeh (1999); Cooper (2005, 2008)). Among others, the framework developed by Archer and Ghasemzadeh (1999), is considered to significantly contribute to the field

(cited by 409 other articles¹⁵), is shown in Figure 5.2. It breaks down the portfolio project selection process into a flexible and logical series of activities that move from initial strategy issues towards the final result. The framework is conceived by pre-process stages, portfolio selection process and post-process stages. This approach offers flexibility which allows users to utilise the advantages of a combination of existing tools.

Finally, the third stream of studies examines how companies select their product portfolio (Cooper et al. (1999, 2000); Nagji and Tuff (2012)). For example, Cooper et al. (1999) investigated the portfolio management practices in 205 business units from various industries. Their study suggests that best performing companies apply established and formal portfolio management methods along with use a combination of multiple methods.

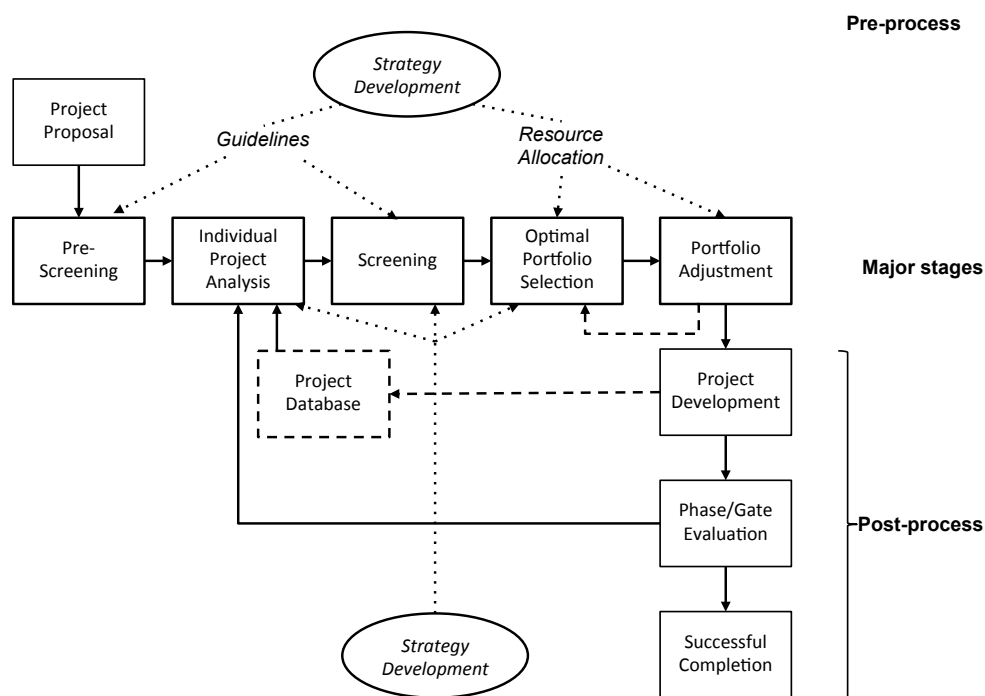


Figure 5.2: The Framework for Project Portfolio Selection

Source: Archer and Ghasemzadeh (1999)

¹⁵ Source: Google Scholar (accessed 14th April 2013)

In summary, the review on the portfolio management theme identified three streams of study: prescriptive tools, integrative framework and implementation portfolio management methods in practice. These studies, however, have largely focused on the portfolio selection aspects rather than on managing the integrated portfolio management. More over, how portfolio decisions are made has not been examined as well in these studies. This issue will be discussed in the following sections by considering the strategic decision-making perspectives in portfolio management.

5.2.2 Strategic Decision-Making (T₂)

As mentioned previously, portfolio management involves complex decision-making processes. The previous models developed, however, disregard the role of the organisational decision process (Adams et al., 2006). Accordingly, in the following sections, the recent studies on portfolio management that involve the decision-making process perspective will be discussed. Prior to that, an insight on strategic decision-making is described in this section, i.e. strategic decision-making perspectives.

Mazzolini (1981) argued that a strategic decision-making process should be viewed as an *organisational process* rather than an *individual process*, because organisations are not “monoliths behaving as unitary agents” but rather aggregations of sub organisations that are loosely-knit and connected by already settled on procedures (p. 87). From this perspective, the organisational processes result in strategic behaviour, which is the output set of processes and *routines*. In contrast, Rajagopalan et al. (1993) indicated that the strategic decision-making frameworks which solely employ an *organisational* or *macro perspective* have some shortcomings, as they ignore the role of the *individual* or *micro perspective* (based on *cognitive* factors) in the process.

The decision-making process is characterised by the level of *rationality* and the degree of *political activity* (Rajagopalan et al., 1993). Fahey (1981) and Thomas (1984), therefore, suggested collectively involving rational and political dimensions when viewing the decision-making process. This is understandable, as neither people nor organisations really behave rationally (Mazzolini, 1981); in addition, political processes can critically impact on any stage of a decision-making process (Fahey, 1981). In contrast, in a later study, Dean and Sharfman (1996) showed that whereas procedural

rationality leads to effective decisions, political behaviour leads to less effective decisions.

In summary, the scholars have different views on how strategic decision-making are effectively conducted. Their views lead to three fundamental perspectives of decision-making process: organisational, individual (cognitive) and political. However, the extent to which each perspective influences the decision-making process is still not apparent.

5.2.3 Strategic Decision-Making in Innovation (T₃)

This theme is only represented by one article that discusses the key factors that manager considers when evaluating innovation projects (Moenaert et al. (2010)). This study identifies four key factors, called the strategic market options criteria, which are used to evaluate the innovation projects: *business opportunity*, *feasibility*, *competitiveness* and *leverage* (the expected possibility of positive spill over effects). Managers consider business opportunity and feasibility are the most important factors when selecting the projects, whereas actually business opportunity and competitiveness factors which influence the success of innovation projects.

5.2.4 Portfolio Decision-Making (T₄)

Portfolio management is a process that entails decisions of updating and revising continuously the active list of new product development projects. These decisions, ultimately, lead to the project selection and resource allocation decisions (Cooper et al., 2000; Lindstedt et al., 2008). Accordingly, exploring the studies on how these decisions are made is required for answering SRQ 1. This section discusses the portfolio decision-making theme that covers a wide range of subject, dividing in three main parts: (1) key decision types of portfolio management, (2) decision-making process in portfolio management and (3) the role of information in portfolio management.

5.2.4.1 Key Decision Types of Portfolio Management

The decision-making processes are dynamic; throughout the process, the portfolio is dynamically restructured responding to new information, new market opportunities, new progress of the precedent projects or changes in available resources (Lindstedt et al., 2008). While new projects are evaluated, selected and prioritised, existing projects

may be accelerated, terminated or postponed (Cooper et al., 1999; Goffin and Mitchell, 2010; Kester et al., 2011). As a consequence, resources need to be allocated and re-allocated to the running projects (Cooper et al., 2001). These traits of portfolio management imply different but complementary decision situations that increase the complexity of the process. This section discusses three decision types identified in this review, faced when managing NPD portfolio projects: (1) *portfolio changes*, (2) *product portfolio complexity* and (3) *inter-functional integration* (the linkage between project and portfolio level).

Firstly, the situations caused by the uncertainty of environment that drives the changes of customer needs, technologies (MacCormack and Verganti, 2003) and competitors' capabilities (Ali et al., 1993). These changes can lead to the acceleration, postponement or termination in NPD projects, implying a situation in which managers should make portfolio change decisions (Steffens et al., 2007). The sort of decisions will impact on a firm's technology roadmap, resource dependencies and development of other products (Steffens et al., 2007), as a consequence of the interdependence among the NPD projects within a portfolio (Dickinson et al., 2001; Roberts, 1999).

Steffens et al. (2007) indicated that the decisions made in responding to changes consider three criteria: *project efficiency*, *customer impact* and *project portfolio*; whereas, *business success* and *preparing for the future* are considered less. In their study, Steffens et al. (2007) identified that a structured and systematic approach is likely to be adopted by managers when making change decisions. MacCormack and Verganti (2003), in contrast, argued that systematic processes are less useful in such situation. Rather, a flexible approach based on an iterative process, which emphasises learning and adaptation, is more suitable for tackling change decisions.

The second decision situation is product portfolio complexity, which is a situation that comes from "... a multiplicity of, and relatedness among, product architectural design elements" (Closs et al., 2008, p. 591). In a different way, Martinsuo and Poskela (2011) considered that product portfolio complexity is created by "... the technical configuration of the product, its unfamiliarity to the firm and the market, and its requirements for the product development work" (p. 901). In addition, Martinsuo and Poskela (2011) argued that this is concerned with the complexity of the *product concept*

and its *novelty* to the organisation. While these two definitions refer to somewhat different concepts, both point out that the complexity stems from the product level rather than the portfolio level. Despite originated from the product level, it affects the decision-making process in portfolio level, as will be shown in the next section, both levels are linked.

On the one hand, product portfolio complexity plays a role as a mediator between external business environments and the firm's profitability (Closs et al., 2008), meaning that portfolio complexity can enable a firm to gain earning in dynamic environments. On the other hand, the complexity of product portfolio compels a firm to deal with a large number of decisions made in various functional fields over prolonged time periods (Closs et al., 2008). This tension can be dealt with the firm's *management competencies*, which refers to three factors: (1) product/technology portfolio strategy; (2) governance and organisational structure for product complexity management; and (3) design information and decision support systems (Closs et al., 2008).

Thirdly, whereas recent studies have suggested extending the analysis of NPD from project level to portfolio level, the inherence of intrinsic links between project and portfolio level resource allocation decision-making is recognised (Perks, 2007). These linkages are known as *inter-functional integration*, defined as "a high intensity of cross-functional linkages, whereby multiple departments work together towards common goals" (Perks, 2007, p. 154). Perks' (2007) study at a steel manufacturing company demonstrated evidence that inter-functional integration impacts on the portfolio decision-making process.

Perks (2007) pointed out two critical dimensions that explain the relationship: *functional domination* and *nature of dominant evaluation criteria*. Functional domination is the domination of single functions, playing a role as "functional champions", which can cause bias and functional resentment. As a result, this lead to the exclusion of appropriate functional involvement in decision making (Perks, 2007, p. 159). On the other hand, nature of dominant evaluation criteria refers to the relationship between inter-functional behaviour and the nature of evaluation criteria in portfolio decision-making. Therefore she suggested that formal evaluation criteria, which promote multi functional input, should be implemented, particularly when the new

product portfolio includes radical projects. This report, however, does not provide findings on either the direction or the extent of the impacts on the portfolio performance.

5.2.4.2 Decision-Making Process in Portfolio Management

Portfolio management covers a pervasive process beyond simply portfolio selection which requires solely tough Go/Kill decisions at the *stage-gate* process, instead it involves an entire decision-making process (Cooper et al., 2000; Nagji and Tuff, 2012). This section looks at an important study recently conducted by Kester et al. (2011) that investigated decision-making from an integrative perspective. The point of the discussion is centred on Kester et al.'s (2011) general framework of portfolio decision-making in addition to other perspective, i.e. the role of managers' personality traits (McNally et al., 2009).

Managing the NPD portfolio requires firms to make effective portfolio decisions; thus, understanding how these decisions are made is vital (Kester et al., 2011). Most NPD research, however, has focused only on decisions towards individual projects (Cooper, 1984; Cooper and Kleinschmidt, 1995a; Kester et al., 2011), whereas empirical research that has addressed the decision-making for overall portfolio performance is still limited (Kester et al., 2011). A recent case study conducted by Kester et al. (2011) has tried to fill this knowledge gap by investigating how decisions are made simultaneously across the full set of NPD projects in development. The result of the study was expressed in a general framework which is shown in Figure 5.3.

In this study, Kester et al. (2011) defined that the organisational objective is to produce effective decisions concerning the firm's NPD portfolio. It can be seen on the right-hand side of the framework that the output of the system is portfolio decision-making effectiveness, which resulted from the interaction between *evidence*, *power* and *opinion-based* processes. The portfolio decision-making effectiveness is measured along three dimensions of organisational outcomes: the extent to which the decision-making system generates a *portfolio mindset*; enables decision-making agility; and creates focused development efforts.

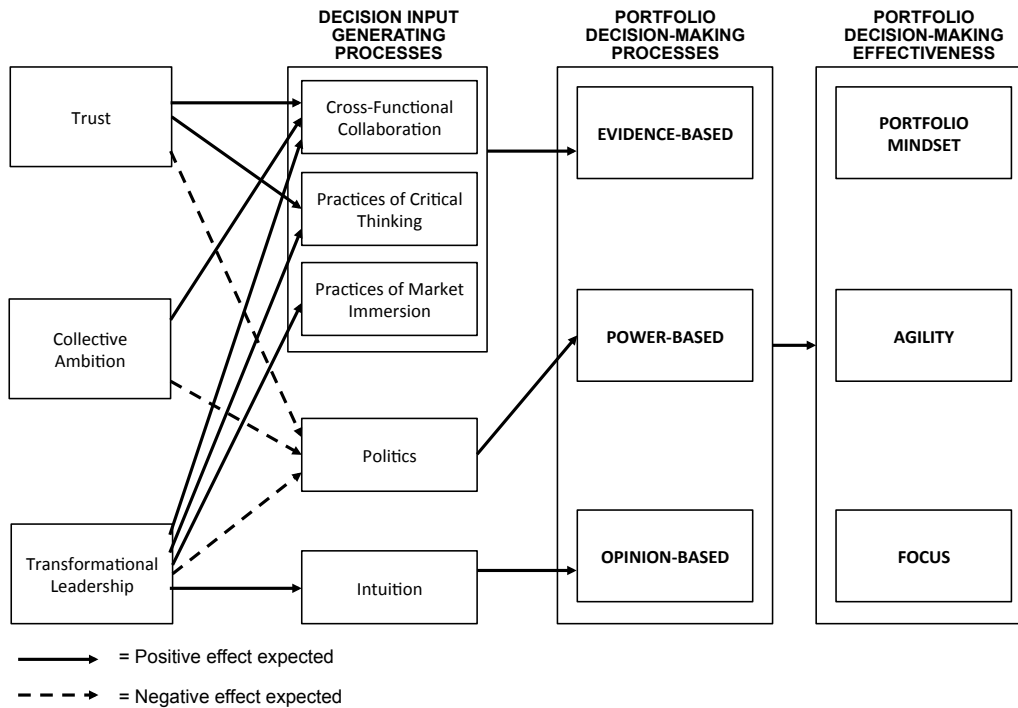


Figure 5.3: The General Framework of Portfolio Decision Making

Source: Kester et al. (2011)

Kester et al. (2011), further, found that effective portfolio decision-making can be gained by having a portfolio mindset, which is referred to as “a complete understanding of all of the projects in the NPD portfolio and how each is aligned to the firm’s strategy” (p. 647). A portfolio mindset provides managers an ability to know exactly the position of each evolved project in the development pipeline, enabling them to immediately identify and sort out potential problems. Further, Kester et al. (2011) posited that while agility contributes to portfolio maximisation and focus associates with strategic alignment, a portfolio mindset facilitates firms in attaining all three objectives of portfolio management: strategic alignment, maximum portfolio value and balanced portfolio.

In addition to decision-making effectiveness, managers’ dispositional traits also influence the achievement of the portfolio management objectives (McNally et al., 2009). McNally et al.’s (2009) study identified that *ambiguity tolerance* (an individual’s ability to accept the lack of information about the uncertain possibility of outcomes) is associated positively with strategic alignment; *analytic cognitive* (the way an individual undertakes “perceptual and intellectual activities”) is positively associated with

portfolio balance; and *leadership style* (the degree to which leaders act democratically or autocratically) is associated positively with the amount of importance the managers give to each objective (p. 134). In contrast, these managers' dispositions are not related to the objective of maximum portfolio value.

Furthermore, the portfolio decision-making processes are considered to be constituted by the interaction between evidence, power and opinion-based processes, implying that Kester et al. (2011) viewed the processes from a cognitive perspective (evidence and opinion-based processes) (Rajagopalan et al., 1993; Schwenk, 1988, 1989) and a political perspective (power-based processes) (Schwenk, 1988, 1989); whereas, the organisational perspective appears to be excluded.

5.2.4.3 The Role of Information in Portfolio Management

Innovation scholars deem that the roles of information and communication are vital in determining the performance of innovation projects (Moenaert et al., 2010). Dean and Sharfman (1996) indicated that a manager who manages the information and applied analytical techniques in the decision-making process makes more effective decisions than those who do not. Also, Cooper (2008) reiterated that effective portfolio management is enabled by the availability of high quality information. In real cases, however, comprehensive information is difficult to obtain. This lack of information brings uncertainty to decision makers concerning the future success of the products (Lindstedt et al., 2008). Many systems have been introduced to cope with managing information related problems; three examples of these decision support systems are described in the following section.

Cooper (2008) asserted that, in the *Stage-Gate* process, information gathered is required for comparing and ranking projects; in order to provide such information, Cooper et al. (2001) had suggested utilising *portfolio displays*, such as *bubble diagrams*, *pie charts* and *prioritised lists of projects*, at the gate meetings to assist the gate keepers by having the information of the entire portfolio rather than only individual projects.

The complexity of the decision-making process together with a large number of products evaluated has led to the necessity of employing information and decision support systems (Archer and Ghasemzadeh, 1999; Closs et al., 2008; Kester et al., 2011; Killen and Kjaer, 2012; Lindstedt et al., 2008). Killen and Kjaer (2012) also suggested

using a *network mapping* approach for visualisation of NPD portfolio interdependencies. This system, while providing support for making strategic decisions, functions as a communications tool. Furthermore, Lindstedt et al. (2008) proposed a system called *Robust Portfolio Modelling* (RPM), a model that is able to evaluate products using several criteria. This system is particularly useful when dealing with portfolios that consist of a large number of products.

However, the study conducted by Bentzen et al. (2011) suggested a contrary view. This study was underpinned by the notion that, in complex decision situations, the amount of attention paid, rather than a deliberate analytical behaviour, determines the effectiveness of decision-making processes. In their study, they investigated the role of quality information in attracting the attention of managers on different NPD projects. The results of their study show that quality of information cannot differentiate the decision makers' attention among the projects; instead, new projects entering the corporate portfolio bring a significant effect to decision makers' attention. Therefore, a regular evaluation of the allocation of managers' attention towards different projects is substantial rather than only providing information.

In summary, Strategic decision-making process is viewed from three perspectives: cognitive, organisational and political; while, Kester et al. (2011) considered portfolio decision-making process as the interaction between evidence, power and opinion-based processes, which are associated only with cognitive and political factors of decision-making. Furthermore, their integrated framework has not involved the representation of portfolio changes, portfolio complexity and inter-functional integration as the circumstances that influence the decision-making process.

5.2.5 The Subject Relevance Tree for SRQ 1

The analysis of the findings brings to light the relationship between the articles, depicted in the subject relevance tree in Figure 5.4. This figure shows that Kester et al.'s (2011) article, which represents the subject of *portfolio decision-making process*, is the core article in the SRQ 1 discussion. In the next section, this article will be central to the discussion of the findings.

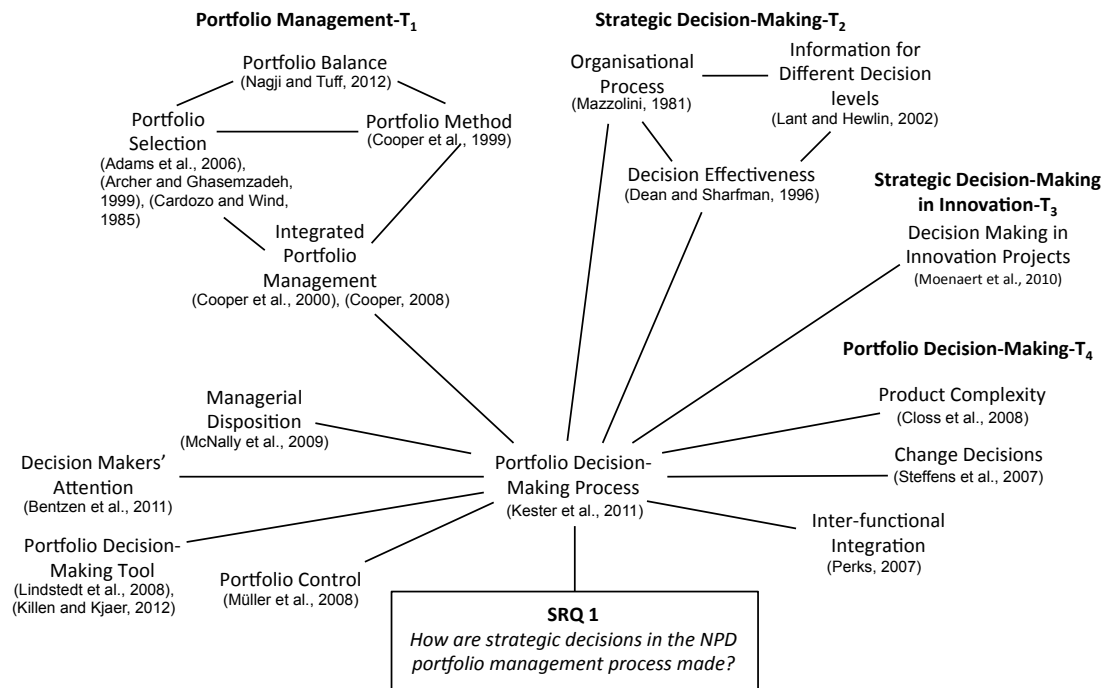


Figure 5.4: The Subject Relevance Tree for Systematic Review Question 1

5.2.6 Discussion of the Findings

In the literature reviewed, the proportion of articles that address the topic of the decision-making process in portfolio management are the largest; however, Kester et al.'s (2011) article is the only one that reports the study of portfolio decision-making from an integrated perspective. Thus, to arrive at the answer to SRQ 1, the discussion will centre on Kester et al.'s (2011) framework.

Kester et al.'s (2011) report appears to present the most comprehensive framework that incorporates the entire portfolio decision-making process. The main elements that constitute Kester et al.'s (2011) framework are aligned with those of Rajagopalan et al.'s (1993) strategic decision process framework, e.g. *decision input generating process* represents *antecedent*; *portfolio decision-making process* represents *decision process*; and *portfolio decision-making effectiveness* is related to *outcomes*. The environmental factors, part of the antecedent factors, however, are not clearly shown in the framework. This limitation impedes the framework in recognising the impact of environmental factors on the decision-making effectiveness (Dean and Sharfman, 1996), not only at the strategic level, but also the tactical level (Lant and Hewlin, 2002).

In the portfolio management context particularly, the dynamic business environment is a driver of portfolio complexity (Closs et al., 2008), and of portfolio changes in the ongoing NPD projects (Steffens et al., 2007). In addition, Müller et al. (2008) showed that environmental factors moderate the relationship between portfolio control—portfolio selection, portfolio reporting and portfolio decision-making—and portfolio management performance. Hence, excluding environmental factors in the NPD portfolio management framework will diminish the comprehensiveness of the framework.

Individual (cognitive) perspectives in decision-making have received significant attention from the scholars. Lant and Hewlin (2002) pointed out that NPD portfolio management involves group decisions that are associated with the cognition of the decision makers, rather than with factors such as organisational structure or implementation issues. McNally et al. (2009) specified this view by identifying that the analytic cognitive style of decision makers is related positively to the product portfolio balance. Further, Bentzen et al. (2011) asserted that the decision makers' attention determines the effectiveness of the decision-making process.

On the other hand, Kester et al. (2011) looked at the portfolio decision-making process not only from a cognitive perspective, but also from a political perspective. However, an organisational perspective (Mazzolini, 1981; Schwenk, 1988, 1989) appears to have been disregarded. An organisational perspective views decisions as a result of standard operating procedures, in which the search for the decisions follows specific patterns influenced by organisational routines (Schwenk, 1988, 1989). As a result, while Kester et al.'s (2011) framework has significantly enhanced the previous models, incorporating organisational perspectives and considering environmental factors in the framework can bring a better understanding of the dynamics of the portfolio management process.

Portfolio management involves two level decisions, strategic portfolio decisions and tactical portfolio decisions (Cooper, 2005; Steffens et al., 2007). Strategic decisions relate to unstructured (Mintzberg et al., 1976; Schwenk, 1988), non-routine and complex situations (Fahey, 1981; Schwenk, 1988; Thomas, 1984), as opposed to tactical decisions that are structured, repetitive and less complex.

Changes in the product portfolio impact on both strategic and tactical decisions (Steffens et al., 2007). When changes take place, the strategic decisions are made by the upper management with less systematic approaches, whereas the tactical decisions are made by following the systematic change management process (Steffens et al., 2007). These findings corroborate the notion that a deliberately explicit analytical decision process gives the best results for simple problems, whereas complex problems take advantage of an *unconscious unstructured* decision process (Dijksterhuis, 2004; Dijksterhuis and van Olden, 2006). Accordingly, in investigating the NPD portfolio management process, employing together *normative (analytical) approaches* and *judgemental approaches* is suggested to gain a more transparent phenomenon (Lindstedt et al., 2008; Moenaert et al., 2010).

5.2.7 Conclusions

Among the limited number of articles that address the topic of strategic decision-making process in portfolio management, there is only one article by Kester et al. (2011) that specifically reports the study of portfolio decision-making from an integrated perspective. The study proposes a general framework of portfolio decision-making.

The strategic decision-making process in NPD portfolio management involves three interrelated factors: cognitive, organisational and political. While cognitive and political factors are manifest in Kester et al.'s (2011) framework, the organisational factor is not clearly identified.

Environmental dynamics lead to circumstances in which managers should deal with various decision types, those identified in this review are portfolio changes and portfolio complexity. In the existing integrated framework, these environmental factors appear not to have been considered explicitly.

There are two level decisions in portfolio management, i.e. tactical and strategic. These decisions are made by involving two approaches: systematic (analytical) approaches for tactical decisions and unconscious unstructured approaches for strategic decisions.

5.3 NPD PORTFOLIO MANAGEMENT AND STRATEGY PROCESS: SRQ 2

The issues raised in the second Systematic Review Question (SRQ 2)—“How does the NPD portfolio management process link to the strategy process?” are addressed in three literature themes: Strategy Process (T₅), Strategic Decision-Making and Strategy Process (T₆), and Front-End NPD and Strategy (T₇). In this section, each theme will be discussed in detail, and the relationship between these themes will be shown in the Subject Relevance Tree.

5.3.1 Strategy Process (T₅)

The strategy process theme comprises two theoretical articles by Hutzschenreuter and Kleindienst (2006) and Johnson et al. (2003). The former reported a literature review, while the latter presented a conceptual article. Hutzschenreuter and Kleindienst (2006) proposed an integrative framework that maps the extant streams of studies in strategy process. In addition, it suggests as well the research opportunities within each stream.

In their article, Johnson et al. (2003) addressed that despite the fact that process perspectives are regarded to have revealed “the black box of organisations”, they still leave some limitations (p. 10). From the limitations identified by them, those that are most related to the systematic review questions are, first, process perspectives disregard the role of managerial agency (Pettigrew, 1985). Second, the process paradigm has been more prescriptive. It has focused merely on the design of strategic change or decision-making process, ignoring the day-to-day activities of managers. The third limitation is caused by its detachment from strategy content, leading to the fifth limitation that it lacks explicit connections to strategy outcomes. Thus, they suggested advancing the understanding further to an *activity-based (micro strategy)* view. This view is concerned the detailed process and practices which constitute the day-to-day activities of organization and which relate to strategic outcomes.

To sum up, strategy process perspective bears a number of limitations: fails to regard the role of managers in the process; more prescriptive rather than descriptive; ignores day-to-day activities and detaches from strategy content and outcomes. To enhance the understanding of strategy, an *activity-based* view of strategy that centres on the detailed process is proposed.

5.3.2 Strategic Decision-Making and Strategy Process (T₆)

Strategy process is the way in which strategies emerge and evolve (de Wit and Meyer, 2004), aiming at achieving and maintaining the firm's strategic position (Chakravarthy and Doz, 1992). In this section, the strategy process will be viewed from the perspective of the decision-making process.

Chakravarthy and White (2002) stated that strategy process is a decision-making process. The decision(s) made is not a single decision or are not discrete decisions but is a stream of decisions and actions with specific patterns (Chakravarthy and White, 2002; Mintzberg and McHugh, 1985). The decisions evolve over long periods of time and cross multiple levels, bridging three different decision processes: cognitive process of individual decision makers, the organisational rules and routines (organisational process) and political processes within groups or individuals (Chakravarthy and White, 2002). These patterns of decisions are the core element of the strategy process (Chakravarthy and White, 2002; Noda and Bower, 1996), which are attributable to changes in the organisational and environmental context.

In their study of two large telecommunication companies, Noda and Bower (1996) identified “*intra organisational dynamics*” by which managers at multiple levels relate to external and internal forces and deal with the cognitive, political and organisational impacts of their actions (p. 188).

In summary, strategy process is concerned with decision-making processes that involve interaction between cognitive, organisational and political process, resulting in a stream of decisions with a specific pattern.

5.3.3 Front-End NPD and Strategy (T₇)

Poskela (2007) conducted a research focused on the integration of *strategic level* and *operative level* innovation processes in the front-end phase. Figure 5.5 shows the conceptual framework of the linkages between strategic and operative level innovation activities. Each level of process is constituted by three sequential activities: *exploration* (what should be done), *execution* (how it should be done) and *exploitation* (how to take advantage of previous activities) (Poskela, 2007, p. 434).

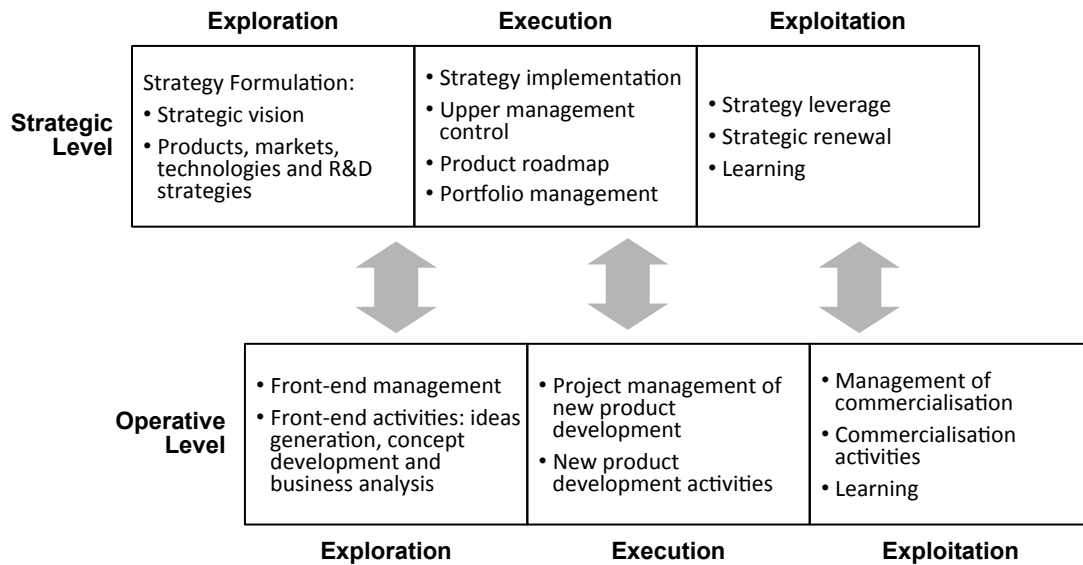


Figure 5.5: The Integration of Strategic and Operative Level Innovation Activities

Source: Poskela (2007)

Poskela (2007) suggested that the integration of strategic and operative level necessitates both top-down and bottom-up processing. From the top-level management's point of view, Poskela (2007) extracted three factors that influence the effectiveness of the integration of the strategic level and operative level front-ends: (1) the level of concreteness of business strategies; (2) the emphasis on business-minded decision making, and (3) the balance between control and creativity.

In summary, the linkages between strategic and operative level activities are apparent. The effectiveness of the integration requires top-down and bottom-up processing.

5.3.4 The Subject Relevance Tree for SRQ 2

The analysis of the findings brings to light the relationship between the articles, which is depicted in the subject relevance tree in Figure 5.6. This figure shows that Poskela's (2007) article, which represents the subject of *strategic and operative level integration*, is the core article in the SRQ 2 discussion. In the next section, this article will be central to the discussion of the findings.

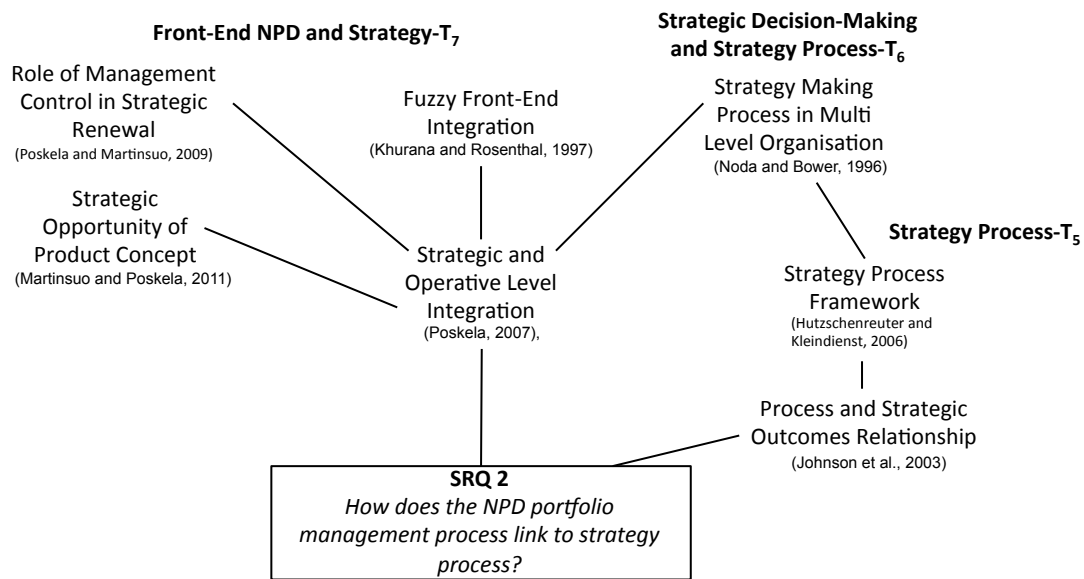


Figure 5.6: The Subject Relevance Tree for Systematic Review Question 2

5.3.5 Discussion of the Findings

The literature reviewed presents vague information concerning the link between NPD portfolio management and the strategy process (SRQ 2). Poskela's (2007) framework, which is addressed to demonstrate the integration process in the front-end phase of the innovation process, is the only concept which can be adopted to approach the answer of SRQ 2. Thus the following discussion will use this framework as a basis.

Linking business strategy and product innovation strategy with the NPD portfolio management process (Cooper, 2005) ensures the new products developed fit the business strategy (Cooper and Edgett, 2010). In the NPD portfolio management, companies deal with decision-making processes that produce strategic portfolio decisions and tactical portfolio decisions (Cooper, 2005). While the former determine where the firm should spend their NPD resources (people and funds), the latter, which follow from the strategic decisions, focus on individual projects—the selection and prioritisation of projects and allocation of the resources required (Cooper, 2005).

In order to portray these interactions, Poskela's (2007) framework on the integration of strategic and operative level was modified, as shown in Figure 5.7. This modified framework shows that the process elements in NPD portfolio management, represented in the Enhanced Conceptual Framework of NPD Portfolio Management

(Figure 2.3), can be categorised accordingly. As shown in the area within the dashed line, business strategy and product innovation strategy formulation are considered as *strategic level* activities in the *exploration* stage, while ideas generation and new product concepts development are regarded as *operative level* activities in the *exploration stage*. Furthermore, strategic portfolio decision-making processes can be classified as *strategic level* activities in the *execution* stage, whereas tactical portfolio decision-making processes can be categorised as *operative level* activities in the *execution* stage.

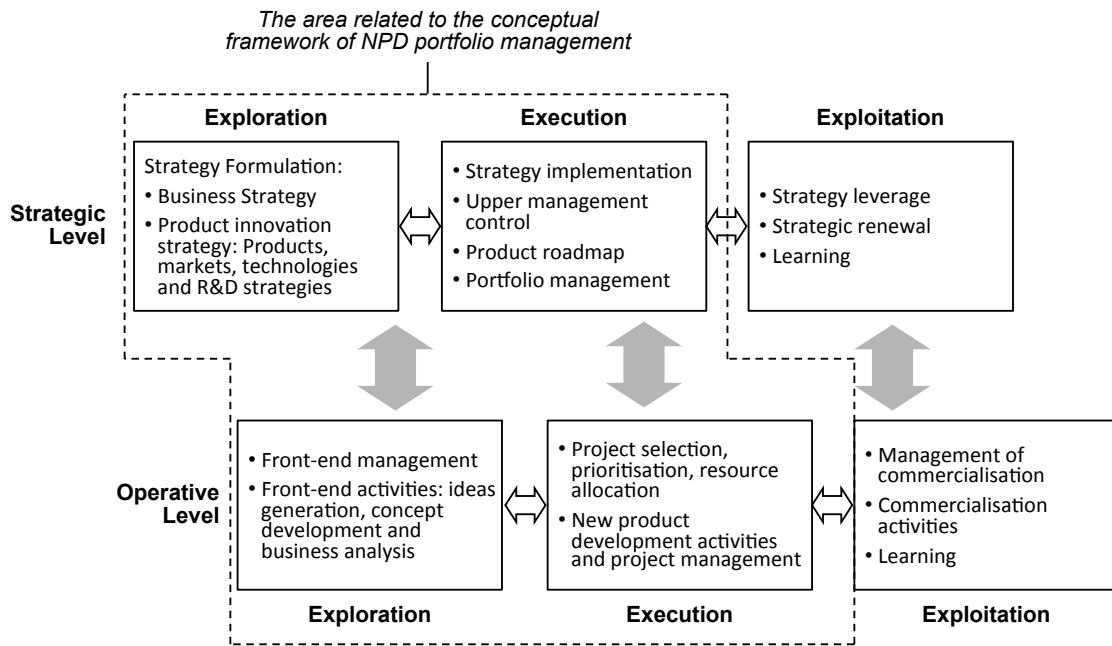


Figure 5.7: The Linkages of Strategic and Operative Level in NPD Projects

Adapted from Poskela (2007)

Poskela's (2007) initial framework has distinguished between *exploration* activities, representing *strategy content* formulation, and *execution* activities, which are contained in the *strategy process* part. This feature eliminates the shortcomings pointed out by (Johnson et al., 2003) regarding the detachment between strategy process and strategy content. However, Poskela's (2007) initial framework does not show the links between activities within one level—exploration, execution and exploitation. In the modified framework (Figure 5.7), the interactions between these three activities are in place. These interactions in the strategic and operative level are parts of the phenomenon of interest for this review.

From a strategy process perspective, Chakravarthy and Doz (1992) suggested that the utilisation of the right decision process and *administrative systems* (organisational structure, planning, control, incentives, human resource management and value systems) enables firms to achieve and maintain their strategic position. In line with this, in the context of NPD portfolio management, (Poskela, 2007) argued that successful portfolio management is indicated by *decision making structures* that support realisation and management for both top-down and bottom-up project activities.

5.3.6 Conclusions

Synthesis of the findings fails to reveal how the NPD portfolio management links with the strategy process (SRQ 2). This issue is not addressed in any of the literature reviewed, except for Poskela's (2007) article which can be considered as only subtly pertaining to the issue.

Poskela's (2007) article is regarded as the key article, nevertheless it has some limitations. First, the study only investigated the integration of strategic and operative level activities in the front-end stage. Second, whereas it indicated the factors that influence the effectiveness of the integration, the study did not propose formal mechanisms of how the linkages are formed and maintained. Finally, the study has not paid attention to the interaction between exploration, execution and exploitation activities.

5.4 ORGANISATIONAL ROUTINES AND NPD PORTFOLIO MANAGEMENT: SRQ 3

The issues raised in the third Systematic Review Question (SRQ 3) — “How does the NPD portfolio management process relate to organisational routines?” — are addressed in five literature themes: Organisational Capabilities (T₈), Agency (T₉), Behavioural Operations (T₁₀), Organisational Routines (T₁₁) and Portfolio Management and Capabilities (T₁₂). In this section, each theme will be discussed in detail, and the relationship between these themes will be shown in the Subject Relevance Tree.

5.4.1 Organisational Capabilities (T₈)

Organisational capabilities are referred to as “the know-how that enables organisations to perform ... and extend [their] characteristics output actions—particularly, the creation of a tangible product or the provision of a service, and the development of new products and services” (Dosi et al., 2000, p. 1). They enable an organisation to realise its purpose into the significant outcomes (Dosi et al., 2000).

Capabilities are systematically shaped by *mindful ordinary acts* carried out by individuals both in development and deployment (Dosi et al., 2000; Salvato, 2009), and develop as a result of everyday, mundane activities (Salvato, 2009). These micro and ordinary activities carried out within and around organisation and at all levels in the organisational hierarchy determine the idiosyncratic content of capabilities and their dynamic adaptation over time (Salvato, 2009).

To sum up, organisational capabilities enable an organisation to realise its purpose into outcomes. These capabilities are shaped by individuals’ mindful ordinary acts carried out in everyday, mundane activities.

5.4.2 Agency (T₉)

The agency theme is represented only by Emirbayer and Mische’s (1998) theoretical article. While the term agency is still elusive, Emirbayer and Mische (1998) defined it as “the temporally constructed engagement by actors of different structural environments—the temporal-relational contexts of action—which, through the interplay of habit, imagination, and judgment, both reproduces and transforms those structures in interactive response to the problems posed by changing historical situations” (p. 970).

This definition implies that human agency encompasses three constitutive elements: iteration, projectivity, and practical evaluation, which relate to the different temporal orientations of agency (Emirbayer and Mische, 1998). This can be examined through the forms of action that are more oriented toward the past, the future and the present.

5.4.3 Behavioural Operations (T₁₀)

The behavioural operations theme is represented only by Gino and Pisano's (2008) theoretical article. They defined behavioural operations as "the study of human behavior and cognition and their impacts on operating systems and processes" (Gino and Pisano, 2008, p. 679). In their study, (Gino and Pisano, 2008) explored the theoretical and implications of incorporating behavioural and cognitive factors into operations management models.

This approach identifies the underlying drivers of operating system performance, enabling to lead to a better understanding of "puzzling pathologies" (e.g. excess inventory, late product development projects, over-commitment to R&D projects, etc.) and to a better identification of appropriate management interventions (Gino and Pisano, 2008, p. 688). Through the behavioural perspective, the source of problems in operations management setting can be linked to systematic errors in managers' judgements and decisions. For example, in portfolio management, they indicated that project managers' inability to use a consistent judgment strategy causes suboptimal and inconsistent selection decisions between the projects in the portfolio.

5.4.4 Organisational Routines (T₁₁)

There are adequate numbers of articles explore the subjects related to organisational routines with different focus of analysis. In discussing them, this section is divided into two parts: Changes in Routines and Routines and Organisational Capabilities.

5.4.4.1 *Changes in Routines*

Teece et al. (1997) viewed dynamic capabilities as being characterised by *path dependent processes*, in which a firm's previous "investment and 'repertoire' of routines" restrict its future behaviour (p. 522-523). Many scholars, nevertheless, have elaborated dynamic capabilities theory further in order to present a more complete picture of how dynamic capabilities and their underlying routines can be path creating rather than path dependent (Peters and O'Connor, 2012).

While routines which underpin dynamic capabilities are considered as sources of stability and unchanging patterns of action (Feldman and Pentland, 2003), routines are also regarded as an important source of flexibility and change (Feldman and Pentland,

2003; Nelson and Winter, 1982). Peters and O'Connor (2012) specified that routines can be either static or transformational. Static routines emerge from the elaboration of structures, positions and strategies (Zollo and Winter, 2002). These types of routines are able to reduce variety in the organisation and ensure predictability and stability of process outcomes (Peters and O'Connor, 2012). Transformational routines, in contrast, emerge from changing these attributes (Amburgey et al., 1993, cited in Peters & O'Connor, 2012).

This duality creates tensions between the need to establish consistency and to respond to change (Turner and Rindova, 2012). In such situations, organisations need to simultaneously set up and maintain two *ostensive patterns*— the “abstract patterns that participants use to guide, account for and refer to specific performances of a routine” (Pentland and Feldman, 2005, p. 795): one of addressed consistency and another of flexibility in internal coordination.

From the perspective of routines as practice, stability and change are relational and *mutually constitutive*, meaning that change may foster stability, but, on the other hand, stability may create change (Feldman and Orlikowski, 2011). In relation to that, Turner and Rindova (2012) suggested that the dual ostensive patterns can be maintained by exercising *artefacts*—the representation of the cognitive structures of individuals (Pentland and Feldman, 2005; Pentland and Rueter, 1994)—and connections both in processes that standardise and stabilise behaviours and in processes that facilitate flexible and mindful responses. Artefacts function for standardising routine actions and reorganising routines under conditions of change. Meanwhile, connections are used for coalescing routines into well-understood and accepted patterns of interdependent action and for reconstituting routines that then will be leveraged to new agreements about the redesigned action sequences (Turner and Rindova, 2012).

Routines are established simultaneously with other structures, including technological, coordination and cultural structures that create overlapping artefacts and social expectation (Howard-Grenville, 2005). Changes in routines that are embedded in other structures are enabled by the role of *agency*, as temporally constructed engagement by *actors* of different structural environments (Emirbayer and Mische, 1998; Howard-Grenville, 2005). Actors with more power and command over resources

possess greater chances of changing embedded routines over time (Howard-Grenville, 2005). This implies that managerial intervention plays a role in changing routines (Gino and Pisano, 2008; Salvato, 2009).

5.4.4.2 Routines and Organisational Capabilities

Routines and organisational capabilities represent “regularities in organisational behaviours, cognitions and performances” (Salvato and Rerup, 2011, p. 472). They are closely related, where capabilities involve organised activities that consist of routines with a repetitive character. Thus, it can be noted that “routines are the building blocks of capabilities” (Dosi et al., 2000, p. 4). This section discusses the conceptual structure of entities that build organisational capabilities.

A theoretical article by Salvato and Rerup (2011) breaks down organisational routines and capabilities into parts and maps their interrelationships, resulting in a synthesis of the knowledge of organisational routines and capabilities on multilevel entities, shown in Figure 5.8. This framework is formed by three constructs: organisational routines and capabilities as the central concept; higher-level construct, constituted by dynamic capabilities and firm strategies; and, lower-level constructs, containing individual skills, habits and managerial competencies.

Salvato and Rerup’s (2011) framework shows that organisational routines are regarded as group-level entities, which generate process performance. Meanwhile, organisational capabilities are functional-level/cross-functional-level entities, resulting in the performance of core activities.

In the higher level, dynamic capabilities and firm strategies are considered as organisational level entities. The outcomes of dynamic capabilities are adaptations of routines and capabilities to dynamic markets. Among others, systematic processes for strategic decision-making and resource allocation are examples of dynamic capabilities (Eisenhardt and Martin, 2000). In the lower-level, individual competencies represent individual level entities, which perform micro and ordinary activities within and around the organisation and at all levels in the organisational hierarchy (Salvato, 2009). These activities are the main determinants of the idiosyncratic content of capabilities and their dynamic adaptation over time (Salvato, 2009).

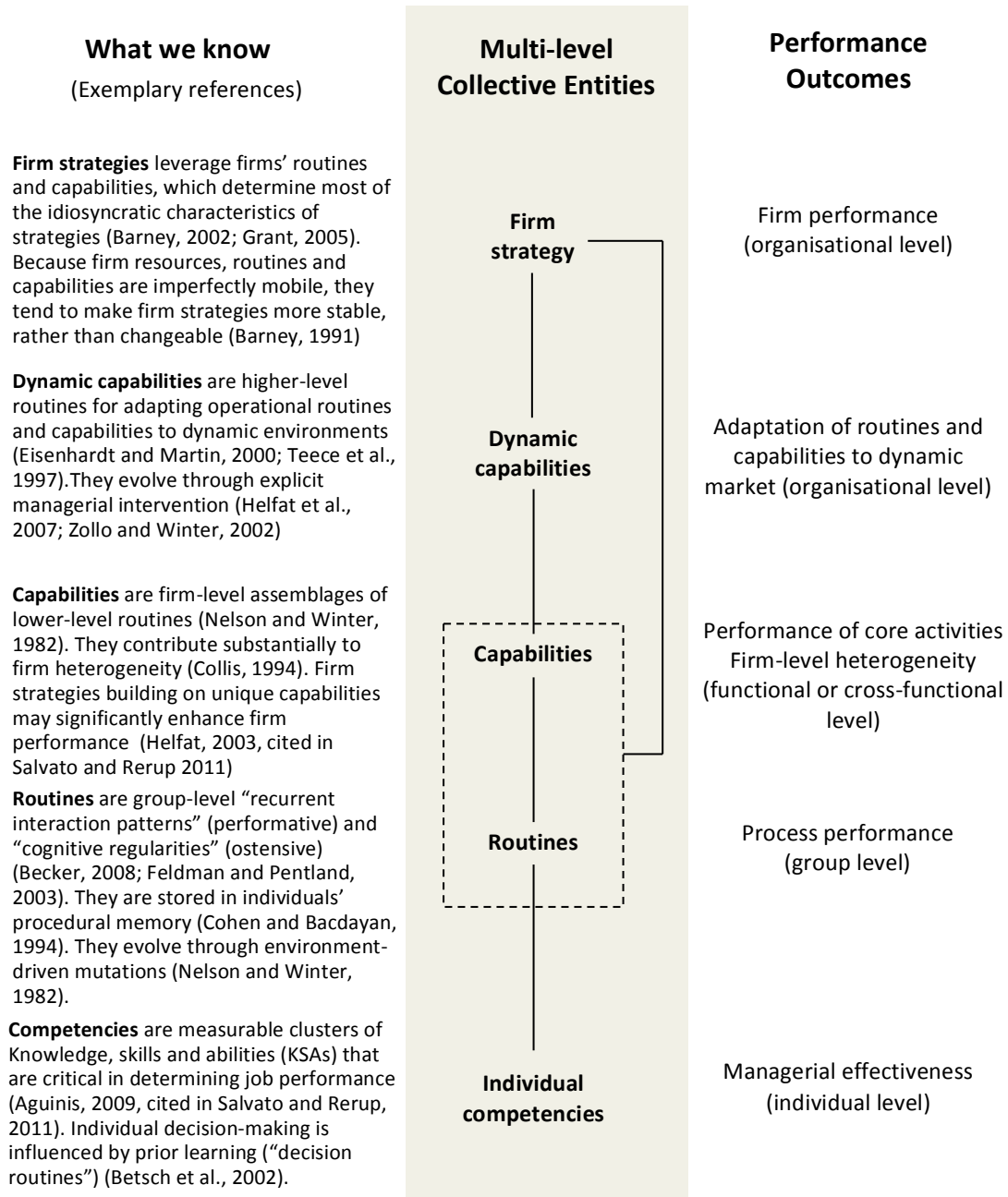


Figure 5.8: The Multilevel Entities of Organisational Capabilities

Source: Salvato and Rerup (2011)

To sum up, routines are considered as sources of stability action as well as a source of flexibility and change. In other words, routines can be either static or transformational. Stability and change are relational and mutually constitutive, which can be enabled by exercising artefacts and connections. Furthermore, routines are

building blocks of capabilities, and, in the organisational level, constituted dynamic capabilities.

5.4.5 Portfolio Management and Capabilities (T₁₂)

The portfolio management and capabilities theme is represented only by Killen et al.'s (2012) theoretical article. They indicated that the application of the dynamic capabilities concept towards portfolio management research has just started. Killen et al. (2012) suggested that dynamic capabilities theory aligns with the learning and change in portfolio management process; in addition, it outlines mechanisms through which portfolio management can contribute to competitive advantage.

The application of the *processes*, *positions* and *path* framework (Teece et al., 1997), has made it clear that the ongoing evolution of portfolio management capabilities is part of the functioning of dynamic capabilities. These capabilities must change and evolve in response to the environmental dynamics (Eisenhardt and Martin, 2000; Teece et al., 1997). Finally, Killen et al. (2012) suggested that tracking *capability initiation* and *evolution, learning* and *change* are beneficial for the study of portfolio management as dynamic capabilities.

5.4.6 The Subject Relevance Tree for SRQ 3

The analysis of the findings brings to light the relationship between the articles, which is depicted in the subject relevance tree in Figure 5.9. This figure shows that Salvato and Rerup's (2011) and Killen et al.'s (2012) articles, which represent the subjects of *role of routines in organisational capabilities* and *portfolio management as dynamic capabilities*, are the core articles in the SRQ 3 discussion. In the next section, these articles will be central to the discussion of the findings.

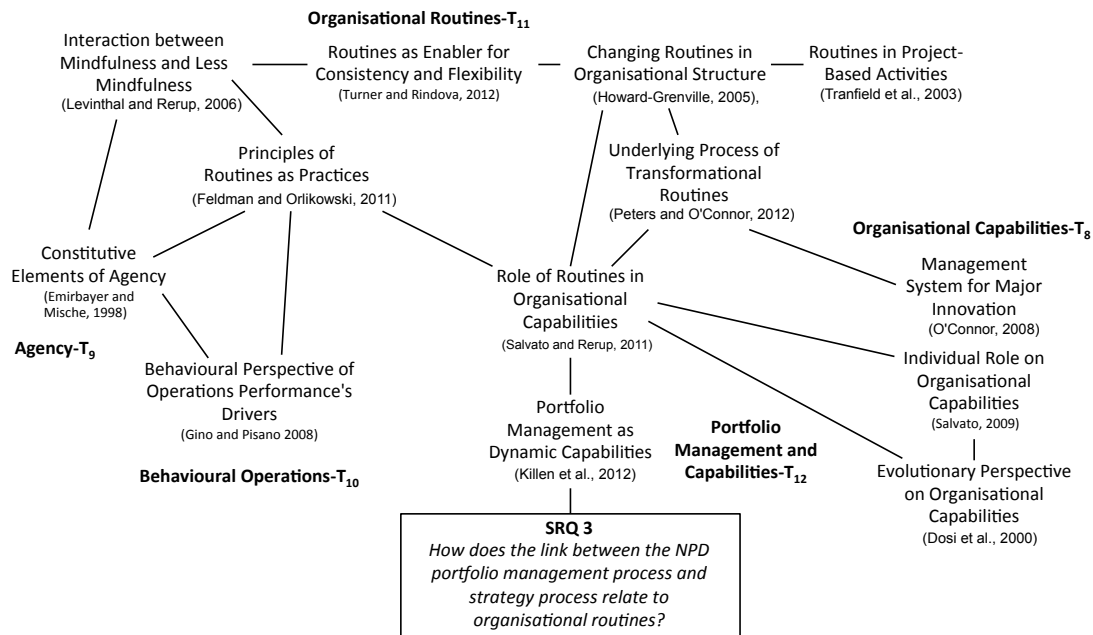


Figure 5.9: The Subject Relevance Tree for Systematic Review Question 3

5.4.7 Discussion of the Findings

The literature reviewed has little explicit information related to the issues raised in SRQ 3. In order to arrive at the answer to the question, this section discusses the connections between the key findings that are underpinned by Salvato and Rerup's (2011) framework of multilevel entities of organisational capabilities. Further, Killen et al.'s (2012) findings lead the discussion to the main ideas.

As stated in the previous section, NPD portfolio management entails resource allocation decision-making processes carried throughout the strategic and operative levels of an organisation (Figure 5.7). On the other hand, Salvato and Rerup's (2011) framework (Figure 5.8) deals with the levels in the organisation rather than the levels of activities. Nevertheless, the correlation between these levels seems to be apparent, i.e. that organisation level entities are concerned with strategic level activities, and functional or cross-functional and group levels entities are concerned with operative level activities. Thus, it appears that the NPD portfolio management process is exercised across different entities in organisational capabilities: routines in the group level, capabilities in the functional or cross-functional level and dynamic capabilities at the organisational level.

In the literature reviewed, the theoretical article by Killen et al. (2012) is the only article that explicitly discusses portfolio management using a dynamic capabilities perspective. The most significant points that contribute to the attempt to answer the systematic review question are: first, the dynamic capabilities concept outlines the mechanisms of portfolio management processes in realising the business strategy. Second, dynamic capabilities embody the concept of learning and change process that evolves as the mechanisms respond to environmental dynamism. Furthermore, as dynamic capabilities are constituted by routines, thus these mechanisms are built by a combination of static and transformational routines (Peters and O'Connor, 2012) that are mutually constitutive (Feldman and Orlikowski, 2011).

5.4.8 Conclusions

The literature reviewed provides only a vague understanding concerning how organisational routines relate to the link between the NPD portfolio management process and the strategy process (SRQ 3). This is due to the linkages between the literature and the issue raised being subtle and inexplicit. This implies that NPD portfolio management has not been investigated from an organisational routines perspective.

Salvato and Rerup's (2011) and Killen et al.'s (2012) studies, which are still based on theoretical views, are considered as those closest to SRQ 3's issues. Salvato and Rerup's (2011) study contributed to the understanding of the routine's position within organisational capabilities, while Killen et al.'s (2012) study proposed the view of dynamic capabilities towards portfolio management. Having acknowledged that dynamic capabilities are constituted by organisational routines, these findings could be connected, leading to the understanding of the linkages between portfolio management and organisational routines.

5.5 INSIGHTS ACROSS THE SRQS

Analysis of the key findings of the literature review leads to some important notions. Firstly, among the SRQs, only SRQ 1 is closely answered by the literature, i.e. Kester et al.'s (2011) article, whereas SRQ 2 and SRQ 3 are only vaguely responded to by the literature reviewed. Kester et al. (2011) identified two factors involved in the portfolio

decision-making process—cognitive and political—whereas the organisational factor has not been considered in their framework. Also, environmental factors that lead to portfolio changes have not been included in the analysis.

Secondly, the issue of how NPD portfolio management links with the strategy process has not been clearly covered in the literature. Nevertheless, there is an important insight gained in SRQ 2's discussions, which is that the links between strategic and operative levels in the new product development activities are in place. However, the literature (Poskela (2007)) does not specifically suggest formal mechanisms for forming and maintaining the links. In addition, the links between exploration, execution and exploitation activities are still overlooked.

Thirdly, the organisational routines perspective has not been used to study NPD portfolio management. The literature does not clearly show how organisational routines relate to the link between the NPD portfolio management process and the strategy process. The leading literature in SRQ 3's discussions is Salvato and Rerup's (2011) and Killen et al.'s (2012) articles. Salvato and Rerup (2011) pointed out that organisational routines are the elements that build dynamics capabilities. On the other hand, Killen et al. (2012) viewed that dynamic capabilities outline the mechanisms of portfolio management processes in realising the business strategy, and represent the concept of learning and change process in responding to the dynamic environment.

These three notions lead to the insights that the organisational factor of the decision-making process for establishing the links between strategic and operative levels, and between exploration, execution and exploitation activities, is still overlooked. Also, the role of organisational routines in establishing these links is still vague.

5.6 SUMMARY

This chapter has presented a conceptual analysis of the literature reviewed. It has shown that:

- Strategic decision-making process in NPD portfolio management (SRQ 1) involves three interrelated factors: cognitive, organisational and political. Kester et al.'s (2011)

article is considered as the key article in this area; while their framework manifests cognitive and political factors, the organisational factor is not clearly identified.

- There are two decision levels in portfolio management, i.e. tactical and strategic. These decisions are made by involving two approaches: systematic and analytical approaches for the former and unconscious unstructured approaches for the latter.
- The synthesis of the findings fails to reveal how the NPD portfolio management links with the strategy process (SRQ 2). Although Poskela's (2007) article is regarded as the key article, the study only investigated the integration of strategic and operative level activities in the front-end stage. It indicated the factors that influence the effectiveness of the integration; however, the study did not propose formal mechanisms of how the linkages are formed and maintained. Furthermore, the study did not give any attention to the interaction between exploration, execution and exploitation activities.
- The literature reviewed provides only a vague understanding concerning how organisational routines relate to the NPD portfolio management process (SRQ 3). Salvato and Rerup's (2011) and Killen et al.'s (2012) studies, which are still based on theoretical views, are considered as those closest to SRQ 3's issues. The findings from these articles may be able to be connected to reveal the linkages between portfolio management and organisational routines.

Chapter 6 Discussion and Conclusions

6.1 INTRODUCTION

This chapter discusses the findings given in Chapters 4 and 5 and derives conclusions. It identifies research gaps and defines research questions for further study. Furthermore, the potential research methodology for investigating these research questions is discussed in the Research Design section. The overall results of this systematic literature review are then presented in the Conclusions section, which is followed by a Limitations and Further Study section. Finally, the chapter closes with a summary.

6.2 DISCUSSION

This section discusses five subjects: (1) synthesis of the descriptive findings; (2) synthesis of the conceptual findings; (3) integrating the findings with the NPD portfolio management conceptual framework; (4) identification of research gaps; (5) defining research questions. The results of the discussions are then summarised in the final section.

6.2.1 Synthesis of the Descriptive Findings

The systematic literature review resulted in a low number of articles (40), which are composed of 20 articles for SRQ 1, seven for SRQ 2, and 13 for SRQ 3. Some of the articles were not strongly relevant to the issues being investigated. This implies that the systematic search did not identify a significant body of literature, suggesting that these areas have received little attention from researchers. Nevertheless, the trend in the number of publications shows that the area has recently started to emerge.

From the 40 articles, three were practical, 15 were theoretical and 22 were empirical research, of which the majority (13 articles) were case studies. As the phenomena had not been studied previously, the case studies were exploratory and largely descriptive; they were mostly conducted in multi-industry settings, while those conducted in a single industry focused mainly on the telecommunications sector. Most studies, however, did not discuss the motivation behind the sample selection. In addition, although some studies recognised the role of environmental factors as a

mediator between the portfolio management process and a firm's performance, the characteristics of industries were considered to be a significant omission.

Most studies were conducted in the United States and Finland, with some in other European countries, but very few in Asian countries. It appears that geographical contexts in relation to NPD portfolio management had not been considered in the discussion of the studies, even though specific cultural and local market dynamics are likely to influence the decision-making process.

6.2.2 Synthesis of the Conceptual Findings

The review showed that the strategic decision-making process can be viewed from three perspectives: (1) *cognitive*; (2) *organisational* (Rajagopalan et al., 1993; Schwenk, 1988, 1989); and (3) *political* (Fahey, 1981; Rowe, 1989; Schwenk, 1988, 1989). In NPD portfolio management, Kester et al. (2011) identified three types of decision-making process: *evidence-*, *power-* and *opinion-based*. The evidence- and opinion-based processes correspond to the cognitive perspective, while the power-based processes are associated with the political perspective. However, the organisational perspective appears to be under-represented, even overlooked, in Kester et al.'s (2011) framework.

The dynamic nature of the business environment impacts on portfolio decisions, causing the acceleration, postponement or termination decisions of NPD projects (Steffens et al., 2007), and ultimately affecting the portfolio performance (Closs et al., 2008; Müller et al., 2008; Steffens et al., 2007). However, these factors seem not to have been considered in the integrated frameworks proposed in the literature, such as the one proposed by Kester et al. (2011).

A key observation from the systematic review is that the literature does not investigate the link between NPD portfolio management and the strategy process. Not a single article directly addresses this issue, although a number of articles do recognise the link between the strategic and operative levels of the portfolio management process (e.g. Perks (2007) and Poskela (2007)). This implies that the literature does not identify ways to form and maintain the link between NPD portfolio management and strategy development and implementation.

The organisational perspective of decision-making views decisions to be based on organisational processes (Schwenk, 1988, 1989). Decision-making processes follow specific patterns, which are influenced and formed by organisational routines (Mazzolini, 1981; Schwenk, 1989). However, previous studies have not specifically addressed the relationship between the decision-making processes in NPD portfolio management and organisational routines.

Organisational processes take place at different levels, including: (1) routines at the *group level*; (2) capabilities at the *functional or cross-functional level*; and (3) dynamic capabilities at the *organisational level* (Salvato and Rerup, 2011). In the context of NPD portfolio management, the processes occurring at the group and functional or cross-functional levels could be associated with the operative level activities which produce tactical portfolio decisions, while the processes carried out at the organisational level could be related to the strategic level activities which result in strategic portfolio decisions. The dynamic capabilities at the organisational level might relate the NPD portfolio management processes to learning and change processes in responding to the dynamics of the environment (Killen et al., 2012).

This implies that, as routines are the constitutive entities of capabilities and dynamic capabilities (Dosi et al., 2000), therefore, it can be speculated that organisational routines constitute the decision-making structure across the operative and strategic levels of the NPD portfolio management process. However, because the extant literature does not relate the NPD portfolio management to organisational routines, this needs further study.

In conclusion, the extant literature suggests that NPD portfolio management entails decision-making processes that involve interaction between cognitive and political factors. It overlooks the organisational factors which are concerned with the organisational process and structure. While a number of articles recognise the link between the strategic and operative levels of a portfolio management process, the link between the decision-making processes in NPD portfolio management and the strategy process is not directly addressed in the extant literature. Finally, even though some articles indicate that organisational routines are underlying the decision-making processes, no literature shows the relationship between organisational routines and the decision-making process in NPD portfolio management.

6.2.3 Integrating the Findings into the Conceptual Framework

The key points from the synthesis of the conceptual findings are integrated with the initial conceptual framework of NPD portfolio management discussed in Chapter 2 (Figure 2.3), resulting in a developed conceptual framework, as shown in Figure 6.1. This framework is composed of three main parts: (1) the NPD portfolio management process; (2) the additional linkages identified from the literature (shown in the blue lines); and (3) the entities and links that potentially need to be explored further (shown in the dashed line shapes and the block arrows).

The first part is the reconfiguration of the initial NPD portfolio management framework (Figure 2.3) by incorporating Poskela's (2007) concept of the division of NPD activities into strategic and operative levels. In addition to this, two new processes have been incorporated: (1) *decision-making processes* within the NPD portfolio management activities; and (2) *changes, learning and strategic renewal*, performed at the strategic level activities.

As shown in Figure 6.1, decision-making processes are considered to be the underlying processes in NPD portfolio management, resulting in strategic and tactical portfolio decisions. These processes are formed by the interaction between cognitive, organisational and political factors (Kester et al., 2011; Schwenk, 1988, 1989), of which the organisational factors were overlooked by the previous studies.

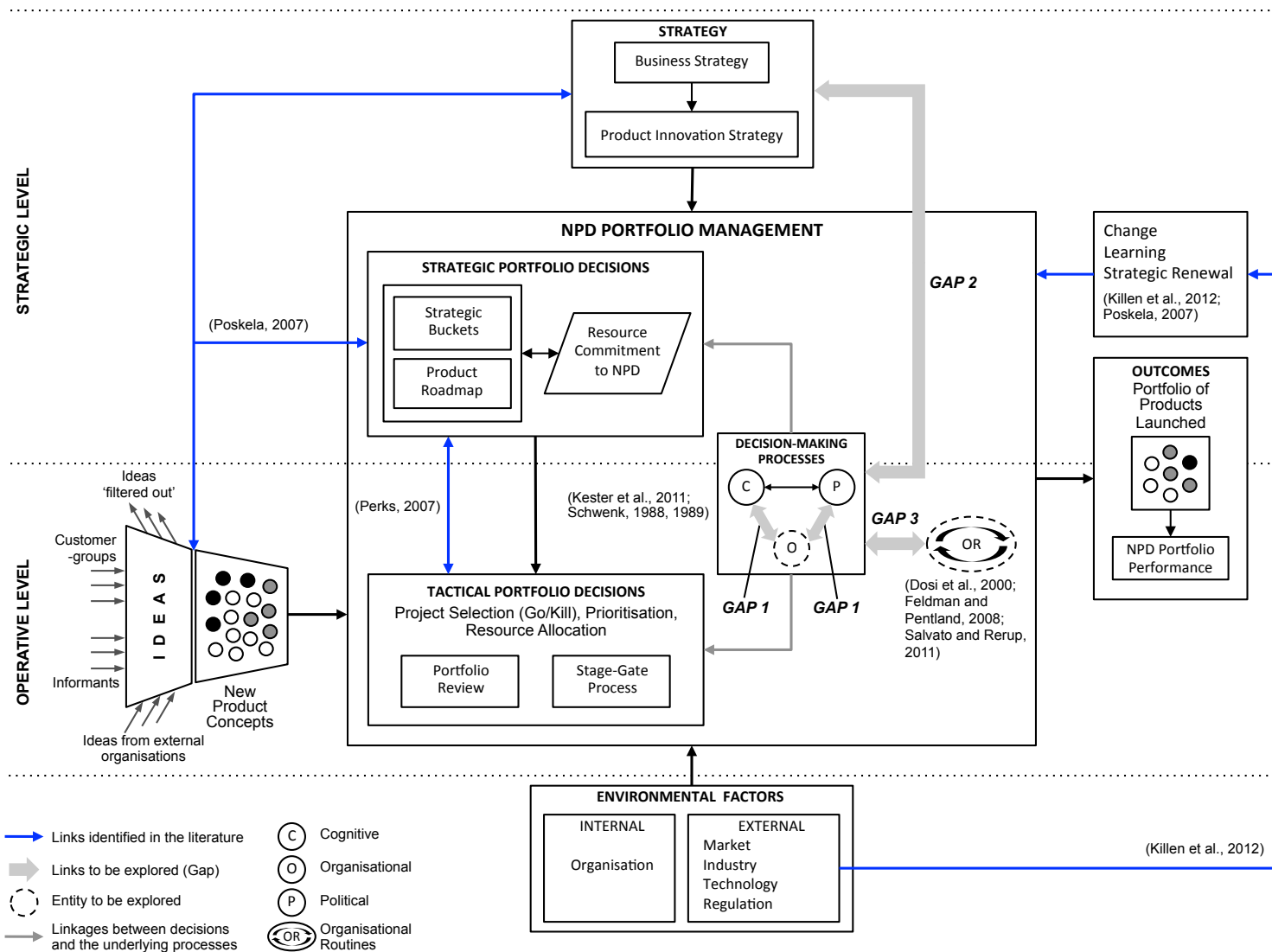


Figure 6.1: The Integration of the NPD Portfolio Management Framework and the Conceptual Findings

Adapted from Cooper (1984, 2005); Goffin and Mitchell (2010); Poskela (2007); Terwiesch and Ulrich (2008)

Furthermore, changes, learning and strategic renewal (Killen et al., 2012; Poskela, 2007) are regarded as *organisational adaptation* processes, which generate changes in structures and routines (Schwenk, 1988, 1989). In this context, NPD portfolio management can be viewed from a dynamic capabilities concept, which outlines the mechanisms of portfolio management in realising the strategy in dynamic environments (Killen et al., 2012). However, the studies in this area (e.g. Killen et al. (2012)) have still focused on the conceptual development and lack the empirical approaches.

The second part is the framework that contains two additional links. The first link shows the linkages between strategic and operative level decision-making processes, discerned by Perks (2007) and Poskela (2007). However, they did not suggest how the links between these two levels could be formed and maintained in a formal process. The second link, indicated by Killen et al. (2012), relates external environments to the process of changes, learning and strategic renewal that take place in the NPD portfolio management process.

The third part is the framework that indicates unexplored entities and links. These entities, which consist of the organisational factors of decision-making processes and organisational routines, lead to two unexplored links: (1) the links between the organisational factors and the cognitive and political factors of decision-making processes, shown as *Gap 1*; and (2) the link between organisational routines and decision-making processes, depicted as *Gap 3*. Furthermore, although Terwiesch and Ulrich (2008) indicated that portfolio management interacts with business strategy, the mechanism for linking one to the other is not directly addressed in the extant literature. This unidentified link is represented by *Gap 2*.

It has been shown that the developed conceptual framework (Figure 6.1) presents a comprehensive view of the NPD portfolio management process by incorporating the additional processes, unexplored entities and unexplored links (gaps). In the next section, the unexplored entities and links will be discussed in detail to identify research gaps.

6.2.4 Identification of Research Gaps

As described earlier, three gaps — *Gap 1*, *Gap 2* and *Gap 3* — have been identified. These gaps can be considered as research gaps in the NPD portfolio management

area. In this section, they are discussed in order to identify potential areas for further study.

Gap 1 is associated with the links between organisational factors and the cognitive and political factors of decision-making processes. These three factors interact with each other as the underlying processes in NPD portfolio management which produce strategic and tactical portfolio decisions. This is referred to as a *partial gap*.

Gap 2 is related to decision-making processes which can generate the portfolio decisions that are aligned with the business strategy. The extant literature does not suggest the formal processes that enable this alignment to be achieved. This can be categorised as a *significant gap*.

Gap 3 is concerned with the relationship between decision-making processes and organisational routines. Previous studies have not used the concept of organisational routines for investigating NPD portfolio management; therefore, this link is still unidentified. This can be classified as a *very significant gap*.

It can be seen that the three research gaps identified in this review offer new research opportunities in the areas of NPD portfolio decision-making and its relationship with strategy process and organisational routines. In the next section, these gaps will be translated into research questions.

6.2.5 Research Questions

Research questions form one of the most important elements in a research design. They provide directions when defining the nature and scope of the research (Blaikie, 2010). In this systematic review, three research questions — RQ 1, RQ 2 and RQ 3 — are derived from the key research gaps discussed earlier:

- RQ 1. How are organisational factors involved with the cognitive and political factors in the decision-making processes in NPD portfolio management?
- RQ 2. How do the decision-making processes in NPD portfolio management link to the business strategy?
- RQ 3. To what extent are organisational routines related to the decision-making processes in NPD portfolio management?

RQ 1 is concerned with intervention to incorporate the organisational factors into the decision-making processes in NPD portfolio management. RQ 2 deals with intervention to establish a link between the decision-making processes in NPD portfolio management and the business strategy. Finally, RQ 3 is a descriptive question that investigates the relationship between organisational routines and NPD portfolio management.

6.2.6 Summary of the Synthesis of the Findings

The results of the synthesis of the findings are summarised in Table 6.1. The key findings correspond to each SRQ. They are presented as the *SRQs' answers*, *research gaps*, *“size” of gap*, and *research questions*.

Table 6.1: The Summary of the Synthesis of the Findings

Systematic Review Question	SRQs' Answers	Research Gaps	"Size" of Gap	Research Question
SRQ 1. How are strategic decisions in the NPD portfolio management process made?	<ul style="list-style-type: none"> The systematic review identified 20 articles on this topic Only one article is directly relevant to the SRQ (i.e. Kester et al. (2011)) NPD portfolio management entails decision-making processes Decisions are made through interaction between three processes: <ul style="list-style-type: none"> Evidence-based Opinion-based Power-based These processes represent the <i>cognitive</i> and <i>political</i> factors of decision-making 	<ul style="list-style-type: none"> Previous studies overlooked the <i>organisational factors</i> in the NPD portfolio decision-making process The influence of environmental factors was not clearly considered in the NPD portfolio decision-making process Decision changes were not incorporated in the NPD portfolio decision-making process 	Partial	RQ 1. How are organisational factors involved with the cognitive and political factors in the decision-making processes in NPD portfolio management?
SRQ 2. How does the NPD portfolio management process link to the strategy process?	<ul style="list-style-type: none"> The systematic review identified only 7 articles on this topic The literature indirectly explains the link between NPD portfolio management and the strategy process 	<ul style="list-style-type: none"> Previous studies only investigated the link between strategic and operative level processes No formal mechanisms to form and maintain the links between strategic and operative level processes The alignment with the business strategy is enabled by the managers' <i>portfolio mindset</i>¹⁶ rather than formal processes 	Significant	RQ 2. How do the decision-making processes in NPD portfolio management link to the business strategy?
SRQ 3. How does the NPD portfolio management process relate to organisational routines?	<ul style="list-style-type: none"> The systematic review identified 13 articles on this topic The literature does not provide an understanding on how organisational routines relate to NPD portfolio management 	<ul style="list-style-type: none"> No previous studies used the concept of organisational routines for investigating NPD portfolio management 	Very significant	RQ 3. To what extent are organisational routines related to the decision-making processes in NPD portfolio management?

¹⁶ "A complete understanding of all of the projects in the NPD portfolio and how each is aligned to the firm's strategy" (Kester et al., 2011, p. 647).

6.3 RESEARCH DESIGN

The nature of the issues raised and the identified research questions determine the most suitable research design (Creswell, 1998, 2009; Yin, 2009). Based on the identified research questions, this section discusses the research design that can be employed, including the research methodology, sample selection and data collection plan.

6.3.1 Research Methodology

The discussion on research methodology considers two issues. First, the concepts revealed in the research methodology literature and how difficult they are to investigate; second, what can be learned from the research methodologies used in the key literature reviewed.

The enquiries brought up in the research questions refer to an emerging and complex phenomenon. Understanding this kind of phenomenon requires a detailed view of explorations, as there is little theory available to explain it. These enquiries also need investigations that take into account the context of the problem. To deal with these research problems, Creswell (1998) suggested using *qualitative approaches*. This type of research can be used to explore a social or human problem, during which the researcher “builds a complex, holistic picture, ... and conducts the study in a natural setting” (Creswell, 1998, p. 15).

More specifically, among the different types of qualitative approach, the *case study* is considered to be the most suitable methodology. This is because a case study allows the researcher to explore in depth one, or a small number of, *organisations, events, processes* or *individuals* over time (Creswell, 2009; Easterby-Smith et al., 2008). In addition, it enables the investigations to “retain the holistic and meaningful characteristics” of these real-life events in specific contexts (Yin, 2009, p. 14).

Referring to the studies conducted in the literature reviewed, it is highlighted that from 22 empirical research articles, 13 (59.1%) reported qualitative research, whereas six (27.3%) presented quantitative research and three (13.6%) used mixed method research (see Chapter 4). All the qualitative research studies used the case study method (3 single-case and 10 multiple-case studies). Table 6.2 shows the

distribution of these empirical articles, in particular the case study articles, to each corresponding research question.

From 13 case study articles, four are considered to be the key studies for this systematic review. Their research methodology is scrutinised for the references to define the methodology to be adopted. This is shown in Table 6.2, presenting the corresponding research questions, methodology used in the extant literature, methodology to be adopted, and potential variables.

RQ 1 and RQ 2 (the “how” questions) are *explanatory* in nature (Bailey, 1987; Yin, 2009), in which they are likely to be investigated using case studies (Yin, 2009). As shown in Table 6.2, RQ 1 is built by five case study articles. Three of them are the explanatory studies, which aim to bring about change (practical outcomes or intervention), whereas, in contrast, two others are *exploratory* studies which look for descriptive answers (Blaikie, 2010). Furthermore, RQ 2 is based on three case study articles which conduct explanatory research. This information shows that explanatory research mainly uses case study methods.

RQ 3 (a “what” question) is more exploratory (Bailey, 1987; Yin, 2009). In this enquiry, a case study would not be an advantageous method to be used (Yin, 2009). Nevertheless, RQ 3 is also built by five case study articles, of which four are based on exploratory research and one is explanatory. This implies that even though the research question is exploratory in nature, a case study is likely to be used.

In conclusion, the problems raised in RQ 1 and RQ 2 are explanatory in nature, whereas in RQ 3 it is exploratory. As indicated by a number of scholars (e.g. Creswell (1998, 2009), Easterby-Smith et al. (2008) and Yin (2009)) and the descriptive findings from the literature, RQ 1, RQ 2 and RQ 3 are appropriate to be investigated using a case study method.

Table 6.2: Research Methodologies

Research Question	Methodology Used in the Extant Literature	Methodology to be Adopted	Potential Variables	
			Observed	Control
RQ 1. How are organisational factors involved with the cognitive and political factors in the decision-making processes in NPD portfolio management?	<ul style="list-style-type: none"> • Building on 12 empirical research articles: 5 qualitative, 4 quantitative and 3 mixed methods • From 5 qualitative articles, 1 single-case and 4 multiple-case studies • 3 cases are explanatory • 2 cases are exploratory <p>Key Previous Research: Kester et al. (2011)</p> <ul style="list-style-type: none"> • Grounded theory • Sample: 4 companies • Data collection sources: <ul style="list-style-type: none"> – Interviews – Meeting observations – Documents • Data analysis: <ul style="list-style-type: none"> – Three-step coding procedure: initial line-by-line coding, focused coding, and axial coding (Glaser and Strauss, 1967, cited in Kester et al., 2011) 	<ul style="list-style-type: none"> • Case study • Sample: 4 companies • Data collection sources: <ul style="list-style-type: none"> – Interviews – Meeting observations – Documents – Experiments • Data analysis: <ul style="list-style-type: none"> – Open coding for defining categories, and axial coding for building the conceptual relationship between categories (Strauss and Corbin, 1998) – Content analysis, identifying patterns, clustering and making comparative analysis (Miles and Huberman, 1994) 	<ul style="list-style-type: none"> • Portfolio decision-making (<i>outcome</i>¹⁷) • Organisational factors (<i>causal condition</i>¹⁸) 	<ul style="list-style-type: none"> • Environment • Politics
RQ 2. How do the decision-making processes in NPD portfolio management link to the business strategy?	<ul style="list-style-type: none"> • Building on 5 empirical research articles (3 qualitative and 2 quantitative) • All 3 qualitative articles are multiple-case studies • 3 cases are explanatory <p>Key Previous Research: Poskela (2007)</p>	<ul style="list-style-type: none"> • Case study • Sample: 4 companies • Data collection sources: <ul style="list-style-type: none"> – Interviews – Meeting observations – Documents – Experiments • Data Analysis: 	<ul style="list-style-type: none"> • Portfolio decision-making (causal condition) • The link to the business strategy (outcome) 	<ul style="list-style-type: none"> • Environment • Politics

^{17,3} Ragin, C. C. and Schneider, G. A. (2011), "Case-Oriented Theory Building and Theory Testing", in: Williams, M. & Vogt, W. P. (eds.), *The Sage Handbook of Innovation in Social Research Methods*, SAGE Publications Ltd., Los Angeles.

Research Question	Methodology Used in the Extant Literature	Methodology to be Adopted	Potential Variables	
			Observed	Control
RQ 3. To what extent are organisational routines related to the decision-making processes in NPD portfolio management?	<ul style="list-style-type: none"> • Sample: 20 companies • Data collection source: <ul style="list-style-type: none"> – Interviews • Data analysis: <ul style="list-style-type: none"> – <i>Ladder of Analytical Abstraction</i> (Miles and Huberman, 1994; Carney, 1990 cited in Poskela, 2007): summarising and packaging the data, repackaging and aggregating the data, and developing propositions to contrast an explanatory framework. – Content analysis, noting patterns, clustering, and making contrasts and comparisons (Miles and Huberman, 1994; Yin, 2009) <p>Building on 5 qualitative empirical research articles</p> <ul style="list-style-type: none"> • 2 single-case and 3 multiple-case studies • 4 cases are exploratory • 1 case is explanatory <p>Key Previous Research: Turner and Rindova (2012)</p> <ul style="list-style-type: none"> • Sample: 6 organisations • Data collection sources: <ul style="list-style-type: none"> – Interviews – Documents • Data Analysis: <ul style="list-style-type: none"> – Content analysis (Miles and Huberman, 1994) <p>Peters and O'Connor (2012):</p> <ul style="list-style-type: none"> • Longitudinal study • Grounded theory • Grounded theory development in investigating micro processes (Langley, 1999) • Sample: 21 companies 	<ul style="list-style-type: none"> – Open coding for defining categories, and axial coding for building the conceptual relationship between categories (Strauss and Corbin, 1998) – Content analysis, identifying patterns, clustering and making comparative analysis (Miles and Huberman, 1994) <ul style="list-style-type: none"> • Multiple-case study with 4 samples • Data collection sources: <ul style="list-style-type: none"> – Interviews – Meeting observations – Documents – Experiments – Artefacts • Data Analysis: <ul style="list-style-type: none"> – Open coding for defining categories, and axial coding for building the conceptual relationship between categories (Strauss and Corbin, 1998) – Content analysis, identifying patterns, clustering and making comparative analysis (Miles and Huberman, 1994) 	<ul style="list-style-type: none"> • Portfolio decision-making (outcome) • Organisational routines (causal condition) 	<ul style="list-style-type: none"> • Environment • Politics

Research Question	Methodology Used in the Extant Literature	Methodology to be Adopted	Potential Variables	
			Observed	Control
	<ul style="list-style-type: none"> • Data collection: <ul style="list-style-type: none"> – Interviews – Documents – Meeting observations • Data analysis: <ul style="list-style-type: none"> – Data coding and categorisation – Prospective, longitudinal investigation and constant comparative analysis (Glaser and Strauss, 1967, cited in Peters and O'Connor, 2012) 			

6.3.2 Sample Selection

The type of case study considered for investigating this research problem is a multiple-case study. This is because multiple-case studies provide a stronger base for theory building (Yin, 2009). Theory building from multiple cases results in more robust, generalisable and testable theory than from a single-case study (Eisenhardt and Graebner, 2007). As a comparison, out of 13 articles in the literature reviewed that reported case study research, 10 conducted multiple-case research. This study may show that a multiple-case research has been used more extensively than a single-case study.

Multiple cases are chosen based on theoretical reasons, i.e. a *literal replication* (predicts similar result) or a *theoretical replication* (predicts contrasting results but for anticipatable reasons) (Yin, 2009). In reference to this, the research problem can be studied using four cases, which are divided into two subgroups (two cases for each group).

This arrangement allows the research to exercise the theoretical replication across the subgroups, while conducting the literal replication within each. This design enables the research to investigate two different patterns of theoretical replications. The division of the subgroups can be based on the level of industry dynamics. One subgroup represents industries in which the dynamics in the environment are low, while the second subgroup represents industries with a more dynamic environment. By doing so, the research can be contrasting the NPD portfolio management process within two different contexts.

This replication perspective leads to the selection of four different sectors. Two sectors represent fast-paced industry, such as consumer and food products; whereas, the other two sectors are from relatively stable industries, such as automotive and electrical components.

From a geographical perspective, it is proposed to conduct the research in the South East Asia region, particularly Indonesia. This is because the Asia region, in general, has received less attention regarding studies on NPD portfolio management, compared to other regions. On the other hand, this region is an emerging market that shows enormous economic development. For example, Indonesia's economy is transforming rapidly into one of the largest economies in the world (Oberman et al.,

2012). This offers various contexts of phenomena, such as market dynamics and cultures, which are fruitful for the studies. Additionally, in choosing South East Asia for the research it will be essential to choose companies which are sufficiently involved in product innovation and which have significant product portfolios.

6.3.3 Data Collection

In a case study approach, data collection activities investigate a bounded system such as a process, activity, event, programme or multiple individuals (Creswell, 1998). The types of information collected typically include documents or archival records, audio-visual materials, interviews, direct observations and physical artefacts (Creswell, 1998, 2009; Yin, 2009). In order to increase the reliability of case study research and guide the researchers in carrying out the data collection, a deliberate plan or protocol is required (Yin, 2009). In this section a preliminary data collection plan for a single site is presented, as shown in Figure 6.2.

Figure 6.2 gives an overview of chronological data collection activities for the duration of four weeks. The data collection sources include *documents*, *interviews*, *meeting observations*, *experiments* and *artefacts*. Simultaneously, early analysis during the data collection is carried out. This consists of documenting the data into *contact summary sheets* and/or *document summary forms*, followed by *coding* and *memoing* the data. In addition to Figure 6.2, the details of each activity are described in Appendix K, which include the *participants*, *activity descriptions* and *data recording means*. The preliminary results of these activities are presented in an *interim site summary*, which will be provided in the closing meeting.

This plan can be replicated for the following samples, started from week 4 of the current data collection cycle. The cycle will be repeated four times, matching the number of case companies selected.

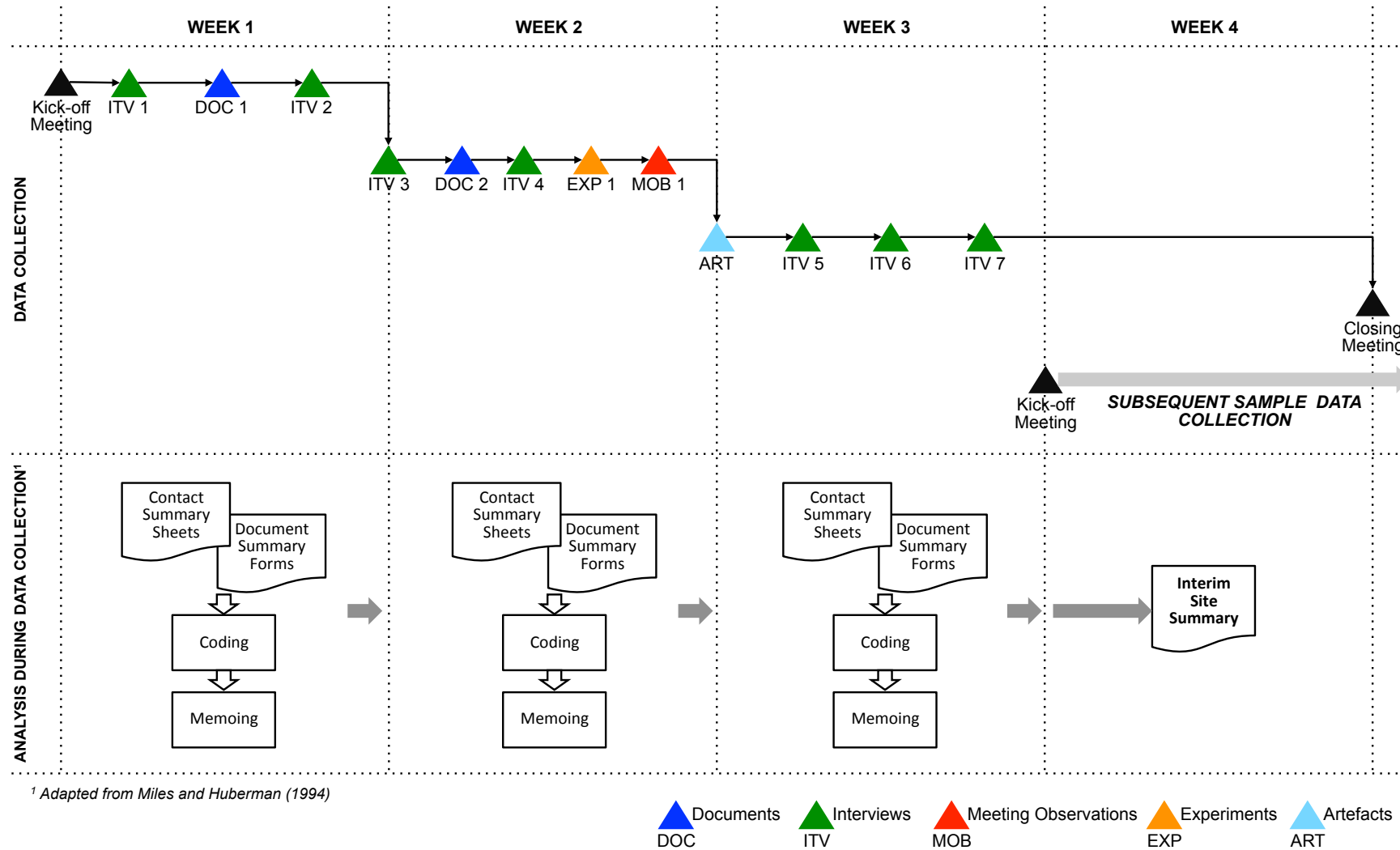


Figure 6.2: An Overview of a Single Site Data Collection Plan

6.4 CONCLUSIONS

The purpose of this systematic literature review was to explore the current state of studies in NPD portfolio management and identify the potential research avenues. The key results of this review are presented in this section, including the SRQs' answers, research gaps, research questions, research methodology and sample selected. The first three key results are presented in the framework shown in Figure 6.3.

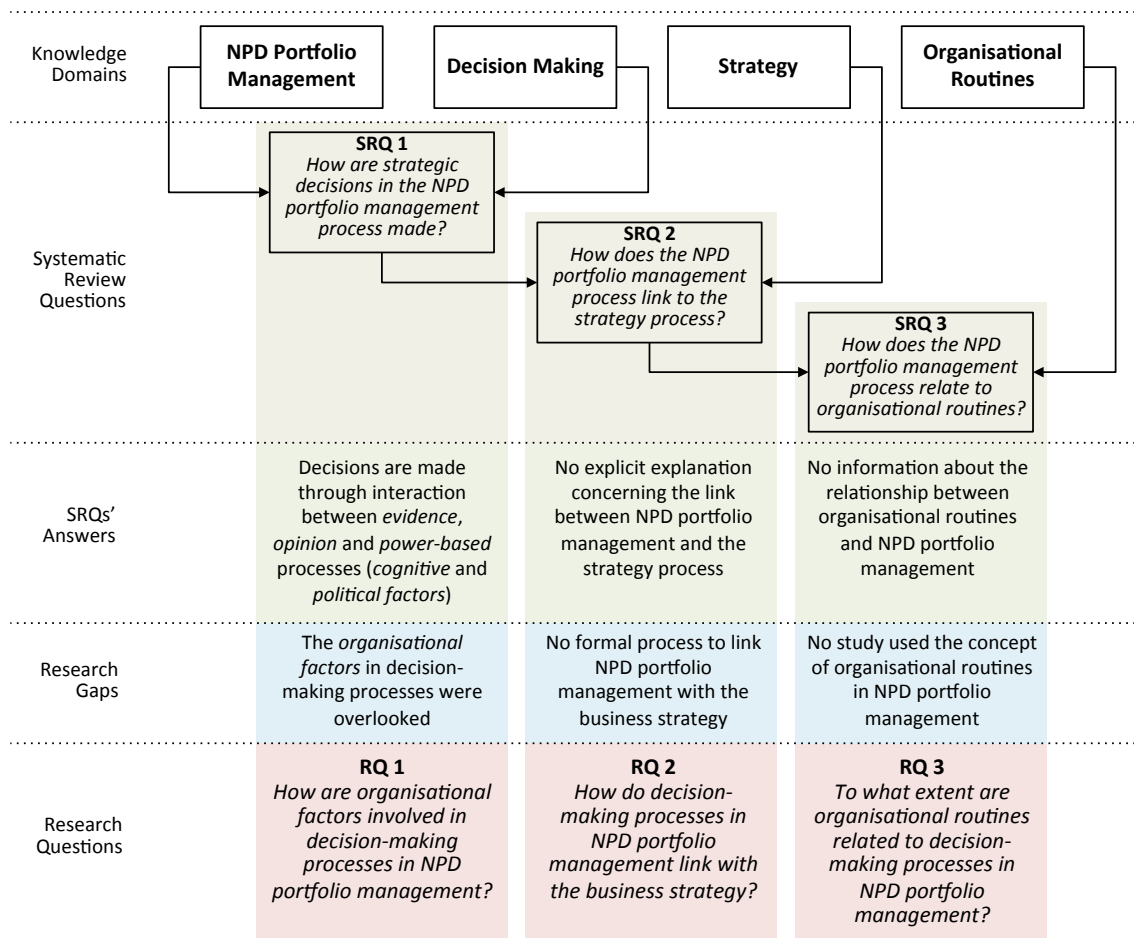


Figure 6.3: The Systematic Literature Review Outcomes

Figure 6.3 shows that this systematic review looked at NPD portfolio management through three other knowledge domains: decision-making, strategy and organisational routines. The interrelationship conceived between these four domains revealed three systematic review questions — SRQ 1, SRQ 2 and SRQ 3.

The conceptual analysis resulted in the key SRQs' answers. First, strategic decisions in NPD portfolio management (SRQ 1) are made through interaction between

cognitive, and political factors. Second, the link between NPD portfolio management and the strategy process (SRQ 2) is not explicitly uncovered. Third, the understanding of how organisational routines relate to the link between the NPD portfolio management process and the strategy process (SRQ 3) is not revealed.

These unanswered questions were considered as research gaps 1, 2 and 3. Gap 1 shows the organisational factors have been overlooked in the NPD portfolio decision-making process. Gap 2 denotes that the formal processes to link the decision-making processes in NPD portfolio management to the business strategy have not been established. Gap 3 indicates previous studies have not used the concept of organisational routines for studying NPD portfolio management. Finally, these three research gaps have led to three research questions — RQ 1, RQ 2 and RQ 3 — shown in Figure 6.3.

These research questions can be investigated by employing a case study approach. Four cases from different sectors can be selected to represent two subgroups of different contexts: a fast-paced industry and a stable industry.

6.5 LIMITATIONS AND FURTHER STUDY

The study into NPD portfolio management through various perspectives — decision-making, strategy process and organisational routines — is still underdeveloped. As a consequence, the systematic search failed to provide high quality and relevant articles. This has caused this review to have some limitations

The searches were based on the whole article's text, as the scanning of *abstracts* alone gave an almost nil result. As a result, the systematic search, together with the additional sources, provided only a limited number of articles with less relevance to the SRQs' issues.

These articles solely were unable to uncover the relationships between the knowledge domains; therefore, self-interpretations were exercised in synthesising them. This approach was constrained by self-perspective biases and by knowledge limitations which might not result in a well-grounded construct.

To answer the research questions, therefore, it is required to extend the study of literature in the areas that have not, or have only partially, been covered in this review.

They include, first, the decision-making process area that specifically explores its fundamental factors — cognitive, organisational and politics. The comprehensive understanding of each factor and the interplay between them will explain the mechanisms of the decision-making process. Second, the organisational routines area that discusses in more detail their characteristics as well as the interactions which construct the structure of a process. Incorporating the *micro-foundations* concept to explain the routines mechanisms located at the micro-level (Abell et al., 2008) could be considered. This knowledge would enable the routines to be identified and reconstructed into a specific structure.

6.6 SUMMARY

This chapter has presented discussions and conclusions of the systematic literature review. It has shown that:

- The SRQs' answers are as follows:
 - Strategic decisions in NPD portfolio management are made through the interaction between cognitive and political factors.
 - The link between NPD portfolio management and the strategy process is not explicitly uncovered.
 - The understanding of how organisational routines relate to the link between the NPD portfolio management process and the strategy process is not revealed.
- The SRQs' answers lead to the following research gaps:
 - Gap 1 shows that organisational factors have been overlooked in the NPD portfolio decision-making process.
 - Gap 2 denotes the formal process to link the decision-making processes in NPD portfolio management to the business strategy have not been established.
 - Gap 3 indicates previous studies have not used the concept of organisational routines for studying NPD portfolio management.
- The research gaps lead to the following research questions (RQs):
 - RQ 1. How are organisational factors involved with the cognitive and political factors in the decision-making processes in NPD portfolio management?
 - RQ 2. How do the decision-making processes in NPD portfolio management link to the business strategy?

RQ 3. To what extent are organisational routines related to the decision-making processes in NPD portfolio management?

The nature of the problems raised in RQ 1, RQ 2 and RQ 3 can be investigated using a case study method with multiple cases. Four cases from different sectors will be selected.

REFERENCES

- Abell, P., Felin, T. and Foss, N. (2008), "Building Micro-Foundations for the Routines, Capabilities, and Performance Links", *Managerial and Decision Economics*, Vol. 29, No. 6, p. 489-502.
- Adams, R., Bessant, J. and Phelps, R. (2006), "Innovation Management Measurement: A Review", *International Journal of Management Reviews*, Vol. 8, p. 21-47.
- Ali, A., Kalwani, M. U. and Kovenock, D. (1993), "Selecting Product Development Projects: Pioneering Versus Incremental Innovation Strategies", *Management Science*, Vol. 39, p. 255-274.
- Anderson Jr., E. G. and Joglekar, N. R. (2005), "A Hierarchical Product Development Planning Framework", *Production and Operations Management*, Vol. 14, p. 344-361.
- Anonymous (2007), "A Dark Art No More", *The Economist*, (Special Report on Innovation), October 13th 2007, p. 11-16.
- Ansoff, H. I. (1965), *Corporate Strategy: An Analytic Approach to Business Policy for Growth and Expansion*, McGraw-Hill, New York.
- Archer, N. P. and Ghasemzadeh, F. (1999), "An Integrated Framework for Project Portfolio Selection", *International Journal of Project Management*, Vol. 17, p. 207-216.
- Astley, W. G., Axelsson, R., Butler, R. J., Hickson, D. J. and Wilson, D. C. (1982), "Complexity and Cleavage: Dual Explanations of Strategic Decision-Making", *Journal of Management Studies*, Vol. 19, No. 4, p. 357-375.
- Bailey, K. D. (1987), *Methods of Social Research*, (3rd ed), The Free Press, New York.
- Barczak, G., Griffin, A. and Kahn, K. B. (2009), "Perspective: Trends and Drivers of Success in NPD Practices: Results of the 2003 PDMA Best Practices Study", *Journal of Product Innovation Management*, Vol. 26, No. 1, p. 3-23.
- Barney, J. (1991), "Firm Resources and Sustained Competitive Advantage", *Journal of Management*, Vol. 17, No. 1, p. 99.
- Barney, J. B. (2002), *Gaining and Sustaining Competitive Advantage*, (2nd ed), Pearson Education, Inc., Upper Saddle River, New Jersey, USA.
- Bazerman, M. H. (1990), *Judgement in Managerial Decision*, (2nd ed), John Wiley & Sons, Inc.
- Becker, M. C. (2004), "Organizational Routines: A Review of the Literature", *Industrial and Corporate Change*, Vol. 13, p. 643-678.

- Becker, M. C. (2008), *Handbook of Organizational Routines*, Edward Elgar Publishing Limited, Cheltenham, UK.
- Becker, M. C. and Zirpoli, F. (2008), "Applying Organizational Routines in Analyzing the Behavior of Organizations", *Journal of Economic Behavior & Organization*, Vol. 66, p. 128.
- Bentzen, E., Christiansen, J. K. and Varnes, C. J. (2011), "What Attracts Decision Makers' Attention?: Managerial Allocation of Time at Product Development Portfolio Meetings", *Management Decision*, Vol. 49, p. 330-349.
- Betsch, T., Haberstroh, S. and Hohle, C. (2002), "Explaining Routinized Decision Making: A Review Theories and Model", *Theory and Psychology*, Vol. 12, p. 453-488.
- Bhuiyan, N. and Thomson, V. (2010), "A Framework for NPD Processes under Uncertainty", *Engineering Management Journal*, Vol. 22, p. 27-35.
- Blaikie, N. (2010), *Designing Social Research*, (2nd ed), Polity Press, Cambridge, UK.
- Blau, G. E., Pekny, J. F., Varma, V. A. and Bunch, P. R. (2004), "Managing a Portfolio of Interdependent New Product Candidates in the Pharmaceutical Industry", *Journal of Product Innovation Management*, Vol. 21, p. 227-245.
- Bowen, H. K., Clark, K. B., Holloway, C. A. and Wheelwright, S. C. (1994), "Development Projects: The Engine of Renewal", *Harvard Business Review*, Vol. 72, No. 5, p. 110-120.
- Bowman, E. H. and Helfat, C. E. (2001), "Does Corporate Strategy Matter?", *Strategic Management Journal*, Vol. 22, p. 1.
- Brown, S. L. and Eisenhardt, K. M. (1995), "Product Development: Past Research, Present Findings, and Future", *Academy of Management Review*, Vol. 20, p. 343-378.
- Camillus, J. C. (1981), "Corporate Strategy and Executive Action: Transition Stages and Linkage Dimensions", *Academy of Management Review*, Vol. 6, p. 253-259.
- Campbell, A. (2003), *The Role of the Parent Company*, Oxford, United Kingdom.
- Cardozo, R. N. and Wind, J. (1985), "Risk Return Approach to Product Portfolio Strategy", *Long Range Planning*, Vol. 18, No. 2, p. 77-85.
- Chakravarthy, B. S. and Doz, Y. (1992), "Strategy Process Research: Focusing on Corporate Self-Renewal", *Strategic Management Journal*, Vol. 13, p. 5-14.
- Chakravarthy, B. S. and White, R. E. (2002), "Strategy Process: Forming, Implementing and Changing Strategies", in: Pettigrew, A., Thomas, H. & Richard, W. (eds.), *Handbook of Strategy and Management*, London, p. 182-205.

- Chao, R. O. and Kavadias, S. (2008), "A Theoretical Framework for Managing the New Product Development Portfolio: When and How to Use Strategic Buckets", *Management Science*, Vol. 54, p. 907-921.
- Closs, D., Jacobs, M., Swink, M. and Webb, G. (2008), "Toward a Theory of Competencies for the Management of Product Complexity: Six Case Studies", *Journal of Operations Management*, Vol. 26, p. 590-610.
- Cohen, M. A., Eliashberg, J. and Ho, T. H. (2000), "An Analysis of Several New Product Performance Metrics", *Manufacturing & Service Operations Management*, Vol. 2, p. 337-349.
- Cohen, M. D. and Bacdayan, P. (1994), "Organizational Routines Are Stored as Procedural Memory: Evidence from a Laboratory Study", *Organization Science*, Vol. 5, No. 4, p. 554-568.
- Collis, D. J. (1994), "Research Note: How Valuable are Organizational Capabilities?", *Strategic Management Journal*, Vol. 15, p. 143-152.
- Cooper, R. G. (1984), "The Strategy-Performance Link in Product Innovation", *R & D Management*, Vol. 14, No. 4, p. 247-259.
- Cooper, R. G. (1990), "Stage-Gate Systems: A New Tool for Managing New Products", *Business Horizons*, Vol. 33, No. 3, p. 44-54.
- Cooper, R. G. (1994), "Third-Generation New Product Processes", *Journal of Product Innovation Management*, Vol. 11, No. 1, p. 3-14.
- Cooper, R. G. (2001), *Winning at New Products: Accelerating the Process from Idea to Launch*, (3rd ed), Perseus Publishing, Cambridge, Massachusetts.
- Cooper, R. G. (2005), *Product Leadership*, (2nd ed), Basic Books, New York.
- Cooper, R. G. (2008), "Perspective: The Stage-Gate® Idea-to-Launch Process - Update, What's New, and Nexgen Systems", *Journal of Product Innovation Management*, Vol. 25, No. 3, p. 213-232.
- Cooper, R. G. and Edgett, S. J. (2010), "Developing a Product Innovation and Technology Strategy for Your Business", *Research Technology Management*, Vol. 53, No. 3, p. 33-40.
- Cooper, R. G., Edgett, S. J. and Kleinschmidt, E. J. (1997), "Portfolio Management in New Product Development: Lessons from the Leaders-I", *Research Technology Management*, Vol. 15, No. 2, p. 186-187.
- Cooper, R. G., Edgett, S. J. and Kleinschmidt, E. J. (1999), "New Product Portfolio Management: Practices and Performance", *Journal of Product Innovation Management*, Vol. 16, No. 4, p. 333-351.

- Cooper, R. G., Edgett, S. J. and Kleinschmidt, E. J. (2000), "New Problems, New Solutions: Making Portfolio Management More Effective", *Research Technology Management*, Vol. 43, p. 18-33.
- Cooper, R. G., Edgett, S. J. and Kleinschmidt, E. J. (2001), *Portfolio Management for New Products*, (2nd ed), Perseus, Cambridge.
- Cooper, R. G. and Kleinschmidt, E. J. (1991), "New Product Processes at Leading Industrial Firms", *Industrial Marketing Management*, Vol. 20, No. 2, p. 137-147.
- Cooper, R. G. and Kleinschmidt, E. J. (1995a), "Benchmarking the Firm Critical Success Factors in New Product Development", *Journal of Product Innovation Management*, Vol. 12, p. 374-391.
- Cooper, R. G. and Kleinschmidt, E. J. (1995b), "Performance Typologies of New Product Projects", *Industrial Marketing Management*, Vol. 24, No. 5, p. 439-456.
- Cooper, R. G. and Kleinschmidt, E. J. (1996), "Winning Businesses in Product Development: The Critical Success Factors", *Research Technology Management*, Vol. 39, p. 18-29.
- Creswell, J. W. (1998), *Qualitative Inquiry and Research Design: Choosing among Five Traditions*, Sage Publications, Inc, Thousand Oaks, California.
- Creswell, J. W. (2009), *Research Design: Qualitative, Quantitative and Mixed Methods Approaches*, (3rd ed), Sage Publications, Inc., Thousand Oaks, California.
- Danneels, E. (2002), "The Dynamics of Product Innovation and Firm Competences", *Strategic Management Journal*, Vol. 23, No. 12, p. 1095-1121.
- de Wit, B. and Meyer, R. (2004), *Strategy: Process, Content, Context*, (3rd ed), Thomson, London.
- Dean, J. W. J. and Sharfman, M. P. (1996), "Does Decision Process Matter? A Study of Strategic Decision-Making Effectiveness", *Academy of Management Journal*, Vol. 39, No. 2, p. 368-396.
- Dickinson, M. W., Thornton, A. C. and Graves, S. (2001), "Technology Portfolio Management: Optimizing Interdependent Projects over Multiple Time Periods", *IEEE Transactions on Engineering Management*, Vol. 48, p. 518-527.
- Dijksterhuis, A. (2004), "Think Different: The Merits of Unconscious Thought in Preference Development and Decision Making", *Journal of Personality and Social Psychology*, Vol. 87, No. 5, p. 586-598.
- Dijksterhuis, A. and van Olden, Z. (2006), "On the Benefits of Thinking Unconsciously: Unconscious Thought Can Increase Post-Choice Satisfaction", *Journal of Experimental Social Psychology*, Vol. 42, No. 5, p. 627-631.

- Dosi, G., Nelson, R. R. and Winter, S. G. (2000), "Introduction: The Nature and Dynamics of Organizational Capabilities", in: Dosi, G., Nelson, R. R. & Winter, S. G. (eds.), *The Nature and Dynamics of Organizational Capabilities*, Oxford University Press, New York, p. 1-22.
- Dougherty, D. (1992), "A Practice-Centered Model of Organizational Renewal through Product Innovation", *Strategic Management Journal*, Vol. 13, p. 77-92.
- Duncan, R. B. (1972), "Characteristics of Organizational Environments and Perceived Environmental Uncertainty", *Administrative Science Quarterly*, Vol. 17, p. 313-327.
- Durmuşoğlu, S. S., McNally, R. C., Calantone, R. J. and Harmancioglu, N. (2008), "How Elephants Learn the New Dance When Headquarters Changes the Music: Three Case Studies on Innovation Strategy Change", *Journal of Product Innovation Management*, Vol. 25, No. 4, p. 386-403.
- Easterby-Smith, M., Thorpe, R. and Jackson, P. R. (2008), *Management Research*, (3rd ed), SAGE, Publications Ltd., London.
- Eccles, A. J. and Wood, D. (1972), "How Do Managers Decide", *The Journal of Management Studies*, Vol. 9, No. 3, p. 291-302.
- Eilon, S. (1969), "What Is a Decision?", *Management Science*, Vol. 16, No. 4, p. B-172-B-189.
- Eisenhardt, K. M. (1999), "Strategy as Strategic Decision Making", *Sloan Management Review*, Vol. 40, p. 65-72.
- Eisenhardt, K. M. and Bourgeois III, L. J. (1988), "Politics of Strategic Decision Making in High-Velocity Environments: Toward a Midrange Theory", *Academy of Management Journal*, Vol. 31, p. 737-770.
- Eisenhardt, K. M. and Graebner, M. E. (2007), "Theory Building from Cases: Opportunities and Challenges", *Academy of Management Journal*, Vol. 50, p. 25-32.
- Eisenhardt, K. M. and Martin, J. A. (2000), "Dynamic Capabilities: What Are They?", *Strategic Management Journal*, Vol. 21, p. 1105-1121.
- Eisenhardt, K. M. and Zbaracki, M. J. (1992), "Strategic Decision Making", *Strategic Management Journal*, Vol. 13, p. 17-37.
- Emirbayer, M. and Mische, A. (1998), "What Is Agency?", *The American Journal of Sociology*, Vol. 103, p. 962-1023.
- Fahey, L. (1981), "On Strategic Management Decision Processes", *Strategic Management Journal*, Vol. 2, p. 43-60.

- Feldman, M. S. (2000), "Organizational Routines as a Source of Continuous Change", *Organization Science*, Vol. 11, p. 611-629.
- Feldman, M. S. (2003), "A Performative Perspective on Stability and Change in Organizational Routines", *Industrial and Corporate Change*, Vol. 12, p. 727.
- Feldman, M. S. and Orlikowski, W. J. (2011), "Theorizing Practice and Practicing Theory", *Organization Science*, Vol. 22, No. 5, p. 1240-1253.
- Feldman, M. S. and Pentland, B. T. (2003), "Reconceptualizing Organizational Routines as a Source of Flexibility and Change", *Administrative Science Quarterly*, Vol. 48, p. 94-118.
- Feldman, M. S. and Pentland, B. T. (2008), "Routine Dynamics", in: Barry, D. & Hansen, H. (eds.), *The Sage Handbook of New Approaches in Management and Organization*, SAGE Publications Ltd, London, p. 302-315.
- Finlay, P. (2000), *Strategic Management: An Introduction to Business and Corporate Strategy*, Person Education Limited, Edinburg Gate.
- French, S., Maule, J. and Papamichail, N. (2009), *Decision Behaviour, Analysis and Support*, Cambridge University Press, Cambridge.
- Giddens, A. (1984), *The Constitution of Society*, University of California Press, Berkeley, CA.
- Gino, F. and Pisano, G. (2008), "Toward a Theory of Behavioral Operations", *Manufacturing & Service Operations Management*, Vol. 10, No. 4, p. 676-691.
- Glueck, W. F. (1974), "Decision Making: Organization Choice", *Personnel Psychology*, Vol. 27, p. 77-93.
- Goffin, K. and Mitchell, R. (2010), *Innovation Management: Strategy and Implementation Using the Pentathlon Framework*, (2nd ed), Houndsmills, Basingtoke, Hampshire.
- Grant, R. M. (2005), *Contemporary Strategy Analysis*, (5th ed), Blackwell Publishing, Malde, MA, USA.
- Guth, W. D. and Ginsberg, A. (1990), "Guest Editors' Introduction: Corporate Entrepreneurship", *Strategic Management Journal*, Vol. 11, No. 4, p. 5-15.
- Hall, D. L. and Nauda, A. (1990), "An Interactive Approach for Selecting IR&D Projects", *IEEE Transactions on Engineering Management*, Vol. 37, No. 2, p. 126-126.
- Harrison, E. F. (1981), *The Managerial Decision-Making Process*, (2nd ed), Houghton Mifflin Company, Boston (MA).

- Hart, C. (1998), *Doing a Literature Review: Releasing the Social Science Research Imagination*, Sage Publications Ltd., London.
- Helfat, C. E., Finkelstein, S., Mitchell, W., Peteraf, M. A., Singh, H., Teece, D. J. and Winter, S. G. (2007), *Dynamic Capabilities: Understanding Strategic Change in Organizations*, Blackwell Publishing, Malden.
- Hickson, D. J., Butler, R. J., Cray, D., Mallory, G. R. and Wilson, D. C. (1986), *Top Decisions: Strategic Decision-Making in Organizations*, Basil Blackwell Ltd, Oxford.
- Howard-Grenville, J. A. (2005), "The Persistence of Flexible Organizational Routines: The Role of Agency and Organizational Context", *Organization Science*, Vol. 16, No. 6, p. 618-636.
- Hutzschenreuter, T. and Kleindienst, I. (2006), "Strategy-Process Research: What Have We Learned and What Is Still to Be Explored.", *Journal of Management*, Vol. 32, No. 5, p. 673-720.
- Johnson, G., Melin, L. and Whittington, R. (2003), "Micro Strategy and Strategizing: Towards an Activity-Based View", *Journal of Management Studies*, Vol. 40, p. 3-22.
- Kandybin, A. (2009), "Which Innovation Efforts Will Pay?", *MIT Sloan Management Review*, Vol. 51, p. 53-60.
- Kester, L., Griffin, A., Hultink, E. J. and Lauche, K. (2011), "Exploring Portfolio Decision-Making Processes", *Journal of Product Innovation Management*, Vol. 28, No. 5, p. 641-661.
- Kester, L., Hultink, E. J. and Lauche, K. (2009), "Portfolio Decision-Making Genres: A Case Study", *Journal of Engineering and Technology Management*, Vol. 26, p. 327-341.
- Ketchen Jr, D. J., Thomas, J. B. and McDaniel Jr, R. R. (1996), "Process, Content and Context: Synergistic Effects on Organizational Performance", *Journal of Management*, Vol. 22, p. 231.
- Khurana, A. and Rosenthal, S. R. (1997), "Integrating the Fuzzy Front End of New Product Development", *Sloan Management Review*, Vol. 38, p. 103-120.
- Killen, C. P., Jugdev, K., Drouin, N. and Petit, Y. (2012), "Advancing Project and Portfolio Management Research: Applying Strategic Management Theories", *International Journal of Project Management*, Vol. 30, p. 525-538.
- Killen, C. P. and Kjaer, C. (2012), "Understanding Project Interdependencies: The Role of Visual Representation, Culture and Process", *International Journal of Project Management*, Vol. 30, No. 5, p. 554-566.

- Krishnan, V. and Bhattacharya, S. (2002), "Technology Selection and Commitment in New Product Development: The Role of Uncertainty and Design Flexibility", *Management Science*, Vol. 48, p. 313-327.
- Krishnan, V. and Ulrich, K. T. (2001), "Product Development Decisions: A Review of the Literature", *Management Science*, Vol. 47.
- Langley, A. (1999), "Strategies for Theorizing from Process Data", *Academy of Management Review*, Vol. 24, No. 4, p. 691-710.
- Lant, T. K. and Hewlin, P. F. (2002), "Information Cues and Decision Making: The Effects of Learning, Momentum and Social Comparison in Competing Team", *Group & Organization Management*, Vol. 27, p. 374-407.
- Lindstedt, M., Liesio, J. and Salo, A. (2008), "Participatory Development of a Strategic Product Portfolio in a Telecommunication Company", *International Journal of Technology Management*, Vol. 42, p. 250-266.
- Loch, C. H. and Kavadias, S. (2002), "Dynamic Portfolio Selection of NPD Programs Using Marginal Returns", *Management Science*, Vol. 48, p. 1227-1241.
- MacCormack, A. and Verganti, R. (2003), "Managing the Sources of Uncertainty: Matching Process and Context in Software Development", *Journal of Product Innovation Management*, Vol. 20, p. 217-232.
- March, J. G. and Simon, H. A. (1963), *Organizations*, (4th ed), John Wiley & Sons, Inc., New York.
- Martinsuo, M. and Poskela, J. (2011), "Use of Evaluation Criteria and Innovation Performance in the Front End of Innovation", *Journal of Product Innovation Management*, Vol. 28, No. 6, p. 896-914.
- Mazzolini, R. (1981), "How Strategic Decisions Are Made", *Long Range Planning*, Vol. 14, No. 3, p. 85-96.
- McNally, R. C., Durmusoglu, S. S., Calantone, R. J. and Harmancioglu, N. (2009), "Exploring New Product Portfolio Management Decisions: The Role of Managers' Dispositional Traits", *Industrial Marketing Management*, Vol. 38, p. 127-143.
- Miles, M. B. and Huberman, A. M. (1994), *Qualitative Data Analysis: An Expanded Sourcebook*, (2nd ed), Sage Publications, Inc., Thousand Oaks, California.
- Mintzberg, H. (1973), "Strategy-Making in Three Modes.", *California Management Review*, Vol. 16, p. 44-53.
- Mintzberg, H. and McHugh, A. (1985), "Strategy Formation in an Adhocracy.", *Administrative Science Quarterly*, Vol. 30, p. 160-197.

- Mintzberg, H., Raisinghani, D. and Théorêt, A. (1976), "The Structure of 'Unstructured' Decision Processes", *Administrative Science Quarterly*, Vol. 21, p. 246-275.
- Moenaert, R. K., Robben, H., Antioco, M., Schamphelaere, V. D. and Roks, E. (2010), "Strategic Innovation Decisions: What You Foresee is not What You Get", *Journal of Product Innovation Management*, Vol. 27, No. 6, p. 840-855.
- Müller, R., Martinsuo, M. and Blomquist, T. (2008), "Project Portfolio Control and Portfolio Management Performance in Different Contexts", *Project Management Journal*, Vol. 39, p. 28-42.
- Nagji, B. and Tuff, G. (2012), "Managing Your Innovation Portfolio", *Harvard Business Review*, Vol. 90, No. 5, p. 66-74.
- Nelson, R. R. and Winter, S. G. (1982), *An Evolutionary Theory of Economic Change*, The Belknap Press of Harvard University Press, Cambridge, Massachusetts.
- Nelson, R. R. and Winter, S. G. (2002), "Evolutionary Theorizing in Economics", *The Journal of Economic Perspectives*, Vol. 16, p. 23-46.
- Noda, T. and Bower, J. L. (1996), "Strategy Making as Iterated Processes of Resource Allocation", *Strategic Management Journal*, Vol. 17, p. 159-192.
- O'Connor, G. C. (2008), "Major Innovation as a Dynamic Capability: A Systems Approach", *Journal of Product Innovation Management*, Vol. 25, p. 313-330.
- Oberman, R., Dobbs, R., Budiman, A., Thompson, F. and Rossé, M. (2012), *The Archipelago Economy: Unleashing Indonesia's Potential*, McKinsey Global Institute, Seoul, San Francisco, London.
- Page, A. L. and Schirr, G. R. (2008), "Growth and Development of a Body of Knowledge: 16 Years of New Product Development Research, 1989–2004", *Journal of Product Innovation Management*, Vol. 25, p. 233-248.
- Penrose, E. (1995), *The Theory of the Growth of the Firm*, (2nd ed), Oxford University Press, New York.
- Pentland, B. T. and Feldman, M. S. (2005), "Organizational Routines as a Unit of Analysis", *Industrial and Corporate Change*, Vol. 14, p. 793-816.
- Pentland, B. T. and Feldman, M. S. (2008), "Designing Routines: On the Folly of Designing Artifacts, While Hoping for Patterns of Action", *Information and Organization*, Vol. 18, p. 235-250.
- Pentland, B. T. and Rueter, H. H. (1994), "Organizational Routines as Grammars of Action", *Administrative Science Quarterly*, Vol. 39, No. 3, p. 484-510.
- Perks, H. (2007), "Inter-Functional Integration and Industrial New Product Portfolio Decision Making: Exploring and Articulating the Linkages", *Creativity and Innovation Management*, Vol. 16, p. 152-164.

- Peters, L. and O'Connor, G. C. (2012), *A Typology of Routines: Demonstrating Transformational Routines as One of Several Types*, Lally School of Management & Technology, Rensselaer Polytechnic Institute, Troy, NY (Working Paper).
- Pettigrew, A. M. (1985), *The Awakening Giant : Continuity and Change in Imperial Chemical Industries*, Blackwell, Oxford.
- Porter, M. E. (1980), *Competitive Strategy*, Free Press, New York.
- Porter, M. E. (1996), "What Is Strategy?", *Harvard Business Review*, Vol. 74, p. 61.
- Poskela, J. (2007), "Strategic and Operative Level Front-End Innovation Activities — Integration Perspective", *International Journal of Innovation & Technology Management*, Vol. 4, p. 433-456.
- Ragin, C. C. and Schneider, G. A. (2011), "Case-Oriented Theory Building and Theory Testing", in: Williams, M. & Vogt, W. P. (eds.), *The Sage Handbook of Innovation in Social Research Methods*, SAGE Publications Ltd., Los Angeles.
- Rajagopalan, N., Rasheed, A. M. A. and Datta, D. K. (1993), "Strategic Decision Processes: Critical Review and Future Directions", *Journal of Management*, Vol. 19, p. 349-384.
- Roberts, P. W. (1999), "Product Innovation, Product-Market Competition and Persistent Profitability in the U.S. Pharmaceutical Industry", *Strategic Management Journal*, Vol. 20, p. 655-670.
- Rowe, C. (1989), "Analysing Management Decision-Making: Further Thoughts after the Bradford Studies", *The Journal of Management Studies*, Vol. 26, No. 1, p. 29-46.
- Rumelt, R. P., Schendel, D. E. and Teece, D. J. (1994), "Fundamental Issues in Strategy", in: Rumelt, R. P., Schendel, D. E. & Teece, D. J. (eds.), *Fundamental Issues in Strategy: A Research Agenda*, Harvard Business School Press, Boston, Massachusetts, p. 9-47.
- Salvato, C. (2009), "Capabilities Unveiled: The Role of Ordinary Activities in the Evolution of Product Development Processes", *Organization science*, Vol. 20, No. 2, p. 384-409.
- Salvato, C. and Rerup, C. (2011), "Beyond Collective Entities: Multilevel Research on Organizational Routines and Capabilities", *Journal of Management*, Vol. 37, No. 2, p. 468-490.
- Schwenk, C. R. (1988), *The Essence of Strategic Decision Making*, D.C. Heath and Company, Lexington.

- Schwenk, C. R. (1989), "Linking Cognitive, Organizational and Political Factors in Explaining Strategic Change.", *Journal of Management Studies*, Vol. 26, p. 177-187.
- Shapira, Z. (1994), "Commentary: Evolution, Externalities and Managerial Action", in: Baum, J. A. C. & Singh, J. V. (eds.), *Evolutionary Dynamics of Organizations*, Oxford University Press, Inc, New York.
- Shapiro, C. (1989), "The Theory of Business Strategy.", *RAND Journal of Economics*, Vol. 20, p. 125-137.
- Simon, H. A. (1957), *Models of Man: Social and Rational*, John Wiley & Sons, Inc., New York.
- Simon, H. A. (1976), *Administrative Behavior: A Study of Decision-Making Processes in Administrative Organization*, (3rd ed), The Free Press, New York.
- Simon, H. A. (1977), *The New Science of Management Decision*, Prentice-Hall, Inc., Englewood Cliffs.
- Steffens, W., Martinsuo, M. and Arto, K. (2007), "Change Decisions in Product Development Projects", *International Journal of Project Management*, Vol. 25, p. 702-713.
- Teece, D. and Pisano, G. (1994), "The Dynamic Capabilities of Firms: An Introduction.", *Industrial & Corporate Change*, Vol. 3, p. 537-556.
- Teece, D. J. (1984), "Economic Analysis and Strategic Management", *California Management Review*, Vol. 26, p. 87.
- Teece, D. J., Pisano, G. and Shuen, A. (1997), "Dynamic Capabilities and Strategic Management", *Strategic Management Journal*, Vol. 18, p. 509-533.
- Terwiesch, C. and Ulrich, K. (2008), "Managing the Opportunity Portfolio", *Research Technology Management*, Vol. 51, No. 5, p. 27-38.
- Terwiesch, C. and Ulrich, K. T. (2009), *Innovation Tournament: Creating and Selecting Exceptional Opportunities*, Harvard Business School Publishing, Boston.
- Thomas, H. (1984), "Strategic Decision Analysis: Applied Decision Analysis and Its Role in the Strategic Management Process", *Strategic Management Journal*, Vol. 5, p. 139-157.
- Tranfield, D., Denyer, D. and Smart, P. (2003a), "Towards a Methodology for Developing Evidence-Informed Management Knowledge by Means of Systematic Review", *British Journal of Management*, Vol. 14.
- Tranfield, D., Young, M., Partington, D., Bessant, J. and Sapsed, J. (2003b), "Knowledge Management Routines for Innovation Projects: Developing a

- Hierarchical Process Model", *International Journal of Innovation Management*, Vol. 7, p. 27-49.
- Turner, S. F. and Rindova, V. (2012), "A Balancing Act: How Organizations Pursue Consistency in Routine Functioning in the Face of Ongoing Change", *Organization Science*, Vol. 23, No. 1, p. 24-46.
- Tushman, M. L. and Romanelli, E. (1985), "Organizational Evolution: A Metamorphosis Model of Convergence and Reorientation", *Research in Organizational Behavior*, Vol. 7, p. 171-222.
- Ulrich, K. T. and Eppinger, S. D. (2004), *Product Design and Development*, (3rd ed), McGraw-Hill/Irwin, New York.
- Verma, D. and Sinha, K. K. (2002), "Toward a Theory of Project Interdependencies in High Tech R&D Environments", *Journal of Operations Management*, Vol. 20, No. 5, p. 451-468.
- Wallace, M. and Wray, A. (2011), *Critical Reading and Writing for Postgraduates*, (2nd ed), SAGE Publications Ltd, London.
- Wernerfelt, B. (1984), "A Resource-Based View of the Firm", *Strategic Management Journal*, Vol. 5, No. 2, p. 171-180.
- Winter, S. G. (2000), "The Satisficing Principle in Capability Learning", *Strategic Management Journal*, Vol. 21, No. 10/11, p. 981-996.
- Yin, R. K. (2009), *Case Study Research: Design and Methods*, (4th ed), Sage Publication Inc., Thousand Oaks, California.
- Zollo, M. and Winter, S. G. (2002), "Deliberate Learning and the Evolution of Dynamic Capabilities", *Organization Science*, Vol. 13, No. 3, p. 339-351.

APPENDICES

Appendix A Title and Abstract Screening

1. Adams, R., Bessant, J. and Phelps, R. (2006), "Innovation Management Measurement: A Review", *International Journal of Management Reviews*, Vol. 8, No. 1, p. 21-47.
2. Archer, N. P. and Ghasemzadeh, F. (1999), "An Integrated Framework for Project Portfolio Selection", *International Journal of Project Management*, Vol. 17, No. 4, p. 207-216.
3. Argouslidis, P. C. and Baltas, G. (2007), "Structure in Product Line Management: The Role of Formalization in Service Elimination Decisions", *Journal of the Academy of Marketing Science*, Vol. 35, No. 4, p. 475-491.
4. Barnett, M. L. (2008), "An Attention-Based View of Real Options Reasoning", *Academy of Management Review*, Vol. 33, No. 3, p. 606-628.
5. Bart, C. and Pujari, A. (2007), "The Performance Impact of Content and Process in Product Innovation Charters", *Journal of Product Innovation Management*, Vol. 24, No. 1, p. 3-19.
6. Bart, C. K. (1987), "Implementing "Growth" and "Harvest" Product Strategies", *California management review*, Vol. 29, No. 4, p. 139-156.
7. Bentzen, E., Christiansen, J. K. and Varnes, C. J. (2011), "What Attracts Decision Makers' Attention?", *Management Decision*, Vol. 49, No. 3, p. 330-349.
8. Besner, C. and Hobbs, B. (2008), "Discriminating Contexts and Project Management Best Practices on Innovative and Noninnovative Projects", *Project Management Journal*, Vol. 39, p. S123-S134.
9. Bourgeois III, L. J. and Brodwin, D. R. (1984), "Strategic Implementation: Five Approaches to an Elusive Phenomenon", *Strategic Management Journal*, Vol. 5, No. 3, p. 241-264.
10. Boyd, H. W. and Headen, R. S. (1978), "Definition and Management of the Product-Market Portfolio", *Industrial Marketing Management*, Vol. 7, No. 5, p. 337-346.
11. Cardozo, R. N. and Smith, J., David K. (1983), "Applying Financial Portfolio Theory to Product Portfolio Decisions: An Empirical Study", *Journal of Marketing*, Vol. 47, No. 2, p. 110-119.
12. Chakravarthy, B. S. (1984), "Strategic Self-Renewal: A Planning Framework for Today", *Academy of Management Review*, Vol. 9, No. 3, p. 536-547.
13. Chakravarthy, B. S. and Lorange, P. (1984), "Managing Strategic Adaptation: Options in Administrative Systems Design", *Interfaces*, Vol. 14, No. 1, p. 34-46.
14. Chen, Y., Carrillo, J. E., Vakharia, A. J. and Sin, P. (2010), "Fusion Product Planning: A Market Offering Perspective", *Decision Sciences*, Vol. 41, No. 2, p. 325-353.
15. Closs, D. J., Jacobs, M. A., Swink, M. and Webb, G. S. (2008), "Toward a Theory of Competencies for the Management of Product Complexity: Six Case Studies", *Journal of Operations Management*, Vol. 26, No. 5, p. 590-610.

16. Cooper, R. G., Edgett, S. J. and Kleinschmidt, E. J. (2000), "New Problems, New Solutions: Making Portfolio Management More Effective", *Research Technology Management*, Vol. 43, No. 2, p. 18-33.
17. Cunha, M. P. E. and Comes, J. E. (2003), "Order and Disorder in Product Innovation Models", *Creativity & Innovation Management*, Vol. 12, No. 3, p. 174-187.
18. Dooley, L., Lupton, G. and O'Sullivan, D. (2005), "Multiple Project Management: A Modern Competitive Necessity", *Journal of Manufacturing Technology Management*, Vol. 16, No. 5/6, p. 466-482.
19. Dougherty, D. (2001), "Reimagining The Differentiation And Integration Of Work For Sustained Product Innovation", *Organization Science*, Vol. 12, No. 5, p. 612-631.
20. Dutton, J. E., Fahey, L. and Narayanan, V. K. (1983), "Toward Understanding Strategic Issue Diagnosis", *Strategic Management Journal*, Vol. 4, No. 4, p. 307-323.
21. Eisenhardt, K. M. (1999), "Strategy as Strategic Decision Making", *Sloan management review*, Vol. 40, No. 3, p. 65-72.
22. Gemic-Ozkan, B., Wu, S. D., Linderoth, J. T. and Moore, J. E. (2010), "R&D Project Portfolio Analysis for the Semiconductor Industry", *Operations research*, Vol. 58, No. 6, p. 1548-1563.
23. Grant, R. M. (2003), "Strategic Planning in a Turbulent Environment: Evidence From the Oil Majors", *Strategic Management Journal*, Vol. 24, No. 6, p. 491-517.
24. Jackson, B. (1983), "Decision Methods for Selecting a Portfolio of R&D Projects", *Research Management*, Vol. 26, No. 5, p. 21.
25. Jemison, D. B. (1981), "The Importance of an Integrative Approach To Strategic Management Research", *Academy of Management Review*, Vol. 6, No. 4, p. 601-608.
26. Johnson, G., Melin, L. and Whittington, R. (2003), "Micro Strategy and Strategizing: Towards an Activity-Based View", *Journal of Management Studies*, Vol. 40, No. 1, p. 3-22.
27. Kelley, D. (2009), "Adaptation and Organizational Connectedness in Corporate Radical Innovation Programs", *Journal of Product Innovation Management*, Vol. 26, No. 5, p. 487-501.
28. Kester, L., Griffin, A., Hultink, E. J. and Lauche, K. (2011), "Exploring Portfolio Decision-Making Processes", *Journal of Product Innovation Management*, Vol. 28, No. 5, p. 641-661.
29. Khurana, A. and Rosenthal, S. R. (1997), "Integrating the Fuzzy Front End of New Product Development", *Sloan management review*, Vol. 38, No. 2, p. 103-120.
30. Killen, C. P. and Kjaer, C. (2012), "Understanding Project Interdependencies: the Role of Visual Representation, Culture And Process", *International Journal of Project Management*, Vol. 30, No. 5, p. 554-566.
31. Lant, T. K. and Hewlin, P. F. (2002), "Information Cues and Decision Making: the

- Effects of Learning, Momentum, and Social Comparison in Competing Teams", *Group & Organization Management*, Vol. 27, No. 3, p. 374-407.
32. Lindstedt, M., Liesio, J. and Salo, A. (2008), "Participatory Development of a Strategic Product Portfolio in a Telecommunication Company", *International Journal of Technology Management*, Vol. 42, No. 3, p. 250-266.
 33. Linton, J. D., Walsh, S. T. and Morabito, J. (2002), "Analysis, Ranking and Selection of R&D Projects in a Portfolio", *R&D Management*, Vol. 32, No. 2, p. 139-148.
 34. Lorange, P. and Roos, J. (1992), "Tailor-Made Strategic Processes to Meet the Firm's Portfolio and Financial Pressures: An Empirical Study", *Scandinavian International Business Review*, Vol. 1, No. 1, p. 20-38.
 35. Maritan, C. A. (2001), "Capital Investment as Investing in Organizational Capabilities: An Empirically Grounded Process Model", *Academy of Management Journal*, Vol. 44, No. 3, p. 513-531.
 36. McCarthy, I. P., Tsinopoulos, C., Allen, P. and Rose-Anderssen, C. (2006), "New Product Development as a Complex Adaptive System of Decisions", *Journal of Product Innovation Management*, Vol. 23, No. 5, p. 437-456.
 37. McCrea, E. and Betts, S. C. (2008), "Failing to Learn from Failure: An Exploratory Study of Corporate Entrepreneurship Outcomes", *Academy of Strategic Management Journal*, Vol. 7, No. 1, p. 111-132.
 38. McNally, R. C., Durmusoglu, S. S., Calantone, R. J. and Harmancioglu, N. (2009), "Exploring New Product Portfolio Management Decisions: The role of managers' dispositional traits", *Industrial Marketing Management*, Vol. 38, No. 1, p. 127-143.
 39. Milosevic, D. Z. and Sabin Srivannaboon (2006), "A Theoretical Framework For Aligning Project Management With Business Strategy", *Project Management Journal*, Vol. 37, No. 3, p. 98-110.
 40. Moenaert, R. K., Robben, H., Antioco, M., de Schamphelaere, V. and Roks, E. (2010), "Strategic Innovation Decisions: What You Foresee Is Not What You Get", *Journal of Product Innovation Management*, Vol. 27, No. 6, p. 840-855.
 41. Montoya-Weiss, M. and Calantone, R. J. (1999), "Development and Implementation of a Segment Selection Procedure for Industrial Product Markers", *Marketing Science*, Vol. 18, No. 3, p. 373-395.
 42. Morris, P. W. G. and Jamieson, A. (2005), "Moving from Corporate Strategy to Project Strategy", *Project Management Journal*, Vol. 36, No. 4, p. 5-18.
 43. Müller, R., Martinsuo, M. and Blomquist, T. (2008), "Project Portfolio Control and Portfolio Management Performance in Different Contexts", *Project Management Journal*, Vol. 39, No. 3, p. 28-42.
 44. Narayanan, V. K., Colwell, K. and Douglas, F. L. (2009), "Building Organizational and Scientific Platforms in the Pharmaceutical Industry: A Process Perspective on the Development of Dynamic Capabilities", *British Journal of Management*, Vol. 20, p. S25-S40.
 45. Noda, T. and Bower, J. L. (1996), "Strategy Making as Iterated Processes of

- Resource Allocation", *Strategic Management Journal*, Vol. 17, p. 159-192.
46. O'Connor, G. C. (2008), "Major Innovation as a Dynamic Capability: A Systems Approach", *Journal of Product Innovation Management*, Vol. 25, No. 4, p. 313-330.
 47. Paladino, A. (2007), "Investigating the Drivers of Innovation and New Product Success: A Comparison of Strategic Orientations", *Journal of Product Innovation Management*, Vol. 24, No. 6, p. 534-553.
 48. Perks, H. (2007), "Inter-functional Integration and Industrial New Product Portfolio Decision Making: Exploring and Articulating the Linkages", *Creativity and Innovation Management*, Vol. 16, No. 2, p. 152-164.
 49. Poskela, J. (2007), "Strategic and Operative Level Front-End Innovation Activities — Integration Perspective", *International Journal of Innovation & Technology Management*, Vol. 4, No. 4, p. 433-456.
 50. Poskela, J. and Martinsuo, M. (2009), "Management Control and Strategic Renewal in the Front End of Innovation", *Journal of Product Innovation Management*, Vol. 26, No. 6, p. 671-684.
 51. Rabino, S. and Wright, A. (1985), "Financial Evaluation of the Product Line", *Journal of Product Innovation Management*, Vol. 2, No. 1, p. 56-65.
 52. Smit, H. T. J. and Trigeorgis, L. (2006), "Strategic Planning: Valuing and Managing Portfolios of Real Options", *R&D Management*, Vol. 36, No. 4, p. 403-419.
 53. Söderlund, J. (2005), "Developing Project Competence: Empirical Regularities in Competitive Project Operations", *International Journal of Innovation Management*, Vol. 9, No. 4, p. 451-480.
 54. Sorenson, O., Mcevily, S., Ren, C. R. and Roy, R. (2006), "Niche Width Revisited: Organizational Scope, Behavior and Performance", *Strategic Management Journal*, Vol. 27, No. 10, p. 915-936.
 55. Steffens, W., Martinsuo, M. and Artto, K. (2007), "Change Decisions In Product Development Projects", *International Journal of Project Management*, Vol. 25, No. 7, p. 702-713.
 56. Thomas, H. (1985), "Decision Analysis and Strategic Management of Research and Development: A Comparison Between Applications in Electronics and Ethical Pharmaceuticals", *R & D Management*, Vol. 15, No. 1, p. 3-22.
 57. Tranfield, D., Young, M., Partington, D., Bessant, J. and Sapsed, J. (2003), "Knowledge Management Routines for Innovation Projects: Developing a Hierarchical Process Model", *International Journal of Innovation Management*, Vol. 7, No. 1, p. 27-49.
 58. Vyas, N. M. (1993), "Industrial Product Elimination Decisions: Some Complex Issues", *European Journal of Marketing*, Vol. 27, No. 4, p. 58-76.
 59. Wheelwright, S. C. (1984), "Strategy, Management, and Strategic Planning Approaches", *Interfaces*, Vol. 14, No. 1, p. 19-33.

Appendix B Full Text Screening

1. Adams, R., Bessant, J. and Phelps, R. (2006), "Innovation Management Measurement: A Review", *International Journal of Management Reviews*, Vol. 8, No. 1, p. 21-47.
2. Archer, N. P. and Ghasemzadeh, F. (1999), "An Integrated Framework for Project Portfolio Selection", *International Journal of Project Management*, Vol. 17, No. 4, p. 207-216.
3. Bentzen, E., Christiansen, J. K. and Varnes, C. J. (2011), "What Attracts Decision Makers' Attention?", *Management Decision*, Vol. 49, No. 3, p. 330-349.
4. Closs, D., Jacobs, M., Swink, M. and Webb, G. (2008), "Toward a Theory of Competencies for the Management of Product Complexity: Six Case Studies", *Journal of Operations Management*, Vol. 26, p. 590-610.
5. Cooper, R. G., Edgett, S. J. and Kleinschmidt, E. J. (2000), "New Problems, New Solutions: Making Portfolio Management More Effective", *Research Technology Management*, Vol. 43, No. 2, p. 18-33.
6. Johnson, G., Melin, L. and Whittington, R. (2003), "Micro Strategy and Strategizing: Towards an Activity-Based View", *Journal of Management Studies*, Vol. 40, No. 1, p. 3-22.
7. Kester, L., Griffin, A., Hultink, E. J. and Lauche, K. (2011), "Exploring Portfolio Decision-Making Processes", *The Journal of Product Innovation Management*, Vol. 28, No. 5, p. 641-661.
8. Khurana, A. and Rosenthal, S. R. (1997), "Integrating the Fuzzy Front End of New Product Development", *Sloan management review*, Vol. 38, No. 2, p. 103-120.
9. Killen, C. P. and Kjaer, C. (2012), "Understanding Project Interdependencies: the Role of Visual Representation, Culture and Process", *International Journal of Project Management*, Vol. 30, No. 5, p. 554-566.
10. Lant, T. K. and Hewlin, P. F. (2002), "Information Cues and Decision Making: The Effects of Learning, Momentum, and Social Comparison in Competing Teams", *Group & Organization Management*, Vol. 27, No. 3, p. 374-407.
11. Lindstedt, M., Liesio, J. and Salo, A. (2008), "Participatory Development of a Strategic Product Portfolio in a Telecommunication Company", *International Journal of Technology Management*, Vol. 42, No. 3, p. 250-266.
12. McNally, R. C., Durmusoglu, S. S., Calantone, R. J. and Harmancioglu, N. (2009), "Exploring New Product Portfolio Management Decisions: The Role of Managers' Dispositional Traits", *Industrial Marketing Management*, Vol. 38, No. 1, p. 127-143.
13. Moenaert, R. K., Robben, H., Antioco, M., de Schamphelaere, V. and Roks, E. (2010), "Strategic Innovation Decisions: What You Foresee Is Not What You Get", *Journal of Product Innovation Management*, Vol. 27, No. 6, p. 840-855.
14. Müller, R., Martinsuo, M. and Blomquist, T. (2008), "Project Portfolio Control and Portfolio Management Performance in Different Contexts", *Project Management*

- Journal*, Vol. 39, No. 3, p. 28-42.
15. Noda, T. and Bower, J. L. (1996), "Strategy Making as Iterated Processes of Resource Allocation", *Strategic Management Journal*, Vol. 17, p. 159-192.
 16. O'Connor, G. C. (2008), "Major Innovation as a Dynamic Capability: A Systems Approach", *Journal of Product Innovation Management*, Vol. 25, No. 4, p. 313-330.
 17. Perks, H. (2007), "Inter-Functional Integration and Industrial New Product Portfolio Decision Making: Exploring and Articulating the Linkages", *Creativity and Innovation Management*, Vol. 16, p. 152-164.
 18. Poskela, J. (2007), "Strategic and Operative Level Front-End Innovation Activities — Integration Perspective", *International Journal of Innovation & Technology Management*, Vol. 4, No. 4, p. 433-456.
 19. Poskela, J. and Martinsuo, M. (2009), "Management Control and Strategic Renewal in the Front End of Innovation", *Journal of Product Innovation Management*, Vol. 26, No. 6, p. 671-684.
 20. Steffens, W., Martinsuo, M. and Artto, K. (2007), "Change Decisions in Product Development Projects", *International Journal of Project Management*, Vol. 25, p. 702-713.
 21. Tranfield, D., Young, M., Partington, D., Bessant, J. and Sapsed, J. (2003), "Knowledge Management Routines for Innovation Projects: Developing a Hierarchical Process Model", *International Journal of Innovation Management*, Vol. 7, No. 1, p. 27-49.

Appendix C Other Sources of Literature

APPENDIX C.1 EXPERTS' RECOMMENDATIONS

Prof Keith Goffin, PhD

1. Gino, F. and Pisano, G. (2008), "Toward a Theory of Behavioral Operations", *Manufacturing & Service Operations Management*, Vol. 10, No. 4, p. 676-691.
2. Nagji, B. and Tuff, G. (2012), "Managing Your Innovation Portfolio", *Harvard Business Review*, Vol. 90, No. 5, p. 66-74.

Prof Gina Colarelli O'Connor, PhD

1. Dosi, G., Nelson, R. R. and Winter, S. G. 2000, "Introduction: The Nature and Dynamics of Organizational Capabilities", in: Dosi, G., Nelson, R. R. & Winter, S. G. (eds.), *The Nature and Dynamics of Organizational Capabilities*, Oxford University Press, New York, p. 1-22.
2. Emirbayer, M. and Mische, A. (1998), "What Is Agency?", *The American Journal of Sociology*, Vol. 103, p. 962-1023.
3. Feldman, M. S. and Orlikowski, W. J. (2011), "Theorizing Practice and Practicing Theory", *Organization Science*, Vol. 22, No. 5, p. 1240-1253.
4. Howard-Grenville, J. A. (2005), "The Persistence of Flexible Organizational Routines: The Role of Agency and Organizational Context", *Organization Science*, Vol. 16, No. 6, p. 618-636.
5. Levinthal, D. and Rerup, C. (2006), "Crossing an Apparent Chasm: Bridging Mindful and Less-Mindful Perspectives on Organizational Learning", *Organization Science*, Vol. 17, No. 4, p. 502-513.
6. Peters, L. and O'Connor, G. C. (2012), *A Typology of Routines: Demonstrating Transformational Routines as One of Several Types*, Lally School of Management & Technology, Rensselaer Polytechnic Institute, Troy, NY (Working Paper).
7. Salvato, C. (2009), "Capabilities Unveiled: The Role of Ordinary Activities in the Evolution of Product Development Processes", *Organization science*, Vol. 20, No. 2, p. 384-409.
8. Salvato, C. and Rerup, C. (2011), "Beyond Collective Entities: Multilevel Research on Organizational Routines and Capabilities", *Journal of Management*, Vol. 37, No. 2, p. 468-490.
9. Turner, S. F. and Rindova, V. (2012), "A Balancing Act: How Organizations Pursue Consistency in Routine Functioning in the Face of Ongoing Change", *Organization Science*, Vol. 23, No. 1, p. 24-46.

APPENDIX C.2 INDEPENDENT SELECTION

1. Cardozo, R. N. and Wind, J. (1985), "Risk Return Approach to Product Portfolio Strategy", *Long Range Planning*, Vol. 18, No. 2, p. 77-85.

2. Cooper, R. G., Edgett, S. J. and Kleinschmidt, E. J. (1999), "New Product Portfolio Management: Practises and Performance", *Journal of Product Innovation Management*, Vol. 16, No. 4, p. 333-351.
3. Hutzschenreuter, T. and Kleindienst, I. (2006), "Strategy-Process Research: What Have We Learned and What Is Still to Be Explored.", *Journal of Management*, Vol. 32, No. 5, p. 673-720.
4. Killen, C. P., Jugdev, K., Drouin, N. and Petit, Y. (2012), "Advancing Project and Portfolio Management Research: Applying Strategic Management Theories", *International Journal of Project Management*, Vol. 30, p. 525-538.
5. Martinsuo, M. and Poskela, J. (2011), "Use of Evaluation Criteria and Innovation Performance in the Front End of Innovation", *Journal of Product Innovation Management*, Vol. 28, No. 6, p. 896-914.
6. Mazzolini, R. (1981), "How Strategic Decisions Are Made", *Long Range Planning*, Vol. 14, No. 3, p. 85-96.

APPENDIX C.3 CROSS-REFERENCING

1. Cooper, R. G. (2008), "Perspective: The Stage-Gate® Idea-to-Launch Process - Update, What's New, and Nexgen Systems", *Journal of Product Innovation Management*, Vol. 25, No. 3, p. 213-232.
2. Dean, J. W. J. and Sharfman, M. P. (1996), "Does Decision Process Matter? A Study of Strategic Decision-Making Effectiveness", *Academy of Management Journal*, Vol. 39, No. 2, p. 368-396.

Appendix D Quality Assessment of the Articles

Articles	Level				Included-I OR Excluded-E
	0-Absence, 1-Low, 2-Medium, 3-High, NA-Not Applicable	Contribution	Theory	Methodology	
1. Adams, R., Bessant, J. and Phelps, R. (2006), "Innovation Management Measurement: A Review", <i>International Journal of Management Reviews</i> , Vol. 8, No. 1, p. 21-47.	2	1	NA	NA	I
2. Archer, N. P. and Ghasemzadeh, F. (1999), "An Integrated Framework for Project Portfolio Selection", <i>International Journal of Project Management</i> , Vol. 17, No. 4, p. 207-216.	2	1	1	NA	I
3. Bentzen, E., Christiansen, J. K. and Varnes, C. J. (2011), "What Attracts Decision Makers' Attention?", <i>Management Decision</i> , Vol. 49, No. 3, p. 330-349.	2	1	2	1	I
4. Cardozo, R. N. and Wind, J. (1985), "Risk Return Approach to Product Portfolio Strategy", <i>Long Range Planning</i> , Vol. 18, No. 2, p. 77-85.	2	2	NA	NA	I
5. Closs, D., Jacobs, M., Swink, M. and Webb, G. (2008), "Toward a Theory of Competencies for the Management of Product Complexity: Six Case Studies", <i>Journal of Operations Management</i> , Vol. 26, p. 590-610.	2	2	2	2	I
6. Cooper, R. G. (2008), "Perspective: The Stage-Gate® Idea-to-Launch Process - Update, What's New, and Nexgen Systems", <i>Journal of Product Innovation Management</i> , Vol. 25, No. 3, p. 213-232.	2	2	3	NA	I
7. Cooper, R. G., Edgett, S. J. and Kleinschmidt, E. J. (1999), "New Product Portfolio Management: Practises and Performance", <i>Journal of Product Innovation Management</i> , Vol. 16, No. 4, p. 333-351.	2	1	NA	NA	I
8. Cooper, R. G., Edgett, S. J. and Kleinschmidt, E. J. (2000), "New Problems, New Solutions: Making Portfolio Management More Effective", <i>Research Technology Management</i> , Vol. 43, No. 2, p. 18-33.	1	1	NA	NA	I
9. Dean, J. W. J. and Sharfman, M. P. (1996), "Does Decision Process Matter? A Study of Strategic Decision-Making Effectiveness", <i>Academy of Management Journal</i> , Vol. 39, No. 2, p. 368-396.	2	3	3	3	I

Articles	Level				Included-I OR Excluded-E
	0-Absence, 1-Low, 2-Medium, 3-High, NA-Not Applicable				
	Contribution	Theory	Methodology	Data Analysis	
10. Dosi, G., Nelson, R. R. and Winter, S. G. 2000, "Introduction: The Nature and Dynamics of Organizational Capabilities", in: Dosi, G., Nelson, R. R. & Winter, S. G. (eds.), <i>The Nature and Dynamics of Organizational Capabilities</i> , Oxford University Press, New York, p. 1-22	3	3	NA	NA	I
11. Emirbayer, M. and Mische, A. (1998), "What Is Agency?", <i>The American Journal of Sociology</i> , Vol. 103, p. 962-1023.	2	3	NA	NA	I
12. Feldman, M. S. and Orlikowski, W. J. (2011), "Theorizing Practice and Practicing Theory", <i>Organization Science</i> , Vol. 22, No. 5, p. 1240-1253.	3	2	NA	NA	I
13. Gino, F. and Pisano, G. (2008), "Toward a Theory of Behavioral Operations", <i>Manufacturing & Service Operations Management</i> , Vol. 10, No. 4, p. 676-691.	3	2	NA	NA	I
14. Howard-Grenville, J. A. (2005), "The Persistence of Flexible Organizational Routines: The Role of Agency and Organizational Context", <i>Organization Science</i> , Vol. 16, No. 6, p. 618-636.	3	3	NA	NA	I
15. Hutzschenreuter, T. and Kleindienst, I. (2006), "Strategy-Process Research: What Have We Learned and What Is Still to Be Explored.", <i>Journal of Management</i> , Vol. 32, No. 5, p. 673-720.	3	2	NA	NA	I
16. Johnson, G., Melin, L. and Whittington, R. (2003), "Micro Strategy and Strategizing: Towards an Activity-Based View", <i>Journal of Management Studies</i> , Vol. 40, No. 1, p. 3-22.	3	2	NA	NA	I
17. Kester, L., Griffin, A., Hultink, E. J. and Lauche, K. (2011), "Exploring Portfolio Decision-Making Processes", <i>Journal of Product Innovation Management</i> , Vol. 28, No. 5, p. 641-661.	3	2	3	NA	I
18. Khurana, A. and Rosenthal, S. R. (1997), "Integrating the Fuzzy Front End of New Product Development", <i>Sloan management review</i> , Vol. 38, No. 2, p. 103-120.	2	2	3	2	I

Articles	Level				Included-I OR Excluded-E
	0-Absence, 1-Low, 2-Medium, 3-High, NA-Not Applicable	Contribution	Theory	Methodology	
19. Killen, C. P., Jugdev, K., Drouin, N. and Petit, Y. (2012), "Advancing Project and Portfolio Management Research: Applying Strategic Management Theories", <i>International Journal of Project Management</i> , Vol. 30, p. 525-538.	2	2	1	NA	I
20. Killen, C. P. and Kjaer, C. (2012), "Understanding Project Interdependencies: the Role of Visual Representation, Culture and Process", <i>International Journal of Project Management</i> , Vol. 30, No. 5, p. 554-566.	1	1	1	1	I
21. Lant, T. K. and Hewlin, P. F. (2002), "Information Cues and Decision Making: The Effects of Learning, Momentum, and Social Comparison in Competing Teams", <i>Group & Organization Management</i> , Vol. 27, No. 3, p. 374-407.	1	1	1	2	I
22. Levinthal, D. and Rerup, C. (2006), "Crossing an Apparent Chasm: Bridging Mindful and Less-Mindful Perspectives on Organizational Learning", <i>Organization Science</i> , Vol. 17, No. 4, p. 502-513.	2	3	NA	NA	I
23. Lindstedt, M., Liesio, J. and Salo, A. (2008), "Participatory Development of a Strategic Product Portfolio in a Telecommunication Company", <i>International Journal of Technology Management</i> , Vol. 42, No. 3, p. 250-266.	1	1	NA	NA	I
24. Martinsuo, M. and Poskela, J. (2011), "Use of Evaluation Criteria and Innovation Performance in the Front End of Innovation", <i>Journal of Product Innovation Management</i> , Vol. 28, No. 6, p. 896-914.	2	2	3	2	I
25. Mazzolini, R. (1981), "How Strategic Decisions Are Made", <i>Long Range Planning</i> , Vol. 14, No. 3, p. 85-96.	2	2	NA	NA	I
26. McNally, R. C., Durmusoglu, S. S., Calantone, R. J. and Harmancioglu, N. (2009), "Exploring New Product Portfolio Management Decisions: The Role of Managers' Dispositional Traits", <i>Industrial Marketing Management</i> , Vol. 38, No. 1, p. 127-143.	2	2	2	2	I
27. Moenaert, R. K., Robben, H., Antioco, M., de Schamphelaere, V. and Roks, E. (2010), "Strategic Innovation Decisions: What You Foresee is not What You Get", <i>Journal of Product Innovation Management</i> , Vol. 27, No. 6, p. 840-855.	2	2	2	2	I

Articles	Level				Included-I OR Excluded-E
	0-Absence, 1-Low, 2-Medium, 3-High, NA-Not Applicable	Contribution	Theory	Methodology	
28. Müller, R., Martinsuo, M. and Blomquist, T. (2008), "Project Portfolio Control and Portfolio Management Performance in Different Contexts", <i>Project Management Journal</i> , Vol. 39, No. 3, p. 28-42.	1	1	2	1	I
29. Nagji, B. and Tuff, G. (2012), "Managing Your Innovation Portfolio", <i>Harvard Business Review</i> , Vol. 90, No. 5, p. 66-74.	1	1	NA	NA	I
30. Noda, T. and Bower, J. L. (1996), "Strategy Making as Iterated Processes of Resource Allocation", <i>Strategic Management Journal</i> , Vol. 17, p. 159-192.	3	3	3	3	I
31. O'Connor, G. C. (2008), "Major Innovation as a Dynamic Capability: A Systems Approach", <i>Journal of Product Innovation Management</i> , Vol. 25, No. 4, p. 313-330.	2	2	NA	NA	I
32. Perks, H. (2007), "Inter-Functional Integration and Industrial New Product Portfolio Decision Making: Exploring and Articulating the Linkages", <i>Creativity and Innovation Management</i> , Vol. 16, p. 152-164.	2	1	1	1	I
33. Peters, L. and O'Connor, G. C. (2012), <i>A Typology of Routines: Demonstrating Transformational Routines as One of Several Types</i> , Lally School of Management & Technology, Rensselaer Polytechnic Institute, Troy, NY (Working Paper).	3	3	3	2	I
34. Poskela, J. (2007), "Strategic and Operative Level Front-End Innovation Activities — Integration Perspective", <i>International Journal of Innovation & Technology Management</i> , Vol. 4, No. 4, p. 433-456.	2	2	1	3	I
35. Poskela, J. and Martinsuo, M. (2009), "Management Control and Strategic Renewal in the Front End of Innovation", <i>Journal of Product Innovation Management</i> , Vol. 26, No. 6, p. 671-684.	2	2	2	2	I
36. Salvato, C. (2009), "Capabilities Unveiled: The Role of Ordinary Activities in the Evolution of Product Development Processes", <i>Organization science</i> , Vol. 20, No. 2, p. 384-409.	2	2	3	2	I

Articles	Level 0-Absence, 1-Low, 2-Medium, 3-High, NA-Not Applicable				Included-I OR Excluded-E
	Contribution	Theory	Methodology	Data Analysis	
37. Salvato, C. and Rerup, C. (2011), "Beyond Collective Entities: Multilevel Research on Organizational Routines and Capabilities", <i>Journal of Management</i> , Vol. 37, No. 2, p. 468-490.	3	3	NA	NA	I
38. Steffens, W., Martinsuo, M. and Artto, K. (2007), "Change Decisions in Product Development Projects", <i>International Journal of Project Management</i> , Vol. 25, p. 702-713.	2	1	1	1	I
39. Tranfield, D., Young, M., Partington, D., Bessant, J. and Sapsed, J. (2003), "Knowledge Management Routines for Innovation Projects: Developing a Hierarchical Process Model", <i>International Journal of Innovation Management</i> , Vol. 7, No. 1, p. 27-49.	2	2	2	2	I
40. Turner, S. F. and Rindova, V. (2012), "A Balancing Act: How Organizations Pursue Consistency in Routine Functioning in the Face of Ongoing Change", <i>Organization Science</i> , Vol. 23, No. 1, p. 24-46.	2	2	3	3	I

Appendix E The Articles Selected

1. Adams, R., Bessant, J. and Phelps, R. (2006), "Innovation Management Measurement: A Review", *International Journal of Management Reviews*, Vol. 8, No. 1, p. 21-47.
2. Archer, N. P. and Ghasemzadeh, F. (1999), "An Integrated Framework for Project Portfolio Selection", *International Journal of Project Management*, Vol. 17, No. 4, p. 207-216.
3. Bentzen, E., Christiansen, J. K. and Varnes, C. J. (2011), "What Attracts Decision Makers' Attention?", *Management Decision*, Vol. 49, No. 3, p. 330-349.
4. Cardozo, R. N. and Wind, J. (1985), "Risk Return Approach to Product Portfolio Strategy", *Long Range Planning*, Vol. 18, No. 2, p. 77-85.
5. Closs, D., Jacobs, M., Swink, M. and Webb, G. (2008), "Toward a Theory of Competencies for the Management of Product Complexity: Six Case Studies", *Journal of Operations Management*, Vol. 26, p. 590-610.
6. Cooper, R. G. (2008), "Perspective: The Stage-Gate® Idea-to-Launch Process - Update, What's New, and Nexgen Systems", *Journal of Product Innovation Management*, Vol. 25, No. 3, p. 213-232.
7. Cooper, R. G., Edgett, S. J. and Kleinschmidt, E. J. (1999), "New Product Portfolio Management: Practises and Performance", *Journal of Product Innovation Management*, Vol. 16, No. 4, p. 333-351.
8. Cooper, R. G., Edgett, S. J. and Kleinschmidt, E. J. (2000), "New Problems, New Solutions: Making Portfolio Management More Effective", *Research Technology Management*, Vol. 43, No. 2, p. 18-33.
9. Dean, J. W. J. and Sharfman, M. P. (1996), "Does Decision Process Matter? A Study of Strategic Decision-Making Effectiveness", *Academy of Management Journal*, Vol. 39, No. 2, p. 368-396.
10. Dosi, G., Nelson, R. R. and Winter, S. G. 2000, "Introduction: The Nature and Dynamics of Organizational Capabilities", in: Dosi, G., Nelson, R. R. & Winter, S. G. (eds.), *The Nature and Dynamics of Organizational Capabilities*, Oxford University Press, New York, p. 1-22.
11. Emirbayer, M. and Mische, A. (1998), "What Is Agency?", *The American Journal of Sociology*, Vol. 103, p. 962-1023.
12. Feldman, M. S. and Orlikowski, W. J. (2011), "Theorizing Practice and Practicing Theory", *Organization Science*, Vol. 22, No. 5, p. 1240-1253.
13. Gino, F. and Pisano, G. (2008), "Toward a Theory of Behavioral Operations", *Manufacturing & Service Operations Management*, Vol. 10, No. 4, p. 676-691.
14. Howard-Grenville, J. A. (2005), "The Persistence of Flexible Organizational Routines: The Role of Agency and Organizational Context", *Organization Science*, Vol. 16, No. 6, p. 618-636.
15. Hutzschenreuter, T. and Kleindienst, I. (2006), "Strategy-Process Research: What

- Have We Learned and What Is Still to Be Explored.", *Journal of Management*, Vol. 32, No. 5, p. 673-720.
16. Johnson, G., Melin, L. and Whittington, R. (2003), "Micro Strategy and Strategizing: Towards an Activity-Based View", *Journal of Management Studies*, Vol. 40, No. 1, p. 3-22.
 17. Kester, L., Griffin, A., Hultink, E. J. and Lauche, K. (2011), "Exploring Portfolio Decision-Making Processes", *The Journal of Product Innovation Management*, Vol. 28, No. 5, p. 641-661.
 18. Khurana, A. and Rosenthal, S. R. (1997), "Integrating the Fuzzy Front End of New Product Development", *Sloan management review*, Vol. 38, No. 2, p. 103-120.
 19. Killen, C. P., Jugdev, K., Drouin, N. and Petit, Y. (2012), "Advancing Project and Portfolio Management Research: Applying Strategic Management Theories", *International Journal of Project Management*, Vol. 30, p. 525-538.
 20. Killen, C. P. and Kjaer, C. (2012), "Understanding Project Interdependencies: the Role of Visual Representation, Culture and Process", *International Journal of Project Management*, Vol. 30, No. 5, p. 554-566.
 21. Lant, T. K. and Hewlin, P. F. (2002), "Information Cues and Decision Making: The Effects of Learning, Momentum, and Social Comparison in Competing Teams", *Group & Organization Management*, Vol. 27, No. 3, p. 374-407.
 22. Levinthal, D. and Rerup, C. (2006), "Crossing an Apparent Chasm: Bridging Mindful and Less-Mindful Perspectives on Organizational Learning", *Organization Science*, Vol. 17, No. 4, p. 502-513.
 23. Lindstedt, M., Liesio, J. and Salo, A. (2008), "Participatory Development of a Strategic Product Portfolio in a Telecommunication Company", *International Journal of Technology Management*, Vol. 42, No. 3, p. 250-266.
 24. Martinsuo, M. and Poskela, J. (2011), "Use of Evaluation Criteria and Innovation Performance in the Front End of Innovation", *Journal of Product Innovation Management*, Vol. 28, No. 6, p. 896-914.
 25. Mazzolini, R. (1981), "How Strategic Decisions Are Made", *Long Range Planning*, Vol. 14, No. 3, p. 85-96.
 26. McNally, R. C., Durmusoglu, S. S., Calantone, R. J. and Harmancioglu, N. (2009), "Exploring New Product Portfolio Management Decisions: The Role of Managers' Dispositional Traits", *Industrial Marketing Management*, Vol. 38, No. 1, p. 127-143.
 27. Moenaert, R. K., Robben, H., Antioco, M., de Schamphelaere, V. and Roks, E. (2010), "Strategic Innovation Decisions: What You Foresee is not What You Get", *Journal of Product Innovation Management*, Vol. 27, No. 6, p. 840-855.
 28. Müller, R., Martinsuo, M. and Blomquist, T. (2008), "Project Portfolio Control and Portfolio Management Performance in Different Contexts", *Project Management Journal*, Vol. 39, No. 3, p. 28-42.
 29. Nagji, B. and Tuff, G. (2012), "Managing Your Innovation Portfolio", *Harvard Business Review*, Vol. 90, No. 5, p. 66-74.

30. Noda, T. and Bower, J. L. (1996), "Strategy Making as Iterated Processes of Resource Allocation", *Strategic Management Journal*, Vol. 17, p. 159-192.
31. O'Connor, G. C. (2008), "Major Innovation as a Dynamic Capability: A Systems Approach", *Journal of Product Innovation Management*, Vol. 25, No. 4, p. 313-330.
32. Perks, H. (2007), "Inter-Functional Integration and Industrial New Product Portfolio Decision Making: Exploring and Articulating the Linkages", *Creativity and Innovation Management*, Vol. 16, p. 152-164.
33. Peters, L. and O'Connor, G. C. (2012), *A Typology of Routines: Demonstrating Transformational Routines as One of Several Types*, Lally School of Management & Technology, Rensselaer Polytechnic Institute, Troy, NY (Working Paper).
34. Poskela, J. (2007), "Strategic and Operative Level Front-End Innovation Activities — Integration Perspective", *International Journal of Innovation & Technology Management*, Vol. 4, No. 4, p. 433-456.
35. Poskela, J. and Martinsuo, M. (2009), "Management Control and Strategic Renewal in the Front End of Innovation", *Journal of Product Innovation Management*, Vol. 26, No. 6, p. 671-684.
36. Salvato, C. (2009), "Capabilities Unveiled: The Role of Ordinary Activities in the Evolution of Product Development Processes", *Organization science*, Vol. 20, No. 2, p. 384-409.
37. Salvato, C. and Rerup, C. (2011), "Beyond Collective Entities: Multilevel Research on Organizational Routines and Capabilities", *Journal of Management*, Vol. 37, No. 2, p. 468-490.
38. Steffens, W., Martinsuo, M. and Artto, K. (2007), "Change Decisions in Product Development Projects", *International Journal of Project Management*, Vol. 25, p. 702-713.
39. Tranfield, D., Young, M., Partington, D., Bessant, J. and Sapsed, J. (2003), "Knowledge Management Routines for Innovation Projects: Developing a Hierarchical Process Model", *International Journal of Innovation Management*, Vol. 7, No. 1, p. 27-49.
40. Turner, S. F. and Rindova, V. (2012), "A Balancing Act: How Organizations Pursue Consistency in Routine Functioning in the Face of Ongoing Change", *Organization Science*, Vol. 23, No. 1, p. 24-46.

Appendix F Data Extraction

This section presents the key information of literature which is quoted directly from the original articles.

Adams, R., Bessant, J. and Phelps, R. (2006), "Innovation Management Measurement: A Review", <i>International Journal of Management Reviews</i> , Vol. 8, p. 21-47.	
Type of Article	Theoretical
Research question/ Aim	Reviews the literature as it relates to the measurement of innovation management in the context of a conceptual framework of process that provides the basis for a general measurement framework
Theory	-
Methodology	Literature review
Unit of Analysis	NA
Participants	NA
Industry	NA
Geography	NA
Hypothesis	NA
Data Collection	NA
Data Analysis	NA
Findings	NA
Conclusion	<ul style="list-style-type: none"> • Seven-dimensional conceptualization of the innovation management phenomenon: Inputs, knowledge management, strategy, organisation culture, portfolio management, project management, commercialisation • It is no longer sufficient to treat innovation as a linear process where resources are channelled at one end, from which emerges a new product or process.
Further research	NA

Archer, N. P. and Ghasemzadeh, F. (1999), "An integrated framework for project portfolio selection", <i>International Journal of Project Management</i> , vol. 17, no. 4, pp. 207-216.	
Type of Article	Theoretical
Research question/ Aim	<ul style="list-style-type: none"> • Evaluate briefly the current state of the art in project portfolio selection methods and to develop a number of related propositions for effective portfolio selection, based on the literature • Suggest an integrated framework to provide decision support for portfolio selection, allowing decision makers to utilise a desired subset of available methodologies in a flexible and logical manner • Describe a decision support system which can embody this framework in the support of portfolio selection activities
Theory	
Methodology	Conceptual
Unit of Analysis	NA
Participants	NA
Industry	NA
Geography	NA
Proposition	<ol style="list-style-type: none"> 1. Strategic decisions concerning portfolio focus and overall budget considerations should be made in a broader context that takes into account both external and internal business factors, before the project portfolio is selected. 2. A project selection framework should be flexible enough so that stakeholders can choose in advance the particular techniques or methodologies with which they are comfortable, in analyzing relevant data and making choices of the type of projects at hand. 3. To simplify the portfolio selection process, it should be organized into a number of stages, allowing decision makers to move logically towards an integrated consideration of projects most likely to be selected, based on sound theoretical models. 4. Users should not be overloaded with unneeded data, but should be able to access relevant data when it is needed. 5. Common measures should be chosen which can be calculated separately for each project under consideration. These will allow an equitable comparison of projects during the portfolio selection process. 6. Current projects that have reached major milestones or gates should be re-evaluated at the same time as new projects being considered for selection. This allows a combined portfolio to be generated within available resource constraints at regular intervals due to (a) project completion or abandonment, (b) new project proposals, (c) changes in strategic focus, (d) revisions to available resources, and (e) changes in the environment. 7. Screening should be used, based on carefully specified criteria, to eliminate projects from consideration before the portfolio selection process is undertaken. 8. Project interactions through direct dependencies or resource competition must be considered in portfolio selection. 9. Portfolio selection should take into account the time- dependent nature of project resource consumption. 10. Decision makers should be provided with interactive mechanisms for controlling and overriding portfolio selections generated by any algorithms or models, and they should also receive feedback on the consequences of such changes. 11. Project portfolio selection must be adaptable to group decision support environments.
Data Collection	NA
Data Analysis	NA
Findings	A framework for simplifying and organizing the project portfolio selection process.
Conclusion	NA

Further research	<ul style="list-style-type: none">• Determining which modeling techniques are preferred by decision makers, and how to simplify some of the more useful techniques to make them more acceptable• Finding in which situations input information requirements can be supported by data gathered from existing projects, and which inputs can be provided by estimates or values generated from economic models,• Examining the scope of strategic decisions which are made outside the purview of the portfolio selection process, to ease the process of portfolio selection.
------------------	--

Bentzen, E., Christiansen, J. K. and Varnes, C. J. (2011), "What attracts decision makers' attention?", <i>Management Decision</i> , vol. 49, no. 3, pp. 330-349.	
Type of Article	Empirical Research
Research question/ Aim	What factors attract decision makers' attention? <ul style="list-style-type: none"> • To Address the need for knowledge about the behaviour of decision makers based on observation from portfolio meetings. • To investigate how managers allocate their attention and the role of different factors for their attention.
Theory	Beyond rational decision-making. Decision makers' attention as important in complex setting with ambiguity.
Methodology	Quantitative Experimental (a real-life setting)
Unit of Analysis	Product Portfolio meeting.
Participants	VP of business units, chief scientists, portfolio manager and general manager.
Industry	Petrochemical
Geography	Denmark
Hypothesis	NA
Data Collection	Meeting observations, 62 projects, 3 months
Data Analysis	-
Findings	<ul style="list-style-type: none"> • Quality of information cannot explain the discernable differences in decision makers' attention to various projects. • Delayed projects cannot explain variations in attention patterns. • New project entering the corporate portfolio provide the single most significant and important effect on attention. • Ownership was the second most important parameter. <p>Within product development Jönsson (2004) found that organisational narratives and visions were more important for the shaping of new cars than were formal structures and systems and that the visions were developed simultaneous with the development activities</p>
Conclusion	-
Further research	-

Cardozo, R. N. and Wind, J. (1985), "Risk Return Approach to Product Portfolio Strategy", Long Range Planning, Vol. 18, p. 77-85.	
Type of Article	Theoretical
Aim	<ul style="list-style-type: none"> • Explains how organisations can apply Risk Return • How one company used this model.
Theory	
Methodology	NA
Unit of Analysis	NA
Participants	NA
Industry	NA
Geography	NA
Hypothesis	NA
Data Collection	NA
Data Analysis	NA
Findings	NA
Conclusion	<ul style="list-style-type: none"> • The analysis of productivity of the present portfolio and selection of target portfolios: (1) defining investments, (2) estimating returns and risks, (3) computing portfolio productivity (4) selecting desired sets of investments. • The advantageous of the model: <ul style="list-style-type: none"> • Relate corporate or divisional financial objectives of level an volatility of earnings directly to product/market choice • Uses explicit forecast to correlate with return • Considers not only level of return but also variation in return or risk • Provides manager multiple approaches to balancing resource-consuming and resource-generating product-market investment
Further research	

Closs, D., Jacobs, M., Swink, M. and Webb, G. (2008), "Toward a Theory of Competencies for the Management of Product Complexity: Six Case Studies", <i>Journal of Operations Management</i> , Vol. 26, p. 590-610.	
Type of Article	Empirical
Research questions	<ol style="list-style-type: none"> 1. What <i>factors drive</i> managerial decisions toward more or less complex product portfolios? 2. How do firms manage product complexity decisions to optimize their product portfolios? 3. What organisational structures, decision processes, and control systems are relevant and effective? 4. What theories describe how organisations cope with product portfolio complexity?
Theory	<ul style="list-style-type: none"> • A product portfolio is defined as the complete set of possible product configurations offered by a business unit at a given point in time (McGrath, 2001; Meyer and Lehnerd, 1997). • The complexity of an item stems from a multiplicity of elements, as well as from relationships among the elements. Further, the combination of multiplicity and relational aspects creates difficulties requiring resources be expended to process the item in question • Complexity is defined as a state of processing difficulty that results from a multiplicity of, and relatedness among, product architectural design elements. • Product portfolio complexity management is defined as the collective set of decisions, supporting processes, value systems, and initiatives pertaining to determining and implementing the most effective product portfolio (i.e., mix of product variants, feature sets, and component choices). • The complexity of a firm's product portfolio is influenced by myriad management decisions made in many functional areas over extended time periods.
Methodology	Qualitative, Case study (6 companies)
Unit of Analysis	SBU
Participants	NA
Industry	Manufacturers of durable goods (global)- Computer Server, Aircraft, Automotive , Agricultural Equipment, Telecommunications Equipment , Imaging Equipment
Geography	Global
Propositions	<ul style="list-style-type: none"> • P1: Business units that more clearly articulate and communicate product technology strategies achieve more profitable levels of product portfolio complexity. • P2: Business units that establish clearly defined, minimal numbers of product differentiating features achieve more profitable levels of product portfolio complexity. • P3: Business units that align their product/technology strategy with product complexity delivery strategies (i.e., marketing, supply, manufacturing, and logistics) will achieve more profitable levels of product portfolio complexity. • P4: Business units that organisationally separate product feature and core technology planning activities from specific product development projects achieve more profitable levels of product portfolio complexity. • P5: Business units that employ more rigorous, cross- functional review processes throughout product development and lifecycle management achieve more profitable levels of product portfolio complexity. • P6: Business units that establish explicit complexity targets achieve more profitable levels of product portfolio complexity. • P7: Business units that extensively use comprehensive product data management systems achieve more profitable levels of product portfolio complexity. • P8: Business units that develop decision analysis models tailored to the needs of internal decision makers achieve more profitable levels of product portfolio

	complexity.
Data Collection	<ul style="list-style-type: none"> • Structured interviews • Printed materials and quantitative data • A research findings conference
Data Analysis	-
Findings	<ul style="list-style-type: none"> • <i>Product portfolio complexity</i> mediates the relationship between <i>environmental drivers</i> and <i>business unit performance</i>. The <i>management competencies</i> identified in our research moderate these relationships. • <i>Driver- External Environment</i>: (1) technological change created by suppliers or other agents outside the firm's control; (2) Market diversity drives greater complexity; (3) Regulation or other mandated standardization drives firms towards reduced portfolio complexity. • <i>Moderator-Management competencies</i>: (1) product/technology portfolio strategy; (2) governance and organisational structure for product complexity management; (3) design information and decision support systems
Conclusion	<ul style="list-style-type: none"> • A clear and succinct definition of complexity. • The application of socio-technical systems theory as an appropriate theoretical lens for studying product portfolio complexity management.
Further research	<ul style="list-style-type: none"> • To extend this definition as it explores sub-dimensions of multiplicity and relatedness in product architectures. • This approach should be used as a basis for design of future research studies, which evaluate key competencies for the management of complexity.

Cooper, R. G. (2008), "Perspective: The Stage-Gate® Idea-to-Launch Process - Update, What's New, and NexGen Systems", <i>Journal of Product Innovation Management</i> , Vol. 25, No. 3, pp. 213-232	
Type of Article	Theoretical
Aim	<ul style="list-style-type: none"> • Providing understandings of the Stage-Gate system and its principles • Debunking some of the myths and misconceptions surrounding Stage-Gate • Dealing with some of the problems and challenges that users face
Theory	Stage-Gate process
Methodology	Conceptualisation of companies' practical experiences
Unit of Analysis	NA
Participants	NA
Industry	NA
Geography	NA
Hypothesis	NA
Data Collection	NA
Data Analysis	NA
Findings	<p>Debunking the Myths about Stage-Gate</p> <p>Not a functional, phased-reviewed process: is built for speed, the stages are cross-functional. This is a business process, not an R&D or marketing process.</p> <p>Not a rigid, Lock –Step Process</p> <p>Not a linear system</p> <p>Not as project control mechanism</p> <p>Not a dated, stagnant system</p> <p>Not a bureaucratic system</p> <p>Not a data entry scheme</p> <p>Not just a back-end or product delivery process</p> <p>Not the same as project management</p> <p>Dealing with common errors and fail points</p> <p>Problems with the Stage-Gate governance process</p> <p>Misapplying cost-cutting model to innovation project</p> <p>Trying to do portfolio management without a Stage-and-Gate process</p> <p>Too much bureaucracy in the idea-to-launch process</p> <p>Too much reliance on software as solution</p> <p>Expecting the impossible from a process</p> <p>Requires some effort</p> <p>Next-Generation Stage-Gate</p> <p>Scaled to suit different risk-level projects</p> <p>A flexible process</p> <p>An adaptable process</p> <p>An efficient, lean and rapid system</p> <p>More effective governance: use scorecards to make better go/kill decisions; employing success criteria at gates; self-evaluation as an input to each gate; displays of in-process metrics at gates; Integrated with portfolio management</p> <p>Accelerating gates</p> <p>Accountability, the postlaunch review and continuous improvement</p> <p>An open system</p>
Conclusion	<p>An effective Stage-Gate system yields positive results in terms of getting new products and services to market quickly, efficiently and profitability.</p> <p>New approaches that firms have built into their next-generation Stage-Gate systems: making the system more flexible, adaptive, and scalable; integration with portfolio management; incorporating accountability and continuous improvement; adapting the system to include open innovation</p>
Further research	NA

Cooper, R. G., Edgett, S. J. and Kleinschmidt, E. J. (1999), "New Product Portfolio Management: Practises and Performance", <i>Journal of Product Innovation Management</i> , Vol. 16, p. 333-351.	
Type of Article	Empirical Research
Aim	<ul style="list-style-type: none"> • To describe and characterize portfolio management and project prioritization methods used in industry, • To determine the relative popularity of each method, • To assess managements' perceptions of, and satisfaction with, alternate portfolio management methods, • To characterize the portfolio methods used, • To determine portfolio results achieved.
Theory	NA
Methodology	Mixed Sequential (Exploratory, survey)
Unit of Analysis	Business unit
Participants	Survey: 205 businesses
Industry	Multi industry: High technology (17.6%), Processed materials (8.3%), Industrial products (8.3%), Chemicals and advanced materials 28.3%), Health care products (6.3), Consumer goods (12.2%), Others (19.0%)
Geography	US
Proposition	NA
Data Collection	Exploratory: in-depth interview Survey: questionnaire with close-ended and open-ended questions
Data Analysis	-
Findings	-
Conclusion	<ul style="list-style-type: none"> • Financial models are used most often but they do not yield the best results. • Scoring models tend to produce much better portfolios in terms of the various performance metrics. • Four clusters of businesses were identified in terms of where they were located on a perception/satisfaction map: <ul style="list-style-type: none"> • <i>Benchmarks</i>, whose portfolio methods rated as high quality and they fit management well. • <i>Cowboy businesses</i>, which rely on an informal (or no) method to select their portfolio but this fits management's style well. • <i>Crossroads businesses</i>, which employ a well-rated, high-quality portfolio approach, but it does not seem to fit management well • <i>Duds</i> rate their portfolio approach poor on just about every metric. • <i>Benchmark</i> companies: <ul style="list-style-type: none"> • View portfolio management as very important. • Have an established, explicit, and formal method for portfolio management. The method they use features very clear and well-defined rules and procedures for portfolio management. • Tend to use multiple portfolio methods more: strategic and financial approaches; strategic approaches combined with bubble diagrams; and financial, strategic, and scoring models together. • The quality of the portfolio method appears to have much more impact on performance results than whether or not the method fits management's style.
Further research	NA

Cooper, R. G., Edgett, S. J. and Kleinschmidt, E. J. (2000), "New Problems, New Solutions: Making Portfolio Management More Effective", <i>Research Technology Management</i> , vol. 43, no. 2, pp. 18-33			
Type of Article	Practice		
Aim	To present some of the problems found in portfolio management practices and to offer some tentative solutions.		
Theory	Portfolio management: resource allocation, project selection and strategy		
Methodology	Research experience		
Unit of Analysis	NA		
Participants	NA		
Industry	NA		
Geography	NA		
Hypothesis	NA		
Data Collection	NA		
Data Analysis	NA		
Findings	<table border="0"> <tr> <td style="vertical-align: top;"> <p><i>Challenges:</i></p> <ol style="list-style-type: none"> 1. Too many projects, not enough resources 2. Projects selection methods fail to discriminate 3. Go/Kill decision without solid information 4. Too many small projects, too few major hits </td> <td style="vertical-align: top; border-left: 1px solid black; padding-left: 10px;"> <p><i>Solutions:</i></p> <p>Introduce resource capacity analysis</p> <p>Develop a product innovation and technology strategy (PTIS)</p> <p>Integrating portfolio management</p> <p>Employ Portfolio tools</p> </td> </tr> </table>	<p><i>Challenges:</i></p> <ol style="list-style-type: none"> 1. Too many projects, not enough resources 2. Projects selection methods fail to discriminate 3. Go/Kill decision without solid information 4. Too many small projects, too few major hits 	<p><i>Solutions:</i></p> <p>Introduce resource capacity analysis</p> <p>Develop a product innovation and technology strategy (PTIS)</p> <p>Integrating portfolio management</p> <p>Employ Portfolio tools</p>
<p><i>Challenges:</i></p> <ol style="list-style-type: none"> 1. Too many projects, not enough resources 2. Projects selection methods fail to discriminate 3. Go/Kill decision without solid information 4. Too many small projects, too few major hits 	<p><i>Solutions:</i></p> <p>Introduce resource capacity analysis</p> <p>Develop a product innovation and technology strategy (PTIS)</p> <p>Integrating portfolio management</p> <p>Employ Portfolio tools</p>		
Conclusion	NA		
Further research	NA		

Dean, J. W. J. and Sharfman, M. P. (1996), "Does Decision Process Matter? A Study of Strategic Decision-Making Effectiveness", <i>Academy of Management Journal</i> , Vol. 39, No. 2, p. 368-396.	
Type of Article	Empirical Research
Aim	To examine whether strategic decision-making processes are related to decision effectiveness.
Theory	<ul style="list-style-type: none"> • Assumption: (1) Decision processes are related to strategic choices; (2) Choices relate to outcomes. • Strategic Decision: First, the decisions had to be defined by the firm as strategic-as determining the overall direction of the firm (Quinn, 1980). Second, decisions had to be sufficiently recent that the firm as yet knew little or nothing about their effectiveness but would see clear outcomes within one to two years. • The relationships between aspects of strategic planning and firm performance. • The impact of structured conflict on performance. Two techniques-devil's advocacy (Cosier &Rechner, 1985) and dialectical inquiry (Mason &Mitroff, 1981)-have been found to result in better decisions than consensus methods (Schwenk, 1988). • Both decision processes and environmental factors shape strategic decision effectiveness.
Methodology	Quantitative Longitudinal, in order to provide enough time for the effects of the decisions to be observed and to increase confidence in the causal interpretation of the findings (Chakravarthy & Doz, 1992; Hart & Banbury, 1994).
Unit of Analysis	The strategic decision
Participants	<ul style="list-style-type: none"> • 52 decisions of high-level managers • 24 firms in 16 industries (annual sales: \$1.5 million to over \$3 billion and numbers of employees from 50 to 6,600)
Industry	Manufacturing industries: electronics, steel, apparel, footwear, paint and coatings, and chemicals (consumer and industrial markets)
Geography	US
Hypothesis	<p>H1: Procedural rationality will be positively related to strategic decision-making effectiveness.</p> <p>H2: Political behavior will be negatively related to strategic decision-making effectiveness.</p> <p>H3: Environmental instability will moderate the relationship between procedural rationality and decision-making effectiveness; this relationship will be stronger in unstable environments than in stable ones.</p>
Data Collection	Two waves of structured interviews
Data Analysis	-
Findings	<ul style="list-style-type: none"> • Procedural rationality (H1) is positively related to decision effectiveness • Political behavior (H2) is negatively related to effectiveness • The control variables were also significant • Environmental favorability and quality of implementation are both positively related to strategic decision effectiveness.
Conclusion	<ul style="list-style-type: none"> • Decision processes influence strategic decision-making effectiveness. • Environmental instability and quality of decision implementation play important roles in influencing decision effectiveness. • Environmental instability plays an important role in moderating the effects of environmental favorability on decision effectiveness.
Further research	<ul style="list-style-type: none"> • To Conduct case study research, so as to disentangle the complex strands of influence on decision effectiveness in any setting • To observe how the effectiveness of strategic decisions evolves over even longer periods of time. • A more detailed look at decision implementation.

- To evaluate the effect of decision processes on decision effectiveness would be well-advised to control for the variables of environmental instability and quality of decision implementation

Dosi, G., Nelson, R. R. and Winter, S. G. 2000. Introduction: The Nature and Dynamics of Organisational Capabilities. In: Dosi, G., Nelson, R. R. & Winter, S. G. (eds.), <i>The Nature and Dynamics of Organisational Capabilities</i> , Oxford University Press, New York, p. 1-22.	
Type of Article	Theoretical
Aim	To sketch the complex intellectual background of current research on capabilities, and to identify some of the areas where improved understanding of capabilities would be particularly useful.
Theory	NA
Methodology	NA
Unit of Analysis	NA
Participants	NA
Industry	NA
Geography	NA
Hypothesis	NA
Data Collection	NA
Data Analysis	NA
Findings	NA
Conclusion	<ul style="list-style-type: none"> • Capabilities involve <i>organized activity</i> and the exercise of capability is typically repetitious in substantial part. • <i>Routines</i> are units or ‘chunks’ of organized activity with a repetitive character. Routines are the <i>building blocks of capabilities</i>—although routines are not the only building blocks of capabilities. <i>Routines are the skills of an organisation’</i> is a metaphorical truth not a literal truth. • A fundamental proposition in evolutionary economics is that firms have ways of doing things that show strong elements of continuity. • Research on capabilities advances the evolutionary economics agenda in three significant ways: <ul style="list-style-type: none"> • It provides concrete examples and specific empirical evidence that illustrates and supports the view of firm behaviour taken in evolutionary theory. • The relationship between <i>capabilities</i> and <i>organisational routines</i>. Routines play a central role in the formulation of evolutionary theory offered by Nelson and Winter. • The capabilities discussion provides a bridge between the predominantly <i>descriptive concerns of evolutionary theory</i> and the <i>prescriptive analysis of firm strategy</i>. • Within any organisation, capabilities, in principle aimed to ‘<i>solve problems</i>’ in the broadest sense come anyhow together with <i>specific mechanism of governance</i> of potentially conflicting interests and incentives. • The links (and, over time, the co-evolution) between <i>organisational capabilities</i> and <i>governance structures</i> is another major field of inquiry ahead (for some hypotheses, cf. Coriat and Dosi 1998; see also Langlois and Foss 1999 and the remarks in Marengo et al.1999). • At the other, more abstract, end a few works—drawing also from ‘artificial sciences’ (e.g. artificial intelligence etc.), complexity theory, and cognitive psychology—try to formally represent the properties of <i>organisational capabilities</i> as <i>emergent</i> from some <i>combinatorial dynamics</i> among multiple underlying ‘bits of elementary knowledge’ (Marengo 1992; Birchenhall et al.1997; Marengo et al.1999). • Over the past several years a number of scholars studying the processes of economic development in rapidly growing countries have come to focus on organisational learning and organisational capabilities. • <i>The capabilities-based view</i>, on the other hand, sees <i>aggregate economic progress</i> largely as the consequence of a <i>multiplicity of actions at the firm level</i>. • Among the <i>external forces</i> that affect the quality of these performances are a

	number of aspects of the <i>environment</i> that might be subject to policy influence—particularly the competitive characteristics of input and output markets, the determinants of firm access to financial capital, and the legal framework surrounding ‘intellectual property’.
Further research	NA

Emirbayer, M. and Mische, A. (1998), "What Is Agency?", <i>American Journal of Sociology</i> , Vol. 103, p. 962-1023.	
Type of Article	Theoretical
Aims	<ul style="list-style-type: none"> • To analytically disaggregate agency into its several component element • To demonstrate the way in which these agentic dimensions interpenetrate with form of structure, • To point out the implication of such a conception of agency for empirical research.
Theory	<ul style="list-style-type: none"> • Agency as temporally constructed engagement by actors of different structural environments • Different constitutive elements of human agency: Iterational or habitual aspect, Projective capacity, Practical evaluative
Methodology	NA
Unit of Analysis	NA
Participants	NA
Industry	NA
Geography	NA
Hypothesis	NA
Data Collection	NA
Data Analysis	NA
Findings	NA
Conclusion	Actors are always living simultaneously in the past, future and present, and adjusting various temporalities of their empirical existence to one another in more or less imaginative or reflective ways.
Further research	To analyse the variable nature of the interplay between structure and agency.

Feldman, M. S. and Orlikowski, W. J. (2011), "Theorizing Practice and Practicing Theory", <i>Organisation Science</i> , Vol. 22, p. 1240-1253.	
Type of Article	Theoretical
Aim	To describe the emerging field of practice theory as it is practiced in relation to organisational phenomena
Theory	<ul style="list-style-type: none"> • Central to a <i>practice lens</i> is the notion that social life is an <i>ongoing production</i> and thus emerges through people's <i>recurrent actions</i>. • Three ways of studying <i>practice</i> (Orlikowski 2010): an <i>empirical</i> focus on how people act in organisational contexts, a <i>theoretical</i> focus on understanding relations between the <i>actions people take and the structures of organisational life</i>, and a <i>philosophical</i> focus on the constitutive role of practices in producing organisational reality. • A key set of theorizing moves: (1) that situated actions are <i>consequential</i> in the production of social life; (2) that dualisms are rejected as a way of theorizing and (3) that relations are <i>mutually constitutive</i>. These principles cannot be taken singly, but implicate one another. • Bourdieu (1990, p. 57): the <i>habitus</i> is a "generative principle of regulated improvisations... which reactivates the sense objectified in institutions."; • Giddens (1984): <i>practices</i> are those social actions that recursively produce and reproduce the structures that <i>constrain</i> and <i>enable</i> actions. • Schatzki (2002): the bundles of human activity that constitute practices enact social orders.
Methodology	NA
Unit of Analysis	NA
Participants	NA
Industry	NA
Geography	NA
Hypothesis	NA
Data Collection	NA
Data Analysis	NA
Findings	NA
Conclusion	<ul style="list-style-type: none"> • Theorizing routines as practices: <ul style="list-style-type: none"> (1) The <i>consequentiality</i> of action means not just that <i>routines</i> are created through <i>action</i> and do not exist without action, but also that the development of the <i>routine</i> occurs through the enactment of it. (2) There are <i>two primary dualities</i> engaged in theorizing routines as practices: <i>action/structure</i> and <i>stability/change</i>. (3) Both of these dualities are <i>relational</i> and <i>mutually constitutive</i>. In the <i>mutually constitutive</i> ways, <i>agency</i> is shaped by but also <i>produces, reinforces, and changes</i> its <i>structural</i> conditions • <i>Actions</i>, as performances or <i>performative</i> aspects, and <i>structures</i>, as <i>patterns or ostensive</i> aspects, are not oppositional but <i>mutually constitutive</i>. • Stability and change are different outcomes of the same dynamic rather than different dynamics. Change may be engaged in order to promote stability, and stability may be essential to bringing about change (Tsoukas and Chia 2002, Farjoun 2010). • Conceptualizing <i>routines</i> as <i>emergent</i> as well as <i>effortful</i> involves noticing how the work of reproduction subtly or dramatically alters the <i>routine</i> (Feldman 2000, 2003; Jarzabkowski et al. 2011). • People can repair the cycle so that it continues to produce outcomes that are similar to the ones that have been produced previously (<i>effortful accomplishment</i>). Alternatively, people can strive to enact new outcomes that more fully realize their ideas/ideals, or people can expand (or contract) their notions of what actions and outcomes are possible (<i>emergent accomplishments</i>).

	<ul style="list-style-type: none"> • Theorizing routines as practices emphasizes the <i>consequentiality</i> of the actions that people take while they are enacting routines and both the potential for change and the work that goes into stability. • Distinguishing the <i>ostensive</i> from the <i>formal rules</i> has brought attention to the <i>multiplicity</i> and <i>flexibility</i> of the <i>patterns</i> created as the enactment of organisational routines. • In practice theory the emphasis is on the <i>relationships</i> and <i>performances</i> that produce <i>outcomes</i>. • The reasons why practice theory is worth the trouble: (1) practice theory provides the basis for powerful <i>theoretical generalizations</i>; (2) practice theory has the capacity to offer important practical implications for practitioners. • The findings and insights of practice scholarship can identify organisational levers for enabling <i>change</i> in practices while supporting and <i>reinforcing</i> those practices that are working. • These levers identified by practice theory are neither <i>exogenous</i> to nor independent of the organisation, but are grounded in the <i>micro dynamics</i> of everyday <i>inter- actions</i> and highlight the importance of all participants' actions in producing organisational outcomes.
Further research	NA

Gino, F. and Pisano, G. (2008), "Toward a Theory of Behavioral Operations", <i>Manufacturing & Service Operations Management</i> , Vol. 10, No. 4, p. 676-691.	
Type of Article	Theoretical
Aims	<ul style="list-style-type: none"> • To provide a precise definition for behavioral operations • To highlight the limitations of current OM models in predicting outcomes in operations settings
Theory	
Methodology	Literature review
Unit of Analysis	NA
Participants	NA
Industry	NA
Geography	NA
Hypothesis	NA
Data Collection	NA
Data Analysis	NA
Findings	NA
Conclusion	<ul style="list-style-type: none"> • A behavioral approach to OM can lead to a better understanding of underlying drivers of operating system performance and also to a better understanding of puzzling "pathologies" (e.g., excess inventory, late product development projects, over-commitment to R&D projects, etc.). • A behavioral perspective can lead to a better identification of appropriate management interventions.
Further research	<ul style="list-style-type: none"> • <i>Replication studies</i> refer to research that attempts to replicate or test existing behavioral theories with data from OM contexts. This type of research uses behavioral decision-making theories and findings from the psychology literature as a starting point. • <i>Theory-testing studies</i> aim at examining OM theories in a laboratory setting. Like experimental economics research, theory-testing studies should have three purposes: (a) <i>normative</i>, aimed at designing laboratory experiments mimicking settings where theories make predictions; (b) <i>descriptive</i>, or designed to test behavior and explain deviations caused by psychological forces; and (c) <i>prescriptive</i>, aimed at suggesting debiasing techniques that can be used to reduce or eliminate systematic errors observed in people's behavior. • <i>Theory-generating studies</i> would build on existing mathematical OM models, addressing the same problems but with changed assumptions formulated based on managers' actual decisions and biases. • <i>Adaptation studies</i>. In this case, the research originates from OM problems, phenomena, or puzzles and focuses on potential behavioral explanations. • <i>OM-specific studies</i> use mixed methodologies, such as lab experiments, field-based research, modeling, and empirical analyses to investigate important OM problems. Their main purpose is to uncover new behavioral or cognitive factors that tend to arise in OM contexts.

Howard-Grenville, J. (2005), "The Persistence of Flexible Organisational Routines: The Role of Agency and Organisational Context", <i>Organisation Science</i> , vol. 16, no. 6, pp. 618-636.	
Type of Article	Empirical Research
Aims	<ul style="list-style-type: none"> To know about how the people enacting a routine and the context in which it is enacted influence both a routine's use at a given point in time and its change or persistence over the time. This paper focuses on routines that involve task performance, where these tasks are to be performed by a single group or interdependently by members of multiple groups within an organisation.
Methodology	Case study, Inductive, theory generating approach (Glaser and Strauss 1967, Numgami 1998) Researcher's role as participant
Participants	Strategic Planning Council meetings SPC Chairs, Engineers and managers
Industry	Semiconductor manufacturing (high-tech)
Unit of Analysis	Manufacturing process development
Geography	USA
Hypothesis/ Proposition	NA
Theory used	<ul style="list-style-type: none"> Routine as "a repetitive, recognisable pattern of interdependent actions, involving multiple actors (Feldman & Pentland, 2003, p. 96) New understanding of organisational routines: Organisational routines are not enacted habitually and with little discretion on the part of actors. Those who use routines make adjustments to their performance in response to prior outcome (Feldman, 2000) or they can intentionally change a routine through a collective learning process (Edmonson, 2001). Routines being used successfully in dynamic environments. Routines consist of both idealised, abstract understanding, or ostensive aspect, and specific performances in specific times and places, or performative aspects (Feldman & Pentland, 2003)
Data Collection	Participant observation (9 months) Field Notes, Semi-structured interview, Documents
Data Analysis	Selecting a Routine, within case analysis, between-case analysis
Findings	<ul style="list-style-type: none"> The more strongly embedded a <i>routine</i> is in other <i>structures</i>, the greater command and individual must have over these structures in order to produce change over time. Individuals embedded in <i>technology structures</i> might be oriented more to apply or project aspects of routines. If routines are experienced as primarily embedded cultural and coordination structures, orientations towards them might be more iterative, as the enactment of these structures tends to draw heavily from past. A <i>routine</i> embedded in <i>technological structure</i> may be altered by those whose power accrues from command over traditional allocative resources (money, knowledge and technical expertise. Changing a routine embedded in <i>coordination structure and cultural structure</i> may rely on more on the exercise of formal or informal authority to recognise patterns of interaction. The individuals with greater command over the resources will be better able to change embedded routines over time. Changing <i>routines</i> that are strongly embedded in cultural structures may rely heavily on the use of <i>authoritative and relational resources</i> because they can be used to frame and negotiate, over time, shared meaning, shared norms, and collectively identity.
Conclusion	<ul style="list-style-type: none"> Routines not as formulaic actions that connect stimuli and responses, but as <i>ongoing, situated accomplishments</i>. Routines are enacted simultaneously with other <i>structures</i>, including technological, coordination and <i>cultural structures</i> that generate overlapping

	<i>artefacts</i> and social expectation. Their embeddedness in these other structures and their deliberate, but not mindless, enactment gives flexible routines persistence over time.
Further research	The implications of embeddedness, agency and power for routine and organisational outcomes

Hutzschenreuter, T. and Kleindienst, I. (2006), "Strategy-Process Research: What Have We Learned and What Is Still to Be Explored.", <i>Journal of Management</i> , Vol. 32, p. 673-720.	
Type of Article	Theoretical
Aim	To attempts to provide guidance on what we have learned and what is still to be explored in strategy-process research.
Methodology	Literature Review
Participants	NA
Industry	NA
Unit of Analysis	NA
Geography	NA
Hypothesis	NA
Theory used	NA
Data Collection	NA
Data Analysis	NA
<p>Findings</p> <p><i>Integrative Framework:</i></p> <ul style="list-style-type: none"> • <i>Antecedents:</i> Environmental Context (uncertainty, complexity); Strategic context (analyzer, defender); Static organisational Characteristics (organisation size, organisation age); Dynamic organisational characteristics (routines, business process); Performance (economic, non-economic). • <i>Strategy Process:</i> Strategists' static characteristics; Strategists' personal and cognitive context; Issue characteristics; process characteristics; process outcome characteristics • <i>Outcomes:</i> Environmental Context; Strategic context; Static organisational Characteristics; Dynamic organisational characteristics; Performance. <p><i>Research stream:</i></p> <ul style="list-style-type: none"> • Stream 1: Antecedents' influence on strategy process • Stream 2: Antecedents' influence of outcomes • Stream 3: Strategy process's influence on strategy process • Stream 4: Strategy process's influence on outcomes. • The focus of today's research lies in the <i>planning-performance link</i> and the description of planning practices in organisations. • It was identified six main <i>perspectives</i> of strategy-process research representing the current intellectual structure of the field: <i>rational-mechanistic perspective, cognitive perspective, upper-echelon perspective, middle-management perspective, organic perspective, and micro perspective.</i> • 	
Conclusion	NA
<p><u>Further research</u></p> <ul style="list-style-type: none"> • Antecedents' influence on strategy process: Explore the effects of antecedents on issue characteristics Discover if and how antecedents influence strategy implementation; Studies that research the influence of antecedents on cognitive context ; Determine the role of antecedents in the development of dynamic organisational characteristics • Antecedents' influence of outcomes: Use configurational constructs; Link personal characteristics to issue characteristics • Strategy process's influence on strategy process: Study the relationship between implementation characteristics and outcomes ; Explore the characteristics of decisions made ex post to implementation • Strategy process's influence on outcomes: Extend research on personal characteristics beyond the effect on strategic context; Explore the effect of personality in contrast to governance on outcomes ; Conduct studies on the effect of implementation on performance; Uncover issue-specific, best-practice strategy processes • Strategists' context: Develop and provide tools and techniques to encounter cognitive biases • Strategy process: Conduct studies involving larger number of studies; Operationalize key constructs 	

Johnson, G., Melin, L. and Whittington, R. (2003), "Micro Strategy and Strategizing: Towards an Activity-Based View", <i>Journal of Management Studies</i> , vol. 40, no. 1, pp. 3-22.	
Type of Article	Theoretical
Research question/ Aim	An introductory paper provides a background to the origins, themes and papers of the Special Issue on Micro Strategy and Strategizing
Theory	<p>Contribution of Theory 1: Resource-Based View (RBC) A resource-based view (Barney, 1986, 1991): Sustainable advantage must lie in micro assets that are hard to discern and awkward to trade. A micro perspective highlights the value generated in the seeming minutiae of organisations, and in periphery as well as the centre. The resource-based view will advance as it shifts towards a micro-perspective capable of capturing both details and activity.</p> <p>Contribution of Theory 2: Institutional Theory A concern with 'the behaviour of organisations as entities and the nature and effects of their formal and collective parts' (Tolbert and Zucker, 1996, p.75). 'Most institutionalist prefer to focus on the structural environments, macro to micro-level effects, and the analytic autonomy of macro structures (DiMaggio and Powel, 1991, p.16). Seek to understand links between 'action and institution' by employing the concept of <i>scripts</i> (Barley & Tolbert, 1997; Johnson et al., 2000).</p> <p>Empirical Contributions 1: Corporate Diversification Alfred Chandler's (1962) <i>Strategy and Structure</i>. Macro oriented research have done very little to establish any positive relationships between diversification and performance. Grant et al. (1988), progress in diversification research requires small-sample, fine-grained investigations capable of capturing both subtlety of economically-valuable relationships and their sensitivity to managerial action or inaction.</p> <p>Empirical Contributions 2: Corporate Structures We know very little about the actual managerial activity involved in designing new organisational structures (Bate et al., 2000). The need to put the micro in the macro in order bot to uncover plausible linkages to performance and to offer tangible guides to managerial action.</p> <p>Process Research The process school has irrevocably opened up the black box of the organisation. Strategy is now recognised as an organisational phenomenon rather than a macro strategy problem detached from the internal dynamics of the organisation. With the application of social construction and socio cognitive perspectives, process research has demonstrated the potential to capture micro aspects of strategic actions made by human beings. Strategy process research contributes to the legitimization of small sample in-depth studies. Limitation:(1) Process research might tell us a good deal about the overall process of organisational decision-making and organisational change, but it has been less interested in the practical activity and tools necessary to make these processes happen; (2) Process research has been reluctant to query the role of managerial agency (Pettigrew, 1985); (3) A challenge for process research is the extent of its practical implications, prescriptive, overarching design of strategic change or decision-making process; (4) its separation from content issues; (5) lacks explicit links to strategy outcomes; (6) trapped within the particular.</p>
Methodology	NA
Unit of Analysis	NA
Participants	NA
Industry	NA
Geography	NA
Hypothesis	NA
Data Collection	NA

Data Analysis	NA
Findings	NA
Conclusion	<ul style="list-style-type: none"> • Micro strategy and strategizing is concerned with the same strategic issues, but in terms of 'the detailed processes and practices which constitute the day-to-day activities of organisation life and which relate to strategic outcomes'. • <i>Benefit</i>: Extending existing traditions of research; transcending divisions within the discipline; and offering practical, actionable guidance to practitioners • <i>Challenges</i>: (1) Macro level's aim is to explain organisational performance. What an activity-based view is trying to explain? It might be able to demonstrate how configurations of such assets take shape; (2) Knowledge accumulation; (3) Design of research. Micro studies have to be constrained in terms of their scope and unit of analysis. • Requires a close engagement with practice rather than a reliance on surrogate measures. It will benefit from the joint production of knowledge directly involving practitioners.
Further research	NA

Kester, L., Griffin, A., Hultink, E. J. and Lauche, K. (2011), "Exploring Portfolio Decision-Making Processes", <i>The Journal of Product Innovation Management</i> , vol. 28, no. 5, pp. 641-661	
Type of Article	Empirical Research
Research question/ Aim	<ul style="list-style-type: none"> • To study portfolio decision-making from an integrated perspective, looking at how decisions are made simultaneously across the full set of NPD projects in development. • To understand more completely how firms make NPD portfolio decisions: how to they make project selection and termination decisions across projects and over time; what inputs are required; what challenges they encounter in making decisions; and why these challenges occur • To develop a general model of the components of portfolio decision-making processes and their outcomes • Provide insights into how some of those components may be combined to contribute to portfolio decision-making effectiveness
Theory	<p>Literature: (Eggers, 2012); (Voss, Montoya-Weiss, & Voss, 2006); (Robert G Cooper, Edgett, & Kleinschmidt, 2000; 1999; 2001a; 2001b)</p> <p>Performance outcomes: strategic alignment, maximized portfolio value, balance</p> <p>The firms with the best-performing portfolios against these goals were more likely to use an explicit, established evaluation method with clear rules and procedures supported by management, that was applied consistently across all appropriate projects, and that considered decisions about all the projects in the portfolio simultaneously (Cooper et al., 2001b)</p>
Methodology	Multiple case study Grounded-theory
Unit of Analysis	Strategic business unit of a large firm or a medium-sized company
Participants	Senior manager
Industry	Medical devices, Financial service, Food
Geography	US, Europe
Hypothesis	NA
Data Collection	2 US's and 2 Europe's companies 9 months period Documents, semi-structured interviews, observing portfolio decision-making meetings
Data Analysis	Initial line-by-line coding, focus coding and axial coding (Glaser and Strauss, 1967). 14 core theoretical categories
Propositions/Findings	<p>Firms use a combination of evidence-based, power-based and opinion based decision-making processes in making NPD portfolio decisions.</p> <p>Achieving different aspects of NPD portfolio decision-making effectiveness depends upon the interactions between evidence-, power-, and opinion-based decision-making process.</p> <p><i>Corollary 1:</i> DM processes dominated by power- and opinion-based processes may be more agile, while processes dominated by evidence-based processes may be less agile</p> <p><i>Corollary 2:</i> DM processes dominated by power- and opinion-based processes are less likely to lead to decisions based on a portfolio mindset.</p> <p><i>Corollary 3:</i> DM processes dominated by evidence-based processes may reduce the ability to focus on those short-term tasks that will lead to long- term strategic goals, whereas power-based processes may lead to more focused effort.</p> <p>Cross-functional collaboration is associated with using evidence-based processes of portfolio decision-making.</p> <p>Practices of critical thinking are associated with using evidence-based processes of decision-making.</p> <p>Practices of market immersion are associated with using evidence-based processes of decision-making.</p>

	<p>High levels of politics are associated with using power-based processes of decision-making.</p> <p>High levels of experience-based intuition are associated with using opinion-based processes of decision-making.</p> <p>8a. Trust is positively associated with cross-functional collaboration</p> <p>8b. Trust is positively associated with practices of critical thinking</p> <p>8c. Trust is negatively associated with the level of politics in the firms</p> <p>9a. Collective ambition is positively associated with cross-functional collaboration</p> <p>9b. Collective ambition is negatively associated with the level of politics in the firm</p> <p>10a. Transformational leadership is positively associated with cross-functional collaboration</p> <p>10b. Transformational leadership is positively associated with practices of critical thinking</p> <p>10c. Transformational leadership is positively associated practices of market immersion.</p> <p>10d. Transformational leadership is positively associated with the building of experience-based intuition.</p> <p>10e. Transformational leadership is negatively associated with the degree of politics in the firm</p>
Conclusion	<ul style="list-style-type: none"> • The “how” of portfolio decision-making is complex. • Strategic decisions are made through some interaction between evidence-, power-, and opinion-based processes (the simultaneous investigation of them in this research constitutes a contribution of this literature). • Firms that are most effective in portfolio decision-making have a portfolio mindset (managers know exactly where each project is located in the development pipeline as this changes over time, which enables them to quickly detect and resolve potential bottleneck). • This research speculates that achieving strategic alignment, maximum portfolio value, and balance all may result from the firm’s ability to develop a portfolio mindset in their decision making • Focused effort may relate to achieving strategic alignment • Agility in decision-making may contribute to portfolio maximization by quickly eliminating projects that have become marginalized due to some changes in the environment. • This research shows that a number of different theoretical lenses need to be combined to advance understanding in this domain.
Further research	<ul style="list-style-type: none"> • Research should investigate further the relationships between the constructs, determine the extent to which there are independencies between them as well as feedback loops across them, and identify other potential moderators influencing the relationships between decision-making process and portfolio decision-making effectiveness. • Identify mechanisms by which manager can achieve changes in the specific parts of the portfolio decision-making system to improve the portfolio decision effectiveness

Khurana, A. and Rosenthal, S. R. (1997), "Integrating the Fuzzy Front End of New Product Development", <i>Sloan Management Review</i> , Vol. 38, p. 103-120.	
Type of Article	Empirical Research
Aims	<ul style="list-style-type: none"> • To Identify challenges and solutions on how companies manage the front-end activities. • To describe an approach for creating a successful process and present a checklist and diagnostic for front-end phase.
Theory	-
Methodology	Qualitative Case, Multiple
Unit of Analysis	Process of the front-end of NPD- 7 critical activities
Participants	11 companies 75 managers (functional managers to company president)
Industry	Multi (consumer packaged good, electronic, industrial products)
Geography	US (seven) Japan (four)
Proposition	NA
Data Collection	Interview ((200 hours interviewing)- mostly unstructured Secondary data collection
Data Analysis	-
Findings	-
Conclusion	<ul style="list-style-type: none"> • Most companies have unnecessarily fuzzy front-end systems. • The best way to integrate the front-end process is to use an overall systems perspective and thoroughly assess the current state of the front-end • Company size, decision-making style, operating culture and frequency of new product introduction are some factors that are critical to a preferred front-end solution • Managing to become less fuzzy means integrating seemingly disparate but related strategic and operational activities, typically crossing functional boundaries.
Further research	NA

Killen, C. P., Jugdev, K., Drouin, N., & Petit, Y. (2012), "Advancing Project And Portfolio Management Research: Applying Strategic Management Theories", <i>International Journal of Project Management</i> , Vol. 30, No. 5, pp. 525–538.	
Type of Article	Theoretical
Research question/ Aim	This paper focuses on a set of theoretical strategic perspectives—the <i>Resource-Based View</i> (RBV), the <i>Dynamic Capability</i> (DC) concept and <i>Absorptive Capacity</i> (AC) concept—and their application to project management and project portfolio management
<p><u>Theory</u></p> <ul style="list-style-type: none"> • Resource-based view (RBV) • Dynamic capabilities (DC): <ul style="list-style-type: none"> • These established capabilities are repeatedly associated with better outcomes (see for example Alvarez and Busenitz, 2001; Cooper et al., 2001; Jugdev et al., 2007; Killen et al., 2008), prompting PM and PPM to be viewed as strategic organisational capabilities that have the ability to provide competitive advantage. • Teece, Pisano, and Shuen's 'processes, positions, and paths' (PPP) framework (Teece et al., 1997) provides a model of the mechanisms at play in the relationship between resources, DCs, learning, and performance. • Through the PPP framework, DCs are shown to be organisational routines or processes that are path dependent and rely strongly on the resource position of the organisation (the underlying resource base) to generate sustainable competitive advantage. • Another DC framework proposed by Teece (2007, 2009) identifies classes of relevant micro-foundations (i.e., distinct skills, processes, procedures, organisational structures, decision rules, and disciplines) and their interrelationships. The framework comprises three main capabilities that are proposed to be required for effective DC: <ul style="list-style-type: none"> • To sense and shape opportunities and threats; • To seize opportunities; • To maintain competitiveness through enhancing, combining, protecting, and when necessary, reconfiguring the business enterprise's intangible and tangible assets. • Absorptive capacity (AC) 	
Methodology	Literature review and research experiences
Unit of Analysis	Project Management (PM) Project Portfolio Management (PPM)
Participants	NA
Industry	NA
Geography	NA
Hypothesis	NA
Data Collection	NA
Data Analysis	NA
<p><u>Findings</u></p> <ul style="list-style-type: none"> • <i>Project Management (PM) as a strategic asset through the Resource-Based View (RBV)</i>: The RBV is appropriate to identify and categorise PM resources. Intangible PM resources directly contribute to competitive advantage through PM. Tangible resources do not • <i>Project Portfolio Management (PPM) as a Dynamic Capability (DC) using the Processes, Position and Path (PPP) framework</i>: DC theory aligns with the learning and change observed and outlines mechanisms through which PPM can contribute to competitive advantage • <i>Using DC to study PPM in dynamic environments</i>: Terminology such as reconfiguring and transforming were ill-defined in the literature. DC could be decomposed into multiple orders • <i>Applying Absorptive Capacity (AC) to PM research: Potential AC</i> (the ability to acquire and assimilate new knowledge) was more easily achieved than <i>realised AC</i> (the ability to transform and exploit this new knowledge) 	
<p><u>Conclusion</u></p> <ul style="list-style-type: none"> • <i>PM as a strategic asset through the RBV</i>: Developed approaches for wording unobservable constructs such as Inimitable. <i>Mixed methods</i> studies can be applied to research on PM and competitive advantage 	

<p>with rewarding results</p> <ul style="list-style-type: none">• <i>PPM as a DC using the PPP framework</i>: Tracking capability initiation and evolution, learning and change are beneficial for the study of PPM as a DC. Elements of the capability must be defined in terms of DC framework to facilitate analysis• <i>Using DC to study PPM in dynamic environments</i>: DC framework is well suited to study PPM processes in uncertain environments. Challenges in classifying organising mechanisms into sensing, seizing, reconfiguring/transforming and in expressing /translating DC for interviewees• <i>Applying AC to PM research</i>: AC conceptual framework helped to qualify and compare the level of <i>potential</i> and <i>realised</i> ACs and to appreciate the mechanisms and processes with the greatest influence on the level of absorption
<p><u>Further research</u></p> <ul style="list-style-type: none">• Proposed conceptual models on learning and PPM drawing upon DC theory should be tested.• Longitudinal study could be used to study PPM evolution in further detail.• Investigate the multiple orders of DC in PPM: resource re-allocation, process improvements and portfolio selection

Killen, C. P. and Kjaer, C. (2012), "Understanding project interdependencies: The role of visual representation, culture and process", <i>International Journal of Project Management</i> , vol. 30, no. 5, pp. 554.	
Type of article	Empirical Research
Aim	<ul style="list-style-type: none"> • To help improve organisations' ability to understand the <i>interdependencies</i> within a <i>project portfolio</i>, and therefore improve their ability to make strategic portfolio decisions. • To reveal whether <i>network mapping</i> visualizations can help organisations understand project interdependencies, and it explores other factors within a project environment that may influence that understanding. T
Theory used	Network mapping approach for the visual representation of project interdependencies.
Methodology	Mixed Methods Sequential
Unit of Analysis	
Participants	2 organisations
Industry	Defense (public sector), Telecommunication (Private)
Geography	Australia
Data Collection	-
Data Analysis	-
Findings	<ul style="list-style-type: none"> • <i>VPM (Virtual Project Mapping)</i> is a network mapping approach for the visualization of project interdependencies to support decision-making. • <i>VPM</i> offers insights that can improve understanding, and that it has the potential to provide benefits by providing support for strategic decision making and as a communications tool. • Both <i>culture</i> and <i>process</i> are important. The culture factors may have more influence than the process factors on an organisation's understanding of project interdependencies.
Conclusion	<ul style="list-style-type: none"> • <i>Project network mapping</i> as a visual representation tool for understanding the interdependencies in project portfolios. The <i>network mapping</i> has potential as a tool to assist with PPM and support <i>strategic portfolio decision-making</i>. • Managers need to pay attention to the project culture as well as the tools and processes. • Managers must ensure that the culture and the project environment support the between-project communication and the <i>capture and sharing of information</i> that are required for best understanding of project interdependencies.
Further Research	<ul style="list-style-type: none"> • To conduct research with other organisations and industries to verify or extend these findings and refine insights into the factors that affect an organisation's understanding of project interdependencies. • To investigate whether and how such tools can enhance an organisation's capability to manage its project portfolio, and how the visual network mapping representations can be best constructed, interpreted, and used in practice. • To consider whether other sources of knowledge about project interdependencies can be effectively used. • To evaluate the effort required to create network mapping displays on a regular basis and the effectiveness of methods of updating the displays to represent dynamic project portfolio environments. • To consider other dimension such as <i>portfolio size</i> and <i>portfolio complexity</i>.

Lant, T. K. and Hewlin, P. F. (2002), "Information cues and decision making: The effects of learning, momentum, and social comparison in competing teams", <i>Group & Organisation Management</i> , vol. 27, no. 3, pp. 374-407.	
Type of Article	Empirical Research
Aim	<ul style="list-style-type: none"> • To investigate how the type of decisions managers make might elicit different schemas, directing attention to different types of information cues. • To examine directly the decision making of teams of individuals making resource allocation and strategic decisions for simulated organisations. • To assess how information drivers such as performance feedback, momentum, and social comparison affect teams' tactical and strategic decisions. • To examine how differences in how teams structured themselves to make decisions influence the information they attend to and how this information influences their choices.
Methodology	Quantitative Experimental (Business game Simulation: Markstart)
Participants	87 individuals of MBA students and executive fellowship programme
Industry	NA
Geography	US
Hypothesis	<p>H1: Performance below aspiration will result in tactical changes but will not result in strategic changes.</p> <p>H2: Prior tactical changes will be positively associated with current tactical changes</p> <p>H3: Prior strategic changes will be positively associated with current strategic changes of the same type</p> <p>H4: Competitor product introductions in one period will be positively associated with strategic changes by the focal firm in the following period</p> <p>H5: Strategic changes will be positively associated with perceived high levels of competition as well as with positioning changes of competitors.</p> <p>H6: Teams with divisions of labour that permit individuals to make decisions independently will engage in more tactical changes than team with divisions of labour that require collective decision making</p> <p>H7: Team with divisions of labour that require individuals to engage in collective discussion prior to making decisions will engage in more strategic changes than teams with divisions of labour that permit individuals to make decisions independently</p>
Data	<p><i>Dependent variables:</i> tactical decision making (modification of existing products) and strategic decision making (new product introductions and withdrawals)</p> <p><i>Predictor variables:</i> past performance, information about prior decisions, information about the competitive environment, and team decision making structure</p> <p><i>Control variables:</i> change in production and sales.</p>
Theory used	<ul style="list-style-type: none"> • Schema-based information processing. Schemas are cognitive representation of the world, based on historical experience, which contain rules that direct information processing • It was applied <i>individual-level information-processing theories</i> to examine two categories of decisions that managers make: <i>tactical</i> and <i>strategic</i>
Findings	<ul style="list-style-type: none"> • Hypothesis 1 not supported; Hypothesis 2 supported; Hypothesis 3 not supported; hypothesis 4 and 5 supported; hypothesis 6 supported; hypothesis 7 not supported • <i>Prior decisions</i> influenced <i>tactical decision-making</i>; the <i>competitive environment</i> influenced both <i>tactical</i> and <i>strategic decision-making</i>. • Tactical decisions would use internally focused information whereas strategic decisions would use externally focused information.
Conclusion	<ul style="list-style-type: none"> • The relationships are due to the cognition of the decision makers. • <i>Routines</i> also develops in the decision-making process itself. The decision momentum may have a cognitive as well as an organisational component.

	<ul style="list-style-type: none">• The way in which groups organise themselves to make decisions can affect their decisions significantly.
Limitation	It is assumed that the effects of information cues on managerial decision-making are independent.

Levinthal, D. and Rerup, C. (2006), "Crossing an Apparent Chasm: Bridging Mindful and Less-Mindful Perspectives on Organisational Learning", <i>Organisation Science</i> , Vol. 17, p. 502-513.	
Type of Article	Theoretical
Aims	To bring the interrelationship between mindful and less-Mindful perspectives to the foreground of organisation theory
Theory	<ul style="list-style-type: none"> • The notion of mindfulness was initially developed in the psychology literature at the individual level of analysis (Sternberg 2000) by Ryle (1990) and Langer (1989a, b, 1997), and introduced into organisational studies in discussions contrasting <i>automatic</i> and <i>non-automatic</i> information processing (Sims and Gioia 1986, Sandelands and Stablein 1987), and in research on high-reliability organisations (Weick and Roberts 1993, Weick et al. 1999). • Mindfulness is a state of active awareness characterized by the continual creation and refinement of categories, an openness to new information, and a willingness to view contexts from multiple perspectives (Langer 1989a). • <i>Mindful</i> (Weick et al. 1999) and <i>less-mindful</i> (March and Simon 1958, Cyert and March 1963) • Mindful and less-mindful behavior are not wholly distinct categories but that there are important interrelationships between the two processes. • Underlying organisational mindfulness is both a sustained high level of <i>sensitivity to errors, unexpected events</i>, and, more generally, to <i>subtle cues</i> suggested by the <i>organisation's environment</i> or its <i>own processes</i>; and the capacity to engage in a flexible range of behaviors in order to respond effectively to this potentially diverse and changing set of stimuli (Weick et al. 1999).
Methodology	Conceptual
Unit of Analysis	NA
Participants	NA
Industry	NA
Geography	NA
Hypothesis	NA
Data Collection	NA
Data Analysis	NA
Findings	<p>Mindful and Less-Mindful Behavior: Four Elements of Complementarity</p> <p><i>Mindfulness and Repertoires of Action:</i></p> <ul style="list-style-type: none"> • Mindfulness requires two basic elements: <i>attentiveness</i> to one's context and the <i>capacity to respond</i> to unanticipated cues or signals from one's context. • Mindfulness in action is <i>local, situated</i>, and involves <i>thinking in real time, simultaneous</i> with the execution of action (spontaneous recombination of wisdom accumulated from <i>prior experimental learning</i>) • There are two possibilities of the cognitive processes: (1) an existing repertoire of initiatives available to the actors allows organisations to respond rapidly to stimuli and to engage in a wide set of possible actions. The actors are able to choose from an inventory of established routines (Allison's (1971) Model II of organisational behavior and Feldman and March (1981)); (2) the rapid <i>emergence of novelty</i> results from the <i>recombination of existing routines</i> (Nelson and Winter 1982). • Mindfulness in action brings together experience and creativity (Miner et al. 2001). The <i>creative recombination</i> of these sets of action repertoires is <i>mindful</i> activities. The <i>effectiveness</i> of those <i>mindful</i> acts is premised on a developed repertoire of <i>less-mindful</i> learning. <p><i>Sustaining Mindfulness:</i></p> <ul style="list-style-type: none"> • Variations in mindfulness can occur over time and across organisational units and hierarchical levels (Rerup 2006b). In order to sustain mindfulness across time, organisations develop and sustain <i>cultures</i> and <i>practices</i> that keep variations in mindfulness within certain boundaries.. • To sustain coordination of the task and prevent detachment, it is required to

	<p>develop and use several integrating mechanisms such as <i>role switching, authority migration, rules, artefacts, and communication</i> to tie <i>individual mindfulness</i> together and thus form a <i>higher-order pattern</i> of <i>organisational mindfulness</i>. These mechanisms generate a <i>storehouse or structure of action possibilities</i> that shape <i>agency</i> across the organisation.</p> <p>Mindfulness and the Enactment of Routines:</p> <ul style="list-style-type: none"> • <i>Ambiguous stimuli</i> are a challenge to <i>less-mindful</i> action because such stimuli require <i>interpretation</i>, and possibly the <i>coordination</i> of such interpretations with others before established repertoires can be triggered. • There is an internal dynamic to routines that promotes continuous change and calls for constant reenactment (Feldman 2000). Routines may be “an effortful, <i>nonautomatic</i> accomplishment” (Giddens 1984, p. 86). Notions of mindfulness are not alien to the routine behavior. • An organisation cannot simply mindlessly replicate or extrapolate a routine into a new context, or even within the same context. Routines are constantly modified and adjusted to accommodate unexpected contingencies (Feldman 2000). <p>Mindfulness and the Encoding of Ambiguous Outcomes:</p> <ul style="list-style-type: none"> • Outcomes classified as exceeding the aspiration are evaluated as a success and are reinforced in subsequent periods, while outcomes not meeting the aspiration are judged as failures. Failure triggers an increase in search for a new way of doing business and a decrease in the aspiration level. • The link between <i>mindful</i> and <i>less-mindful</i> perspectives not only runs from the mindful encoding of the environment, but also runs in reverse in the sense of how the repertoire of <i>less-mindful</i> behavior impacts the <i>mindful process</i> of encoding. <p>Mindful and Less-Mindful Behavior: Two Elements of Tension</p> <p>Opportunity Costs of Mindfulness:</p> <ul style="list-style-type: none"> • The <i>less-mindful</i> perspective emphasizes the role of <i>continuity</i> as a mechanism to preserve accumulated experience, while the <i>mindful</i> perspective stresses the importance of <i>novelty</i> to respond to changing and possibly unique circumstances. • <i>Organisational routines</i> are a critical element in <i>generating reliability</i> in organisational behavior that they are critical for enhancing rates of organisational survival (Hannan and Freeman 1984). In contrast, <i>resilience</i> stems from the capacity to engage in a rapidly <i>changing repertoire of actions</i> (Weick et al. 1999). • Organisations, as routine-based, history-dependent systems that adapt locally and incrementally to past experiences (March and Simon 1958, Cyert and March 1963), tend to have repositories of <i>competencies</i>. <i>Mindfulness</i> can potentially be a threat to these <i>competencies</i>. <p>Normative Claims:</p> <ul style="list-style-type: none"> • Research on <i>mindfulness</i> at the <i>individual level</i> (Langer 1989a, b, 1997; Langer and Moldoveanu 2000) and <i>organisational level</i> (Weick and Sutcliffe 2001, Weick et al. 1999, Fiol and O’Connor 2003, Weick and Roberts 1993) reveals that <i>mindfulness</i> is almost always conceptualized as leading to <i>positive outcomes</i>, while <i>less-mindful</i> forms of learning are generally seen as leading to <i>less-favorable outcomes</i>. • It is suggested the proposition that all processes, including <i>mindful</i> and <i>less-mindful</i> processes may have both <i>positive</i> and <i>negative</i> consequences, so that a full theory of <i>organisational mindfulness</i> will have to address both possibilities.
Conclusion	<ul style="list-style-type: none"> • The interrelationship between <i>mindful</i> and <i>less-mindful</i> processes suggests a strong <i>performative link</i> between the two perspectives, whereas the literature suggests that at the <i>ostensive level</i> of theory development the link between the <i>mindful</i> and <i>less-mindful</i> perspectives is relatively underdeveloped. • There are two thought worlds (scripts): one built around ideas of <i>mindfulness</i> and one around <i>less-mindful</i> behavior that animates and to some degree guides (i.e., is generative) academic research on organisational learning • The <i>performative practice</i> of academic research, particularly empirical research

	<p>based on close observation, reveals a <i>relationship</i> between these two scripts that the scripts themselves do not convey.</p> <ul style="list-style-type: none">• Although the existing literature provides some useful guidance as to the boundaries of <i>mindful</i> and <i>less-mindful</i> organisational acting and thinking, <i>prior work has not dedicated systematic attention to their integration.</i>
Further research	NA

Lindstedt, M., Liesio, J. and Salo, A. (2008), "Participatory development of a strategic product portfolio in a telecommunication company", <i>International Journal of Technology Management</i> , vol. 42, no. 3, pp. 250.	
Type of Article	Practice
Aim	<ul style="list-style-type: none"> • A case study on <i>participatory decision modeling</i> that made use of the <i>RPM (Robust Portfolio Modeling)</i> in the development of its strategic product portfolio in view of a 2–3 year time horizon. • To report how a recently developed preference programming approach, RPM, to support the development of a product portfolio strategy
Theory	<p>As an activity, product portfolio selection determines which products must be included in the company's product portfolio.</p> <p>Typically, a more general term project portfolio selection is employed in settings where 'go/no-go' decisions must be made about discrete investment opportunities, resulting in the project portfolio.</p> <p>The term portfolio management, in turn, emphasises that the maintenance and revision of the portfolio is essentially a continuous activity. The</p>
Methodology	Implementation of RPM
Unit of Analysis	
Participants	7 people (CEO, sales, and technical expert)
Industry	Telecommunication
Geography	Finland
Hypothesis	NA
Data Collection	NA
Data Analysis	NA
Findings	<ul style="list-style-type: none"> • The RPM model is able to evaluate products with regard to several criteria, which was a basic requirement that would not have been fulfilled by other purely financial models. • The RPM model allowed the company to complete the decision process in the allotted amount of time, helped in focusing the data-collecting effort and fostered the development of a decision. • The RPM may be useful in drawing attention to the salient features of the problem while recognising that not all the relevant information can be acquired and quantified. • The RPM seems suitable for the analysis of portfolios that contain up to a hundred products or so; but if the number of products runs into several hundreds, the collection of judgmental inputs is likely to call for a considerable amount of time and effort. • The size of the organisation and the number of participants are also key design factors in the development of the RPM process. • Wide score intervals make it difficult to identify products that should be clearly included or excluded from the portfolio. Similar difficulties in offering decision recommendations also occur when the number of criteria is large and only incomplete information on their importance is available.
Conclusion	<ul style="list-style-type: none"> • Portfolio modeling needs to focus the modelling efforts on those salient aspects of the problem that can be modelled in a transparent manner; that is, it may be better to introduce judgmental adjustments to a transparent model than to build a more complex and ambiguous model based on suspect assumptions and estimation procedures. • RPM can be useful in other related decision settings where the presence of <i>multiple objectives, incomplete information about possible outcomes and budgetary limits</i> need to be accounted for.
Further research	

Martinsuo, M. and Poskela, J. (2011), "Use of Evaluation Criteria and Innovation Performance in the Front End of Innovation", <i>Journal of Product Innovation Management</i> , Vol. 28, p. 896-914.	
Type of Article	Empirical Research
Aims	<ul style="list-style-type: none"> • To examine how <i>idea and concept evaluation</i> is associated with <i>innovation performance</i> during project selection. • To explain how idea and concept evaluation is associated with strategic opportunity when selecting product development projects, using competitive potential and future business potential as the key measures of strategic opportunity before project selection. • To identify antecedents to project choices that are likely to promote the product's competitive and future business potential. • To investigate the role of product complexity as a possible moderator between evaluation and strategic opportunity. • To report that the use of different evaluation criteria has an important role in competitive and future business potential, but assessment formality may be detrimental.
Research Question	Does product complexity moderate the relationship between idea and concept evaluation and strategic opportunity? And How?
Theory	<ul style="list-style-type: none"> • Product complexity deals with the technical configuration of the product, its unfamiliarity to the firm and the market, and its requirements for the product development work. • Product complexity is viewed from two complementary viewpoints: <i>concept complexity</i> and <i>concept novelty</i> to the organisation.
Methodology	Quantitative Survey
Unit of Analysis	NA
Participants	107 companies (12.3% out of 867 responses) Product development managers and experts
Industry	Multi (consumer and industrial)
Geography	Finland
Hypothesis	<p>H1: Assessment formality is positively associated with competitive potential. H2: Use of strategic criteria is positively associated with competitive potential. H3: Use of market criteria is positively associated with competitive potential. H4: Use of technical criteria is positively associated with competitive potential. H5: Assessment formality is positively associated with future business potential. H6: Use of strategic criteria is positively associated with future business potential. H7: Use of market criteria is positively associated with future business potential. H8: Use of technical criteria is positively associated with future business potential.</p>
Data Collection	Cross-sectional questionnaire
Data Analysis	-
Findings	<p>H1: <i>Assessment formality</i> is positively associated with <i>competitive potential-Rejected</i> H2: <i>Use of strategic criteria</i> is positively associated with <i>competitive potential-Rejected</i> H3: <i>Use of market criteria</i> is positively associated with <i>competitive potential-Supported</i> H4: <i>Use of technical criteria</i> is positively associated with <i>competitive potential-Supported</i> H5: <i>Assessment formality</i> is positively associated with <i>future business potential-Rejected</i> H6: <i>Use of strategic criteria</i> is positively associated with <i>future business potential-Supported</i> H7: <i>Use of market criteria</i> is positively associated with <i>future business potential-Rejected</i> H8: <i>Use of technical criteria</i> is positively associated <i>future business potential-Supported</i></p> <ul style="list-style-type: none"> • <i>Competitive potential</i> has a significant positive correlation with the <i>use of market</i>, and <i>technical criteria</i>. • <i>Future business potential</i> has a significant positive correlation with the <i>use of strategic</i> and <i>technical criteria</i>, and with <i>concept complexity</i> and <i>novelty</i>. • <i>Assessment formality</i> and the <i>use of evaluation criteria</i> mediated the relationship between <i>product complexity</i> and <i>strategic opportunity</i>.

<ul style="list-style-type: none"> • <i>Technical criteria</i> may be needed to bring objectivity and a <i>systematic approach</i> to evaluation in order to find ideas and concepts that are technically feasible. • The benefits of <i>strategic criteria</i> may be more apparent at the <i>business level</i>, not at the level of <i>single concepts</i>. • The complexity of the concept and its novelty to the organisation did not reveal any significant moderating associations. • <i>Concept complexity</i> and <i>novelty</i> had a significant direct association with the <i>future business potential</i>. • <i>Concept novelty</i> had a significant association with the <i>competitive potential</i> when evaluation criteria were in use (the use of <i>evaluation systems and criteria</i> appeared to mediate the relationship between <i>product complexity</i> and <i>strategic opportunity</i>). • The <i>mediating role of evaluation criteria</i> as a way to enhance the positive effects of <i>concept novelty</i> and to reduce the effects of <i>complexity</i> draws attention to how managers focus their attention, information search, and negotiation on both internal and external sources of uncertainty.
<p><u>Conclusion</u></p> <ul style="list-style-type: none"> • Using criteria was especially beneficial in achieving <i>future business potential</i>. <i>Assessment formality</i> might generate a hurdle in the early phases of product development. • The use of <i>evaluation systems</i> as a mediator between <i>product complexity</i> and <i>strategic opportunity</i>. • Managers should not only pay attention to the immediate product attractiveness with the new concept, but they should also see longer term strategic opportunities when evaluating the ideas and concepts. • Managers need to be increasingly aware of simultaneous competing interests in the front end of innovation, as different evaluation criteria are associated with them in a different manner. • A more informal approach would promote the possibility for managers to focus their attention on mutually valuable issues, seek new knowledge to become informed for making their decisions, and negotiate new product ideas and concepts in a rather flexible manner. • The results highlight the positive role of product complexity and thereby encourage innovation managers to boldly seek ideas and concepts that are technically challenging and beyond the firm's current knowledge base.
<p><u>Further research</u></p> <ul style="list-style-type: none"> • To explore the role of project-level control variables (e.g., customer orientation, the project manager's profile, or front-end team composition) and performance measures at the different levels of the firm in forthcoming frameworks of evaluation and performance. • The potential relevance of assessment quality (i.e., how the ideas and concepts are evaluated, by whom, and <i>how decisions are made</i>), which might be a more informative measure on the nature of idea and concept evaluation than criterion use. • The companies' ways of designing and adopting evaluation criteria and optimization issues in idea and concept evaluation with regard to the different measures of strategic opportunity deserve further research attention. • To elicit more evidence on the role of product complexity prior to project selection. • The choice of the dependent variables offers a limited view to the pursuits in the early phases of product development, which is why also the actual product development decisions should be studied further as potential outcomes of idea and concept evaluation. • New research is encouraged for developing frameworks that would cover both the project level and business level performance measures and the use of evaluation criteria.

Mazzolini, R. (1981), "How Strategic Decisions Are Made", <i>Long Range Planning</i> , Vol. 14, p. 85-96.	
Type of Article	Theoretical
Aims	<ul style="list-style-type: none"> • To shed some light on how strategic decisions and actions occur in organisations. • To formulate the process view of <i>policy-type decisions</i>. • To contribute to the development of theory—what should ultimately be a <i>model</i> of how specific commitments to action or of <i>resource allocation</i> are made in the firm.
Theory	<ul style="list-style-type: none"> • Strategic decisions are defined as the commitments to action and the <i>resource allocations</i> which determine the field of activity of the firm—what endeavors it pursues, i.e. what goods or services it produces and what markets it serves. • Strategic decisions also refer to how such endeavors are pursued in terms of the way key corporate resources are raised and allocated. These decisions are unstructured or non-repetitive—as opposed to routine operating decisions (Bower and Doz, 1977). 'Unstructured refers to the decision processes that have not been encountered in quite the same form and for which no predetermined and explicit set of ordered responses exists in the organisation' (Mintzberg et al., 1976, p. 246).
Methodology	Conceptual Research Experience
Unit of Analysis	NA
Participants	NA
Industry	NA
Geography	NA
Proposition	NA
Data Collection	NA
Data Analysis	NA
<p>Findings</p> <p>The Traditional View of Strategic Behavior</p> <p><i>Assumptions:</i></p> <ul style="list-style-type: none"> • The company is a monolithic agent and it is this agent which is the decider and actor. • All corporate resources are centrally coordinated and mobilized in a consistent. • Homogeneity, unity, purposiveness and rationality to the firm: their prescriptions-logical ways of formulating 'the best' course of action for the total • A perfectly informed, value-maximizing 'central mind' • A totally docile organisation (that the 'central mind' is in full control of the actions of the whole and can cause the entire firm to act consistently with the master plan). <p>Appraising the Traditional View</p> <ul style="list-style-type: none"> • Neither people nor organisations really behave rationally • Organisations are not monoliths behaving as unitary agents but rather aggregations of sub- organisations more or less tightly knit together by agreed upon procedures. <p>An Organisational Process Approach to Strategic Behavior</p> <ul style="list-style-type: none"> • Strategic behavior is the product of organisational processes in five main ways: <ul style="list-style-type: none"> • Decision-need Identification. • Search for Alternatives for Action. • Investigation of Courses of Action. • Reviews and Approval. • Implementation. <p>Key Characteristics</p> <ul style="list-style-type: none"> • Four fundamental features of the process approach. <ul style="list-style-type: none"> • Actors: The deciding and acting agent is not the firm per se. It is a constellation of loosely-knit units to whom parts of the total task are factored out. • Goals. • Search: when does search for a new strategic action occur?; how does strategic search occur? <ul style="list-style-type: none"> • The way alternatives are looked for the way the investigation process is conducted and the way in which alternatives are evaluated are dependent on routines. 	

<ul style="list-style-type: none"> • Solutions are generally sought in a repertoire of known alternatives, and the routines for investigation and evaluation, while improved over time, normally do not change radically. • Top Management Function. <p>Limits to Organisational Action</p> <p>A number of organisational factors tend to limit the range of options and to restrain its flexibility:</p> <ul style="list-style-type: none"> • Goals as Constraints. • Organisational Momentum and Inertia. • Organisational Feasibility: when the degree of innovation is high, a strategy is hard to implement; the extent to which a strategy calls for the coordinated action of many units complicates implementation.
<p><u>Conclusion</u></p> <ul style="list-style-type: none"> • The pre-eminent trait of organisational activity is its programmed character-the extent to which behavior is the product of set processes (To understand corporate behavior, one must understand these processes) • While the traditional approach invoked postulated objectives to account for companies' actions, here the focus is on <i>standard operating procedures</i> and <i>routines</i> which vitally condition what a company does and does not do. • To understand what will trigger strategic search, one has to look at what information organisational routines are designed to collect and process. • To understand what alternatives will be considered in given circumstances, one has to look at what past circumstances are closest to the present ones and what was done then. Similarly, to predict a firm's behavior in a given situation, one has to look at past behavior in a similar situation. • For new types of courses of action one must still consider what processes lead to a particular output. • For a new kind of problem or opportunity to be identified and for a new kind of strategic alternative to be considered and pursued, an <i>initiating force</i> must actively intervene in the decision process. • One must not lose sight of the fact that, while forces can indeed provide the impetus for new problems or opportunities and courses of action to be considered, their influence beyond that is critically conditioned by existing organisational processes. Once a force has introduced a new idea, standard procedures take over and the force can have but limited-if any-impact on what is done with its idea • The actual moves which are taken 'in the field' to accomplish a plan are generally exclusively the products of set routines.
<p>Further research NA</p>

McNally, R. C., Durmusoglu, S. S., Calantone, R. J. and Harmancioglu, N. (2009), "Exploring New Product Portfolio Management Decisions: The Role of Managers' Dispositional Traits", <i>Industrial Marketing Management</i> , Vol. 38, p. 127-143.	
Type of Article	Empirical
Research question/ Aim	To explore the role of managers' dispositions in new product portfolio management (NPPM) by identifying several management characteristics affecting the use of NPPM evaluative dimensions
Theory	
Methodology	Qualitative Case Study, Multiple
Unit of Analysis	
Participants	3 SBU of a single corporation Manager, Senior Manager, VP, Senior VP, Director, Senior Director
Industry	Building materials
Geography	US
Proposition	NA
Data Collection	Survey, Documents: NPD process documentation, SBU organisational structure charts Direct observation Interviews
Data Analysis	-
Findings	<ul style="list-style-type: none"> • Analytic cognitive style, ambiguity tolerance and leadership style are related to certain NPPM dimensions and the importance afforded to each dimension. • Analytic cognitive style is associated positively with balance. • Ambiguity tolerance is positively associated with the NPPM of strategic fit. • Managers' leadership style is positively associated with how much importance or weight they place on each evaluative dimension. • There is no association between managerial disposition and the NPPM evaluative dimension of financial return
Conclusion	<ul style="list-style-type: none"> • Intolerance of the types of ambiguous information derived from assessing latent needs is associated with weak strategic fit and a short-term view in project selection • The lack of an association for <i>financial return</i> dimension with <i>manager dispositions</i> reveals a boundary condition for the role of dispositions in NPPM decisions. Give the primary objective of industrial firms to produce profit, the influence of <i>individual-level factors</i> is <i>minimal</i> in comparison with this <i>firm-level objective</i>.
Further research	-

Moenaert, R. K., Robben, H., Antioco, M., de Schamphelaere, V. and Roks, E. (2010), "Strategic Innovation Decisions: What You Foresee Is Not What You Get", <i>Journal of Product Innovation Management</i> , Vol. 27, No. 6, p. 840-855.	
Type of Article	Empirical Research
Research questions	RQ 1. What are the key factors that managers consider when evaluating the attractiveness of strategic innovation projects? RQ2. What is the relative importance of these key factors in strategic innovation decision-making? RQ3. Do Decision makers award attention to the "right" factors in the evaluation of strategic innovation projects?
Theory	Beyond rational decision-making. Decision makers' attention as important in complex setting with ambiguity.
Methodology	Mixed Sequential: Exploratory, Case (RQ1); Conclusive (RQ2 and RQ3)
Unit of Analysis	An Innovation Project
Participants	Exploratory: 22 projects, 17 companies Conclusive: 148 returned questionnaires, 144 responses were used to perform the conjoint analysis.
Industry	Exploratory: 14 product based industry, 3 service based industry Survey: Chemical
Geography	Exploratory: Belgian and Dutch Survey: Global
Hypothesis	NA
Data Collection	-
Data Analysis	-
<p>Findings</p> <p>Exploratory (RQ1)</p> <p>Managers evaluate <i>strategic market options</i> on the basis of four criteria:</p> <ul style="list-style-type: none"> • <i>Business Opportunity</i>: the economic rent the manager expects to gain from the investment. • <i>Feasibility</i>: the degree to which the proposed option is expected to be possible, in economic, technical, and organisational terms. Decision makers assess the feasibility of a strategic option on (1) its <i>alignment with corporate strategy</i>, (2) the <i>resource requirements</i>, (3) the <i>flexibility</i> and (4) the <i>quality of the team</i> that proposes the strategic option. • <i>Competitiveness</i>: the relative strength of the proposed new product compared with the offerings of other firms in the industry. The <i>competitiveness dimension</i> consists of three key elements: (1) to what extent does the proposed option offer a competitive answer to the identified threats and opportunities; (2) how big is the advantage over the competition the company seeks to develop (i.e., is it incremental or game changing) and (3) how sustainable is the proposed option (i.e., how fast can a competitor come up with a similar solution)? • <i>Leverage</i>: the expected likelihood of positive spillover effects. Such spillover effects may involve business leverage in other business units belonging to the same company (e.g., other business units producing similar products on the basis of a new platform). Positive spillovers are "nice-to-have" factors that senior executives are likely to consider when making investment decisions. <p>Ex Ante Conjoint (RQ2)</p> <p>In judging strategic innovations, managers based their choice first and foremost on the perceived <i>business opportunity</i> and <i>feasibility</i>: They were the two most important decision-making factors when selecting, ex ante, a project from a basket of product innovation projects.</p> <p>Ex Post Success–Failure (RQ 3)</p> <ul style="list-style-type: none"> • <i>Feasibility</i> does not significantly influence the success of projects ex post as <i>business opportunity</i> and <i>competitiveness</i> do. <i>Business opportunity</i> is identified as an important decision-making factor in both the ex ante and ex post study. The <i>competitiveness</i> criterion was the second least important factor for strategic decision making in the ex ante study. This suggests that innovation project selection may be off track when reality is accounted for. • All other relationships between the <i>managers' idiosyncrasies</i>, as well as the <i>current and future context of</i> 	

<i>the business unit</i> with the decision-making criteria are non-significant.	
Conclusion	NA
Further research	A replication in less capital-intensive firms is definitely needed.

Müller, R., Martinsuo, M. and Blomquist, T. (2008), "Project Portfolio Control and Portfolio Management Performance in Different Contexts", <i>Project Management Journal</i> , Vol. 39, p. 28-42.	
Type of Article	Empirical
Aims	<ul style="list-style-type: none"> • To investigate the nature and relationship of project portfolio control techniques and portfolio management performance, and how this relationship is moderated by situational idiosyncrasies of internal and external dynamics, industries, governance types, and geo- graphic location. • To develop a framework on portfolio control, and to estimate the role of portfolio control in portfolio management performance.
Research Question	How are portfolios controlled, and how does this control relate to portfolio management performance in different contexts?
Theory	<ul style="list-style-type: none"> • A project portfolio is a group of projects that share and compete for the same resources and are carried out under the sponsorship or management of an organisation (Archer & Ghasemzadeh, 1999a, 1999b) • Turner and Müller (2003, p. 7) defined a portfolio as "an organisation (temporary or permanent) where projects are managed together to coordinate interfaces, prioritize resources between projects, and thereby reduce uncertainty." • Recent research suggests that at least some multiple-project factors (Fricke & Shenhar, 2000), portfolio governance structure (Blomquist & Müller, 2006a), or certain single-project management practices (Fricke & Shenhar, 2000; Martinsuo & Lehtonen, 2007) are associated with <i>project portfolio management performance</i>. • <i>Portfolio-level control</i> can be categorized in three main areas: <i>portfolio selection</i>; <i>portfolio reporting</i> and <i>portfolio decision-making</i>.
Methodology	Quantitative, Survey
Unit of Analysis	The portfolio of projects.
Participants	Managers working with program and portfolio management. 242 respondents
Industry	Multi industry
Geography	Global (26 countries: 40% from North America, 32% from the Scandinavian countries (Denmark, Finland, Norway, and Sweden), 17% from other parts of Europe, and 11% from other parts of the world)
Hypothesis	<p>H1: <i>Portfolio performance measures in practice are multidimensional and include the project, portfolio, and organisational level.</i></p> <p>H2: <i>Selection of projects for the portfolio based on the organisation's strategy is positively associated with portfolio management performance.</i></p> <p>H3: <i>Project and program reporting are positively associated with portfolio management performance.</i></p> <p>H4: <i>There is a positive association between certain decision-making styles and portfolio management performance.</i></p> <p>H5: <i>The relationship between portfolio control and portfolio management performance is moderated by contextual factors.</i></p>
Data Collection	Web-based questionnaire
Data Analysis	-
Findings	<ul style="list-style-type: none"> • There were the three mechanisms of portfolio control: <i>portfolio selection</i>, <i>portfolio reporting</i>, and <i>portfolio decision-making</i>. • <i>Portfolio selection</i> is about aligning projects with strategy and prioritizing them, and it includes three items (projects are selected based on the organisation's strategy; projects are prioritized; project priorities are communicated). • <i>Portfolio reporting</i> concerns how projects are reported toward the portfolio and includes three items (reporting using similar templates and similar metrics; a tool used for collecting and disseminating status of all high-priority projects). • <i>Portfolio decision-making</i> deals with how decisions are made regarding the portfolio and it includes three items (decisions are made in face-to-face settings and as joint management decisions; decisions are

<p>made in the best interest of the organisation).</p> <ul style="list-style-type: none"> • <i>Portfolio selection</i> is found as the only independent variable explaining variance in <i>achieving purpose</i> and the correlation is positive and significant. Selection of projects for the portfolio based on the organisation's strategy is positively associated with portfolio performance (H2) • <i>Portfolio reporting</i> is the only significant, positive independent variable explaining variance in <i>achieving results</i>. Project and program reporting is positively associated with portfolio performance (H3). • <i>Portfolio decision-making</i> is not significantly correlated with the portfolio management performance measures (not supported H4) • The relationship between portfolio control and portfolio performance is moderated by contextual factors (H5) • The relationship between <i>portfolio selection</i> and <i>achieving purpose</i> is strengthened in contexts of <i>high external dynamics, low internal dynamics</i>, and internal projects. The relationship between <i>portfolio selection</i> and <i>achieving results</i> appears to be strengthened in contexts of <i>low internal dynamics, North American location, hybrid governance structures, and internal and external projects</i>. Internal projects and circumstances of low internal dynamics appear to be the context factors reinforcing the impact of <i>portfolio selection</i> on both performance measures <i>achieving purpose</i> and <i>achieving results</i>. • The relationship between <i>portfolio control</i> and <i>portfolio performance</i> is moderated by contextual factors.
<p><u>Conclusion</u></p> <ul style="list-style-type: none"> • Successful organisations have an organisation-level practice of <i>selecting and prioritizing</i> projects in line with strategy. • Successful organisations have a shared <i>reporting</i> approach to channel information flows from projects to the portfolio level. • Such organisations share responsibility for <i>decisions</i> at the portfolio level. • Organisations with different <i>governance styles</i> differ in their use of different portfolio control practices, whereas other contextual factors did not appear as significant. • Successful organisations look into achieving desired portfolio <i>results</i>, and achieving project and program <i>purpose</i> for the overall portfolio. • More specifically, strategy-aligned <i>portfolio selection</i> was in a positive correlation with <i>achieving results</i>, <i>portfolio reporting</i> was positively correlated with <i>achieving purpose</i>, and <i>portfolio selection</i> was in a positive correlation with <i>achieving results</i> in some specific contexts.
<p><u>Further research</u></p> <ul style="list-style-type: none"> • Unique portfolio control–performance relationships • The idiosyncrasies of the differences in context • Analyzing and operationalizing portfolio control in broader terms

Nagji, B. and Tuff, G. (2012), "Managing Your Innovation Portfolio", <i>Harvard Business Review</i> , Vol. 90, No. 5, p. 66-74.	
Type of Article	Practice
Aims	To describe typical companies which have steady and above-average returns by having a well-balanced portfolio.
Theory	NA
Methodology	Research experiences
Unit of Analysis	NA
Participants	NA
Industry	Industrial, technology consumer good
Geography	NA
Hypothesis	NA
Data Collection	NA
Data Analysis	NA
Findings	<ul style="list-style-type: none"> • Companies that allocated about 70% of their innovation activity to core initiatives, 20% to adjacent ones, and 10% to transformational ones outperformed their peers, typically realizing a P/E premium of 10% to 20%. • Core innovation efforts typically contribute 10% of the long-term, cumulative return on innovation investment; adjacent initiatives contribute 20%; and transformational efforts contribute 70%
Conclusion	<p>Approaches to organise and manage the total innovation system:</p> <ul style="list-style-type: none"> • <i>Talent</i> should include a diverse set of skills and be able to deal with ambiguous data. • <i>Teams</i> should be separated from day-to-day operations. • <i>Funding</i> should come from outside the normal budget cycle. • <i>Pipeline management</i> should focus on the iterative development of a few promising ideas, not the ruthless filtering of many. • <i>Metrics</i> should recognize nonfinancial achievements in early phases.
Further research	NA

Noda, T. and Bower, J. L. (1996), "Strategy Making as Iterated Processes of Resource Allocation", <i>Strategic Management Journal</i> , Vol. 17, p. 159-192.	
Type of Article	Empirical Research
Aims	To fills the critical gap and extends the B-B model to a comparative analysis of a single business across multiple firms, as opposed to multiple types of businesses within a single firm. It explores the interfirm comparative questions in the context of new business development by comparing divergent business development experiences of two very similar firms
Theory	<ul style="list-style-type: none"> • From <i>strategy process</i> perspective, strategy is 'a pattern in a stream of decisions and actions' (Mintzberg and McHugh, 1985: 161) that are distributed across multiple levels of an organisation. • The <i>Bower-Burgelman (B-B)</i> process model of strategy making in a large, complex firm depicts multiple, simultaneous, interlocking, and sequential managerial activities over three levels of organisational hierarchy (i.e., <i>front-line or bottom, middle, and top managers</i>) and conceptualizes intraorganisational strategy-making processes as consisting of four subprocesses: <i>two interlocking bottom-up core processes of 'definition' and 'impetus'</i> and <i>two overlaying corporate processes of 'structural context determination' and 'strategic context determination.'</i>
Methodology	Qualitative Case Study, multiple, longitudinal
Unit of Analysis	
Participants	2 companies. 50 managers (30 BellSouth and 20 US WEST). Top corporate executives, corporate staff managers, and senior officers in the subsidiaries
Industry	Telecommunication
Geography	US
Proposition	<ul style="list-style-type: none"> • <i>1a.</i> Top managers exercise a critical influence on the strategic initiatives of lower-level managers by setting up <i>the context</i> in which these managers make decisions and take actions. • <i>1b.</i> Both <i>strategic</i> and <i>structural contexts</i> influence bottom-up initiatives in the definition process, and shape <i>resource allocation</i> in the impetus process in a way that virtually defines a course of business development and subsequent emergence of a corporate strategy for the new business. • <i>1c.</i> A firm's <i>structural context</i> is relatively stable over time, and its persistent impact on the subsequent business development process constrains the discretion of top managers who may want to change the firm's course of actions in response to the development of technology and the market for a new business. • <i>2.</i> In the case of a new business development that involves a high degree of uncertainty, the <i>iterations</i> of the <i>resource allocation process</i> generate a pattern of escalation or deescalation of a firm's strategic commitment based on early results from operations that confirm or disconfirm the premises of the first investment and the credibility of the champions. • <i>3.</i> In the case of successful business development, continuous, incremental learning of top managers during business development and the resulting fine tuning of strategic context, shift resource allocation and precede the articulation or change in official statements of the corporate strategy for the new business.
Data Collection	Interviews and archival documents.
Data Analysis	-
Findings	-
Conclusion	<ul style="list-style-type: none"> • The interfirm comparison of new business development and strategy-making processes using the B-B model highlights <i>intra organisational dynamics</i> by which managers at <i>multiple levels</i> relate to external and internal forces and deal with <i>cognitive, political</i> and <i>organisational consequences</i> of their actions. • Seminal elements of strategy making in a complex firm, such as <i>entrepreneurial</i>

	<p><i>initiatives of front-line managers, integrating/brokering activities of middle managers, and the corporate context set up by top managers and its subsequent changes.</i></p> <ul style="list-style-type: none"> • The iterated model enriches understanding of intra <i>organisational strategy process</i> and elucidating <i>multilevel, simultaneous, interrelated managerial activities</i> which are combined to generate '<i>emergent</i>' strategy. • Overall strategic direction for an enterprise, which reflects top managers' crude strategic intentions, has noticeable impact on the business development at operating levels of a complex firm. • This preliminary phrasing of <i>strategic direction</i>, together with the <i>structural context</i>, strongly influences the way managers at responsible operating or business units perceive new business opportunities, and shape the <i>premises</i> of the concrete and detailed strategic analysis for new businesses. • <i>Middle managers</i> play a key <i>mediating role</i> in interpreting the results and communicating them with the top managers. • <i>Entrepreneurial managers</i> can and actually do develop <i>independent strategic premises</i> based on their visions and intentions regardless of those of top managers. • The direction of companies evolves in response to changing markets in a way that is mediated by the internal contest for corporate resources and top management attention. • Different <i>corporate contexts</i> function as an internal selection environment to generate a <i>varied resource allocation pattern</i> and to shape different <i>evolutionary dynamics</i> among competing multiple businesses. By identifying the role of top managers and 'strategic levers' available for them to intervene (i.e., the design of corporate context), demonstrating the sources of inertia (e.g., stability of structural context), and highlighting the feedback mechanism through learning by multilevel managers and their interplay, the iterated model of resource allocation extends Burgelman's intraorganisational ecology perspective and contributes to further develop an evolutionary perspective on strategy.
Further research	<ul style="list-style-type: none"> • To explore the balance between top managers' intents reflected in corporate context and entrepreneurial activities of lower-level managers (Van de Ven, 1992) in determining the strategic context. • To study in different settings as well as large sample studies are required to validate the model and test the propositions.

O'Connor, G. C. (2008), "Major Innovation as a Dynamic Capability: A Systems Approach", <i>Journal of Product Innovation Management</i> , Vol. 25, p. 313-330.	
Type of Article	Theoretical (conceptual)
Aims	<ul style="list-style-type: none"> To leverage systems theory and recent advances in dynamic capability theory to increase our understanding of how firms can evolve a capability for enabling major innovations. To identify the elements of a management system for sustained major innovation (MI) that is not reliant simply on strong willed champions but rather that leverages these and other knowledge assets to fuel organisational renewal and health.
Theory	<ul style="list-style-type: none"> Systems theory: <ul style="list-style-type: none"> A system is defined as "a complex of elements in mutual interaction . . . Each individual part . . . depends not only on conditions within itself, but also to a greater or lesser extent on the conditions within the whole, or within superordinate units of which it is a part" (von Bertalanffy, 1960, pp. 11–12). Dynamic capabilities theory <ul style="list-style-type: none"> <i>Capabilities</i> are the business processes needed to configure <i>assets</i> in advantageous ways. The concept of <i>dynamic capabilities</i> emphasizes the role of strategic management in <i>adapting, integrating, and reconfiguring</i> those assets to match the requirements of the changing environment (Teece, Pisano, and Shuen, 1997). <i>Radical Innovation</i> is defined as encompassing innovations that offer either new to the world performance features or significant improvement (5–10 times) in known features or significant reductions (e.g., 50%) in cost, such that new application domains would open up (Leifer et al., 2000; O'Connor, 1998; O'Connor and Rice, 2001).
Methodology	Literature review
Unit of Analysis	NA
Participants	NA
Industry	NA
Geography	NA
Propositions	<p>P1: MI dynamic capability requires an identifiable organisational group responsible for the firm's major innovation efforts.</p> <p>P2a: An MI dynamic capability requires that the MI system's role in the larger organisation be communicated throughout the organisation.</p> <p>P2b: An MI dynamic capability requires that the MI system objectives be tightly and reciprocally coupled to the firm's strategic intent.</p> <p>P2c: An MI dynamic capability requires that the MI system be loosely coupled with the mainstream organisation in terms of access to resources, networks, and BU systems.</p> <p>P2d: An MI dynamic capability requires that the MI system's project management processes be decoupled from those of the mainstream system.</p> <p>P3: An MI dynamic capability requires that learning- oriented, exploratory processes be utilized for managing project progress.</p> <p>P4: An MI dynamic capability requires attention to the identification and nurturing of appropriate skills and talent.</p> <p>P5a: An MI dynamic capability requires a specific, unique mechanism for considering and governing the portfolio of MI ventures.</p> <p>P5b.1: An MI dynamic capability requires an options mentality to project evaluation, with an allowance for reconsideration of expired options.</p> <p>P5b.2: An MI dynamic capability requires a mechanism for governing or overseeing each project in the portfolio composed of project-specific expertise.</p> <p>P5c: An MI dynamic capability requires a mechanism for constant reflection and</p>

	<p>reconfiguration.</p> <p>P6: An MI dynamic capability requires establishing metrics that are appropriate for the high-risk, high-un- certainty objectives of the MI management system.</p> <p>P7: An MI dynamic capability requires an organisational environment whose leadership and culture recognize the importance of the MI system.</p>
Data Collection	NA
Data Analysis	NA
Findings	NA
Conclusion	<ul style="list-style-type: none"> • The seven elements that together form a management system rather than a process-based approach to nurturing radical innovation (1) an identifiable organisation structure; (2) interface mechanisms with the mainstream organisation, some of which are tightly coupled and others of which are loose; (3) exploratory processes; (4) requisite skills and talent development, given that entrepreneurial talent is not present in most organisations; (5) governance and decision-making mechanisms at the project, MI portfolio, and MI system levels; (6) appropriate performance metrics; and (7) an appropriate culture and leadership context. • These elements must be brought into <i>internal consistency</i> and into <i>alignment</i> with the requirements of operating in a highly uncertain environment
Further research	NA

Perks, H. (2007), "Inter-Functional Integration and Industrial New Product Portfolio Decision Making: Exploring and Articulating the Linkages", <i>Creativity and Innovation Management</i> , Vol. 16, p. 152-164.	
Type of Article	Empirical
Aims	<ul style="list-style-type: none"> • To explore the relationship between the nature of inter-functional integration and the management of the new product project portfolio. • To understand how the nature of inter-functional integration, within and across development projects, impacts upon decision-making. • To investigate and unravel critical dimensions of the relationship between the nature of inter-functional integration and portfolio decision making in the context of industrial new product and service development.
Research Questions	<ol style="list-style-type: none"> 1. How and why do firms <i>allocate resources across a portfolio of new product projects</i>? 2. How do firms derive criteria to inform such resource allocation decisions? 3. What influence does the nature of inter-functional integration have on the criteria and resource allocation decisions at project and portfolio levels? 4. What are the critical dimensions explaining and underlying such influences?
Theory	<ul style="list-style-type: none"> • Project and portfolio resource allocation decision making are intrinsically linked. In seeking to study and understand portfolio decision making, it is unwise to isolate decision making at the portfolio level from behaviours and decisions occurring at the project level. • Inter-functional integration is defined as a high intensity of cross-functional linkages, whereby multiple departments work together towards common goals
Methodology	Qualitative Case Study, single
Unit of Analysis	Projects (division)
Participants	NA
Industry	Steel Manufacturer (industrial product)
Geography	Europe
Propositions	NA
Data Collection	<ul style="list-style-type: none"> • 15 in-depth semi-structured interviews. • Observational visits to the commercial, marketing and technical product development offices. • Extensive secondary documentation: project planning documents, annual plans, phase gate process blueprints, evaluation reports, minutes of meetings and copies of internal e-mails.
Data Analysis	-
Findings	-
Conclusion	<ul style="list-style-type: none"> • The nature of inter-functional integration does impact on portfolio management. Two critical dimensions that explain the relationship: <i>Functional Domination</i> and <i>Nature of Dominant Evaluation Criteria</i>. They draw attention to the impact of excessive project control by functional champions on portfolio resource allocation decisions. In particular, they alert managers to the dangers of permitting personal bias and sentiment to dominate resource allocation decisions. This may be especially detrimental if managing a diverse range of projects. This suggests a need to ensure appropriate <i>cross-functional representation</i> is in place at the project level. This appears to be particularly important in <i>the early stages</i>. • Managers should implement formal evaluation criteria that encourage multi-functional input. Such approaches are pertinent where the new product portfolio includes radical projects. • The results indicate the need for systematic monitoring of the project and portfolio evaluation process by senior management.
Further research	NA

Peters, L. and O'Connor, G. C. (2012), <i>A Typology of Routines: Demonstrating Transformational Routines as One of Several Types</i> , Lally School of Management & Technology, Rensselaer Polytechnic Institute, Troy, NY (Working Paper).	
Type of Article	Empirical Research
Aims	To examine the nature and characteristics of routines whose objective is to induce high impact organisational change (enhance path-creating, rather than path-dependent change in firms)
Theory	<ul style="list-style-type: none"> • Creating new resources as part of a <i>Dynamic Capability</i> (DC) requires underlying routines that invoke change. • Scholars are called to consider how DC's can be path creating or path breaking (Eisenhardt and Martin 2000; Garud and Karnoe 2001; Pandza and Thorpe 2009; Sydow et al. 2009) rather than path dependent, and also how firms create rather than recombine resources (Bowman and Collier 2006; Easterby-Smith et. al. 2009). • Scholars have recently distinguished three types of DC: <i>Incremental</i> and <i>renewing</i> capabilities leverage the current resource and <i>regenerative</i> DC evaluate and augment the overall portfolio (Ambrosini et. al. 2009; Easterby-Smith et. al. 2009). • <i>Routines</i> that underlie DC can be either <i>static</i> or <i>transformational</i>, King and Tucci (2002). <i>Static</i> experience comes from elaboration of existing structures, positions and strategies (Zollo and Winter 2002). The objective is to reduce variety in the organisation and increase predictability and stability of process and outcome. Transformational experience comes from changing these attributes (Amburgey et al. 1993). • <i>Operating routines</i> based on standard operating procedures require that rules be followed very closely; the practice gap latitude is small and disposition toward change modest. • <i>Higher-order routines</i> are routines to change routines. They shape and improve what is already in place. Their disposition toward change is minimal: change is evolutionary. However, there is potential for experimentation in the evolution of these routines. This routines require experimentation with new practices but are focused on <i>path-dependent change</i>. • <i>Transformational routines</i> are high in both <i>disposition to change</i> and <i>practice gap latitude</i>. Disposition to change is high because the purpose of these routines is promoting change, increasing organisational variety, and transforming the company by creating and <i>accessing new resources</i> • <i>Complex routines</i> are those requiring multiple disciplines or functions to interface to accomplish a task. Each actor must abide by a strict set of rules or procedures to maintain interconnections. The orientation toward change is high, and the expected result would be one of very high impact.
Methodology	Qualitative, Case Study, Multiple Grounded theory A twelve-year, two-phase longitudinal study
Unit of Analysis	Phase 1: project Phase 2: corporate level management system for innovation
Participants	Phase 1: 10 companies (12 ongoing projects) Phase 2: 21 companies
Industry	Multi industry
Geography	US
Proposition	NA
Data Collection	Phase 2: first visit-142 interviews (8-18 managers for each company), second visit-246 interviews (Semi structured interview) Newspapers, business journals documents and archives. Periodic meetings with the validation sample of nine companies
Data Analysis	<ul style="list-style-type: none"> • Data coding and categorization • Categories to themes: Discovery, Incubation and Acceleration.

Findings	<ul style="list-style-type: none"> • Transformational Routines: (1) <i>Discovery</i> focuses on the identification, elaboration and articulation of breakthrough opportunities; (2) <i>Incubation</i> focuses on experimenting with how opportunities manifest themselves from a technological, market/business model, and organisational strategy and structure standpoint; (3) <i>Acceleration</i> institutionalizes the nascent businesses by scaling them to levels that allow predictability and traditional planning mechanisms to work, and integrates them into the mainstream of the company. • Discovery include: a) equipping the organisation for <i>idea generation</i> and alertness to <i>opportunities</i>; b) engaging with the scientific community; c) identifying and elaborating opportunities; d) developing and socialising opportunities, and e) evaluating opportunities for further investment. • <i>Discovery</i> allows for <i>path-breaking</i> rather than <i>path-dependent</i> behavior and decision making. Learning about new phenomena occurs regularly. Each learning exercise is new so the value of <i>past experience</i> may not contribute to the <i>new domain</i>. • Learning is <i>exploratory</i> rather than <i>confirmatory</i>, focused on new insights rather than validating hypotheses. • Incubation is to nurture opportunities identified in <i>Discovery</i> that have uncertain outcomes but immense possibility for the market and the company. • Four sets of activities as key to an Incubation capability: a) legitimizing incubation within the larger organisation; b) managing the portfolio of BI's; c) providing support for projects through coaching and mentoring; and d) evaluating project progress. • Acceleration is the routine that escalates fledgling businesses to the point where they can stand on their own relative to other business platforms in the organisation's operating units. • Four sets of activities of <i>acceleration</i>: 1) garnering resources for scaling (which far outweigh those required for Discovery or Incubation); 2) preparing the BI businesses to comply with the <i>operational excellence system</i>; 3) preparing the organisation to accept the new business, and 4) evaluating accelerating businesses. • <i>Acceleration</i> is the implementation routine to institutionalize changes that <i>discovery</i> surfaces and <i>incubation</i> develops. • We suggest that Discovery, Incubation and Acceleration can be characterized as routines because they have repeated patterns of interdependent actions involving <i>multiple actors</i> or functionally similar behaviors that guide organisational action. • <i>Discovery, Incubation and Acceleration</i> are guided by <i>norms</i> embedded in <i>structures</i>, and <i>structure</i> embodies <i>procedures or rule sets</i>. • Discovery, Incubation and Acceleration routines are aimed at enhancing performance through major change. The overarching goal was to create new ways of thinking that would provide a foundation for behavioral change and options for new business opportunities.
Conclusion	<ul style="list-style-type: none"> • <i>Routines</i> serve different purposes in the organisation's overall objective of coping with its environment. Some are <i>efficiency</i> oriented, while others are <i>change</i> oriented. • Some <i>routines</i> are useful for <i>operating in predictable and/or simple environments</i>, others for operating in <i>chaotic and/or complex environments</i>. Under all these conditions, the firm must <i>access, reconfigure, integrate</i> and, at times, <i>create</i> resources to maintain its health.
Further research	<ul style="list-style-type: none"> • To consider whether the dimensionalization is appropriate and, if so, to elaborate the other categories of routines and consider how each contributes to firms' dynamic capabilities.

Poskela, J. (2007), "Strategic and Operative Level Front-End Innovation Activities — Integration Perspective", <i>International Journal of Innovation & Technology Management</i> , Vol. 4, p. 433-456.	
Type of Article	Empirical Research
Aims	<ul style="list-style-type: none"> • To illustrate how top managers perceive the integration of <i>business strategies</i> and <i>operative level innovation</i> activities in the early phase of the innovation process. • To identify the most critical integration mechanisms, challenges and enablers perceived by the top managers. • To provide propositions and draw implications about factors contributing to effective front-end management.
Theory	-
Methodology	Qualitative inductive research/case study, Multiple
Unit of Analysis	NA
Participants	CEO of a company or a business unit 20 Companies
Industry	Multi industry
Geography	Finland
Propositions	<ul style="list-style-type: none"> • P1: Medium-sized companies are more likely to encounter integration challenges of strategic level and operative level front-end activities based on lack of efficient structures and processes supporting R&D work than large organisations. • P2: Medium-sized companies are more likely to encounter integration challenges of strategic level and operative level front-end activities based on lack of commitment to selected strategic focus than large companies. • P3: The role of innovation culture is a more important enabler of successful integration of strategic level and operative level front-end activities in large companies than in medium-sized companies. • P4: Organisations employing simultaneously two types of strategy- making processes, one of which represents non-deterministic approach to integrate strategic level and operative level front- end activities are more unlikely to have problems in balancing control and creativity than organisations applying only a single type of a strategy-making process. • P5: Organisations applying only command type strategy-making process in the integration of strategic level and operative level front end activities are more likely to encounter challenges in adopting emergent ideas to current strategy than organisations applying other types of strategy-making processes. • P6: An incentive system is a more important enabler of effective integration of strategic level and operative level front end activities in organisations employing only command type strategy-making than in organisations applying other strategy-making processes.
Data Collection	Semi-structured interview
Data Analysis	NA
Findings	<ul style="list-style-type: none"> • Companies exploit different strategy-making processes, and that each strategy-making mode is prone to particular challenges. • The relationship between the integration challenges and employed strategy-making modes is also partly moderated by the company size.
Conclusion	<ul style="list-style-type: none"> • Strategic level front-end activities form a basis for the success of operative level innovation activities and necessitate top management involvement. • Effective integration of strategic level and operative level front-end activities both in top-down and bottom-up processing is a cornerstone for creating an effective innovation process. • From the top-level business managers' point of view the effectiveness of integration of strategic level and operative level front-ends is depended on three factors: (a) the level of concreteness of business strategies, (b) the emphasis of

	business-minded decision making, and (c) the balance between control and creativity.
Further research	To test the created propositions through a quantitative study. A survey method would help to validate findings of main integration mechanisms, challenges and enablers and to create more normative instructions for practitioners.

Poskela, J. and Martinsuo, M. (2009), "Management Control and Strategic Renewal in the Front End of Innovation", <i>Journal of Product Innovation Management</i> , Vol. 26, No. 6, p. 671-684.	
Type of Article	Empirical Research
Aim	To address the role of management control on strategic renewal as the main construct for measuring performance in the front-end phase
Research question	RQ1. How are management control mechanisms associated with front-end performance? RQ2. How does task uncertainty influence the relationship between management control mechanisms and front-end performance? <i>Explorative question:</i> What is the role of strategic vision, informal communication, participative planning, and intrinsic task motivation with regards to strategic renewal in the front end?
Theory used	Management controls defined as management activity that is used to maintain or alter patterns in organisational activities to achieve successful results in the front-end of innovation
Hypothesis	H1: Input control is positively associated with strategic renewal. H2: Front-end process formalization is negatively associated with strategic renewal H3: Outcome-based rewarding is negatively associated with strategic renewal H4: The more market uncertainty, the more negative the association between front-end process formalization and strategic renewal H5: The more technology uncertainty, the more negative association between front-end process formalization and strategic renewal H6: The more market uncertainty, the more negative the association between outcome-based rewarding and strategic renewal H7: The more technology uncertainty, the more negative the association between outcome-based rewarding and strategic renewal
Methodology	Quantitative Cross sectional survey
Participants	133 companies (more than 50 employees). Having product development activities R&D Director, technology director, CEO or R&D responsible person
Industry	Industrial products
Geography	Finland
Data	<i>Dependent variable:</i> strategic renewal; <i>independent variables:</i> intrinsic task motivation and strategic vision; moderating variables: technology and market uncertainty
Findings	<ul style="list-style-type: none"> • Input control is positively associated with strategic renewal; • Front-end <i>process formalization</i> and <i>outcome-based rewarding</i> are not associated with strategic renewal. • Intrinsic task motivation front-end is positively associated with strategic renewal. • Market and technology uncertainty have positive association with strategic renewal. • None of the control variables had a significant association with strategic renewal. • Higher degrees of market uncertainty do not increase the negative effect of front-end process formalization. • The more technology uncertainty, the more negative association between front-end process formalization and strategic renewal. • Higher degrees of market uncertainty do not increase the negative effect of outcome-based rewarding. • The more technology uncertainty, the more negative the association between outcome-based rewarding and strategic renewal.
Conclusion	<ul style="list-style-type: none"> • <i>Process formalization</i> and <i>outcome-based rewarding</i> have a neutral role with regards to the front-end project's longer-term aim of <i>strategic renewal</i>, thereby possibly enabling their use in management control of shorter-term interests. • <i>Technology uncertainty</i> as an important variable moderating the relationship between <i>process and outcome-based control</i> and <i>strategic renewal</i>.

Limitation

Based on the responses of a single informant.

Further research

- The non-significant impacts of front-end process formalization and outcome-based rewarding on strategic renewal open up avenues for further research.
- Shed more light on management control in terms of the influence of market and technology uncertainty separately, not uncertainty in general.
- One informant could focus on evaluating the performance of the front-end project and the other could estimate the use of control mechanisms.

Salvato, C. (2009), "Capabilities Unveiled: The Role of Ordinary Activities in the Evolution of Product Development Processes", <i>Organisation science</i> , Vol. 20, p. 384-409.	
Type of Article	Empirical
Aim	To unveil the capabilities concept by exploring how mindful acts of individuals in and around the organisation may explain their dynamic renewal, thereby extending thinking beyond the currently prevailing view of capabilities evolving as collective entities
Research question	<ul style="list-style-type: none"> • How was the reorientation from a niche maker of precious stainless-steel objects to a world-class manufacturer of countless design products possible? • What forces shaped Alessi's core capabilities in design and product development? • What role did the ordinary activities carried out by individuals within and around the organisation play in these processes?
Theory	<ul style="list-style-type: none"> • Explaining <i>organisational capabilities, their evolution</i> and, ultimately, <i>variations in firm performance</i> may require starting with <i>individuals' everyday actions</i> as the <i>unit of analysis</i>. • Understanding a firm's ability to systematically <i>renew its strategies</i> and <i>underlying capabilities</i> requires an in-depth understanding of the <i>micro-processes</i> that make up an <i>organisational capability</i> and its <i>component routines</i>, of the day-to-day events that induce mindful alterations in such sequences, and of the <i>role managerial intentionality</i> has in leveraging such alterations with the aim of achieving <i>systematic improvement</i> in capabilities.
Methodology	Qualitative, Inductive Case Study
Unit of Analysis	Product innovation process
Participant	Single company 90 NPD processes
Industry	Home products manufacturing
Geography	Italy
Hypothesis	NA
Data Collection	-
Data Analysis	-
Findings	<ul style="list-style-type: none"> • An organisation whose <i>core routines</i> and <i>capabilities</i> develop more as a result of <i>everyday, mundane activities</i> than of <i>managerial cognition</i>. • There are three key findings: (1) <i>established capabilities</i>, which function as semiautomatic, <i>less-mindful entities</i> are systematically reshaped by <i>mindful ordinary acts</i> carried out by individuals within and around the organisation; (2) <i>timely managerial interventions</i> encode successful experiments into higher-level organisational capabilities; (3) whereas "<i>mutated</i>" processes resulting from mindful experiments temporarily underperform the original "level n" capability, "<i>n+1 level</i>" capabilities resulting from the encoding of such heterogeneous experiments display <i>higher process homogeneity</i> and a <i>permanent increase in performance</i>. • <i>Micro and ordinary</i> activities carried out by individuals within and around the organisation and at all levels in the organisational hierarchy are central to determining the <i>idiosyncratic content of capabilities</i> and their <i>dynamic adaptation over time</i>. • Learning processes underpinning the emergence of <i>adaptive capabilities</i> demand the aggregation of prior experience. • <i>Mindful improvisation</i> by internal and external actors, followed by the encoding of resulting improvements into the NPD capability, may significantly enhance product performance. • The encoding of <i>heterogeneous experiences</i> resulted in reconfigurations of existing <i>product development routines</i>.
Conclusion	<ul style="list-style-type: none"> • Adaptive renewal is premised on a number of day-to-day activities, whereby mutations resulting from local search are first tested by internal or external

	<p>selective forces, and then refined and reproduced by managerial intervention.</p> <ul style="list-style-type: none"> • Managing capabilities renewal means encouraging and motivating all units, sub-units, and even external collaborators to actively participate in experimenting novel solutions within the ongoing functioning of capabilities. • The heterogeneity and variety of experiments from which lessons for improving capabilities are drawn can be increased through such mechanisms as promoting individual discretion over decisions, reducing bureaucratic controls, favoring face-to-face interaction styles, and promoting diversity of internal and external collaborators. • The interpretation of resulting local experiments should be run by top managers as ad hoc problem solving, rather than by establishing innovation routines and operating rules.
Further research	<ul style="list-style-type: none"> • To investigate the specific selection criteria that managers use to retain and <i>institutionalize</i> some of the improvised “mutations” and not others. Because mutations often lead to lower performance in their first iteration, the focus should be on understanding the criteria and cognitive processes prompting managers to select and retain variations that initially show negative performance outcomes. • To add depth to the cognitive dimension of processes through which managers “learn” which alterations in capabilities bear the highest adaptive potential, and which intentional selection and reproduction activities can more effectively replicate this potential. • Attention should also be devoted to understanding under what conditions evolved capabilities directly improve organisational performance, rather than simply constituting reliable building blocks for innovative efforts. If these inductive insights survive empirical testing, then they may extend theories of capabilities-driven strategic renewal beyond the opposite—and equally unrealistic—views of change resulting from blind search or from nearly full managerial foresight.

Salvato, C. and Rerup, C. (2011), "Beyond Collective Entities: Multilevel Research on Organisational Routines and Capabilities", <i>Journal of Management</i> , Vol. 37, No. 2, p. 468-490.	
Type of Article	Theoretical
Aims	<ul style="list-style-type: none"> • To illustrate how new and complex understanding of organisational routines and capabilities can be generated by breaking them into parts and mapping their interrelationships. • To propose some foundations for a multilevel perspective for studying the microfoundation of routines and capabilities
Theory	NA
Methodology	Conceptual, literature study
Unit of Analysis	NA
Participants	NA
Industry	NA
Geography	NA
Hypothesis	NA
Data Collection	NA
Data Analysis	NA
Findings	NA
Conclusion	<ul style="list-style-type: none"> • By further specifying how capabilities and routines can be interpreted as sequence of individual action, our perspective provides a foundation for developing a deeper understanding of the role that individuals play in shaping routines, capabilities and firm performance. • By elaborating how emotions and micro social interactions within and outside the routine are central dimensions of routines' performance, our perspective provides an opportunity to more accurately capture how the proximate micro context in routines influences organisational performance and change. • By tracing how the individual activities within a routine can be linked to different levels of the organisational hierarchy and their associated rationalities, our perspective improves our ability to understand if and how higher-level rationalities and managerial foresight can emerge across the hierarchy. • By further specifying how routines can be broken into their ostensive and performative components and how their interactions can be studied, our perspective provides a deeper understanding of the role that routines might be playing in shaping higher-level organisational entities.
Further research	NA

Steffens, W., Martinsuo, M. and Artto, K. (2007), "Change Decisions in Product Development Projects", <i>International Journal of Project Management</i> , Vol. 25, p. 702-713.	
Type of Article	Empirical
Aim	<ul style="list-style-type: none"> • To explore the use of decision criteria for change requests of product development projects • To identify decision-making approaches and change management systems, and analyze their relevance to managers' perceptions of the robustness of such change management. • To propose relevant issues to be considered in the change management of complex product development projects.
Research Questions	<p>RQ1. How are changes managed in complex product development projects?</p> <p>RQ2. What are the main criteria for change decisions in such projects?</p> <p>RQ3. How are the change decisions made?</p> <p>RQ4. How do project managers and owners, in general, perceive change management in this setting?</p>
Theory	•
Methodology	Exploratory study, qualitative research design Multiple-Case Study within one company (7 cases)
Unit of Analysis	Project
Participants	Decision makers at both project level and business level.
Industry	Telecommunications network infrastructure development.
Geography	Finland
Proposition	NA
Data Collection	Structured Interviews Project-related documentation and database excerpts on the change log of case projects
Data Analysis	NA
Findings	<p><i>Use of decision criteria in change decisions:</i></p> <ul style="list-style-type: none"> • Criteria regarding <i>project efficiency</i>, <i>customer impact</i> and <i>project portfolio</i> are the most explicitly considered when evaluating and deciding on changes. <i>Business success</i> and <i>preparing for the future</i> were considered somewhat less frequently and less consistently. • <i>Project portfolio</i>: the impacts of the changes on technology platform and resource dependencies were considered when evaluating and deciding on changes. A majority of projects also considered the impacts of changes to the product or technology roadmap, development of other products in the same product line, and ongoing development projects in other product lines. • <i>Decision-making approach in change decisions</i>: (1) change decisions were made by the project team; (2) some projects used product line's management board to make decisions on changes; (3) one project split the responsibility on change decisions between project team and product line's management board. • These patterns seemed to be related to several change-related factors: the importance of the change, the impact of the change, decision-making culture, and way of operation in the product line. • Change management Brought structure into the project work, A change management process with its decision-making approach and way of communicating changes helped the projects, the systematic approach have improved the project teams' overall attitude

Conclusion	<ul style="list-style-type: none"> • It was identified a distinction between operative and strategic change management. The more strategic decisions somehow “by-passed” the formal change management system, which may be an inherent characteristic of a dynamic, complex product development environment. • The context in which changes take place seems to have an impact on how changes are and should be managed. Therefore, we are inclined to suggest a contingency view to change management instead of or as part of company or industry-wide standards. On the other hand, <i>the product line, business or company-level system of change management could actually be characterized as a repertory of alternative change management tools and tactics, each designed for different types of change events</i> • The alternative patterns of decision making that were identified in this study add understanding about the tactical steps in making change decisions. The role of a screening team was highlighted, especially when the number of change requests is significant.. • There is a need to develop more holistic frameworks for change management. Such a framework should cover different changes not only in terms of their source but also in terms of their business context, <i>strategic vs. operative nature</i>, scope, and alternative tactics for their management.
Further research	<ul style="list-style-type: none"> • It is seen an evident connection between change management research and strategic decision-making research. They could be combined and empirically explored in future studies. • To examine the position of a screening team in comparison to the project team or the product line management board was not examined in this study purposefully. • To test and verify the findings.

Tranfield, D., Young, M., Partington, D., Bessant, J. and Sapsed, J. (2003), "Knowledge Management Routines for Innovation Projects: Developing a Hierarchical Process Model", <i>International Journal of Innovation Management</i> , Vol. 7, p. 27-49	
Type of Article	Empirical
Aim	<ul style="list-style-type: none"> • To identify and understand how knowledge is managed to drive innovation within a variety of organisations and across a range of projects. • To investigate and understand those knowledge processes on which dynamic capability depended. • To report on the development of a process model of innovation constructed from a synthesis of innovation literature from which we derived the overall conceptual framework, and knowledge management routines resulting from our fieldwork conducted across a variety of sectors.
Theory	Grounded theory of management action" (Partington, 2000), and following the methodology of Glaser and Strauss (1967).
Methodology	Qualitative, inductive approach Case study, multiple
Unit of Analysis	Organisational routines
Participants	11 Organisations Managers and operators
Industry	9 sectors: health, food packaging, whisky distillation and bottling, highway maintenance, software development, simulation, advanced electronics and aerospace.
Geography	UK (not specified)
Proposition	NA
Data Collection	<ul style="list-style-type: none"> • In-depth open-ended interviews (123 interviews from all levels in the organisation). • Archival data in the form of written procedures • Observation of operations
Data Analysis	NA
Findings	NA
Conclusion	<ul style="list-style-type: none"> • Knowledge management: The process by which the capacity to act is facilitated or enhanced, matching knowledge sources to knowledge needs, using performative competencies which privilege the flow and sharing of knowledge over simple custody, and which is value rated by its contextual efficacy. • From a practitioner perspective: • It offers a conceptual framework for knowledge management in innovation, a map of the territory rather than a prescriptive route. It offers managers a framework within which they can initially locate, and then subsequently monitor, their innovation activity. • It enables managers to audit their knowledge management processes, either off-line as a review of past procedures or on-line during a current innovation, to assess the presence or absence of routines, to exploit those at which they are adept and to improve on those at which they are less so. • This synthesis and generic model is both theoretically and empirically grounded in evidence from widely dissimilar organisations. It therefore provides a basis for cross sector transfer of learning and practice. • For a theoretical perspective: • It provides an understanding of the theory of innovation particularly in project-based environments. • It contributes by arguing the case for thinking in terms of routines which can be adapted, developed and crafted locally, but which are grounded in the repetition of common generic patterns.
Further research	• NA

Turner, S. F. and Rindova, V. (2012), "A Balancing Act: How Organisations Pursue Consistency in Routine Functioning in the Face of Ongoing Change", <i>Organisation Science</i> , Vol. 23, p. 24-46.	
Type of Article	Empirical
Aim	To examine how routine participants view and balance the pressures for consistency in the face of ongoing change that surrounds routine functioning.
Theory	-
Methodology	Qualitative, Multiple Case study
Unit of Analysis	
Participants	6 organisations <i>Familiarization stage</i> : Presidents of solid waste firms, directors of public and nonprofit solid waste organisations, state government leaders, and faculty experts in the Research Triangle Park area of North Carolina. <i>Systematization Stage</i> : director, supervisor, and field employee
Industry	Waste collection organisations
Geography	US
Proposition	NA
Data Collection	<i>Familiarization stage</i> : <ul style="list-style-type: none"> • Open-ended interviews (12) • Archival data sources: Biannual survey of solid waste practices among municipalities, Annual reports of operating performance for a select group of cities in the state industry analyst reports, industry trade publications, 10 years of trade press coverage in Waste Age and Waste News. <i>Systematization Stage</i> : 28 semistructured interviews.
Data Analysis	Using analytical techniques for qualitative content analysis (Miles and Huberman 1994)
Findings	NA
Conclusion	<ul style="list-style-type: none"> • Recognition of the tension between the need to ensure <i>consistency</i> and <i>respond to change</i> leads organisational members to simultaneously establish and maintain two <i>ostensive patterns</i>: one of targeted <i>consistency</i> and another of <i>flexibility</i> in internal coordination. • To maintain dual <i>ostensive patterns</i> that combine targeted <i>consistency</i> and enacted <i>flexibility</i>, organisational members leveraged <i>artefacts</i> and <i>connections</i> both in processes that <i>standardize</i> and <i>stabilize</i> behaviors and in processes that facilitate <i>flexible</i> and <i>mindful</i> responses.
Further research	<ul style="list-style-type: none"> • To consider the pursuit of consistency and change in contexts where variability and change appear to dominate. • To consider how routine designs around different types of task interdependence, including pooled and reciprocal types (Thompson 1967), affect the processes through which participants balance consistency and change.

Appendix G Journal Titles and the Publication Periods

Journal Title	1981- 1987	1988- 1992	1993- 1997	1998- 2002	2003- 2007	2008- 2012
<i>Academy of Management Journal</i>			1			
<i>American Journal of Sociology</i>				1		
Book section				1		
<i>Creativity and Innovation Management</i>					1	
<i>Group & Organization Management</i>				1		
<i>Harvard Business Review</i>						1
<i>Industrial Marketing Management</i>						1
<i>International Journal of Innovation & Technology Management</i>					1	
<i>International Journal of Innovation Management</i>					1	
<i>International Journal of Management Reviews</i>					1	
<i>International Journal of Project Management</i>				1	1	2
<i>International Journal of Technology Management</i>						1
<i>Journal of Management</i>					1	1
<i>Journal of Management Studies</i>					1	
<i>Journal of Operations Management</i>						1
<i>Journal of Product Innovation Management</i>				1		6
<i>Long Range Planning</i>	2					
<i>Management Decision</i>						1
<i>Manufacturing & Service Operations Management</i>						1
<i>Organization Science</i>					2	3
<i>Project Management Journal</i>						1
<i>Research Technology Management</i>				1		
<i>Sloan Management Review</i>			1			
<i>Strategic Management Journal</i>			1			
Working paper						1
Total	2	0	3	6	9	20

Appendix H The Study Themes and the Articles

	Study Theme	Related References
Systematic Review Question 1	Portfolio Decision-Making	<p>Bentzen, E., Christiansen, J. K. and Varnes, C. J. (2011), "What Attracts Decision Makers' Attention?", <i>Management Decision</i>, Vol. 49, No. 3, p. 330-349.</p> <p>Closs, D., Jacobs, M., Swink, M. and Webb, G. (2008), "Toward a Theory of Competencies for the Management of Product Complexity: Six Case Studies", <i>Journal of Operations Management</i>, Vol. 26, p. 590-610.</p> <p>Kester, L., Griffin, A., Hultink, E. J. and Lauche, K. (2011), "Exploring Portfolio Decision-Making Processes", <i>The Journal of Product Innovation Management</i>, Vol. 28, No. 5, p. 641-661.</p> <p>Killen, C. P. and Kjaer, C. (2012), "Understanding Project Interdependencies: The Role of Visual Representation, Culture and Process", <i>International Journal of Project Management</i>, Vol. 30, No. 5, p. 554-566.</p> <p>Lindstedt, M., Liesio, J. and Salo, A. (2008), "Participatory Development of A Strategic Product Portfolio in a Telecommunication Company", <i>International Journal of Technology Management</i>, Vol. 42, No. 3, p. 250-266.</p> <p>McNally, R. C., Durmusoglu, S. S., Calantone, R. J. and Harmancioglu, N. (2009), "Exploring New Product Portfolio Management Decisions: The Role of Managers' Dispositional Traits", <i>Industrial Marketing Management</i>, Vol. 38, No. 1, p. 127-143.</p> <p>Müller, R., Martinsuo, M. and Blomquist, T. (2008), "Project Portfolio Control and Portfolio Management Performance in Different Contexts", <i>Project Management Journal</i>, Vol. 39, No. 3, p. 28-42.</p> <p>Perks, H. (2007), "Inter-Functional Integration and Industrial New Product Portfolio Decision Making: Exploring and Articulating the Linkages", <i>Creativity and Innovation Management</i>, Vol. 16, p. 152-164.</p> <p>Steffens, W., Martinsuo, M. and Artto, K. (2007), "Change Decisions in Product Development Projects", <i>International Journal of Project Management</i>, Vol. 25, p. 702-713.</p>
	Portfolio Management	<p>Adams, R., Bessant, J. and Phelps, R. (2006), "Innovation Management Measurement: A Review", <i>International Journal of Management Reviews</i>, Vol. 8, No. 1, p. 21-47.</p> <p>Archer, N. P. and Ghasemzadeh, F. (1999), "An Integrated Framework for Project Portfolio Selection", <i>International Journal of Project Management</i>, Vol. 17, No. 4, p. 207-216.</p> <p>Cardozo, R. N. and Wind, J. (1985), "Risk Return Approach to Product Portfolio Strategy", <i>Long Range Planning</i>, Vol. 18, p. 77-85.</p> <p>Cooper, R. G. (2008), "Perspective: The Stage-Gate® Idea-to-Launch Process - Update, What's New, and Nexgen Systems", <i>The Journal of Product Innovation Management</i>, Vol. 25, p. 213-232.</p> <p>Cooper, R. G., Edgett, S. J. and Kleinschmidt, E. J. (1999), "New Product Portfolio Management: Practices and Performance", <i>Journal of Product Innovation Management</i>, Vol. 16, p. 333-351.</p>

Study Theme	Related References
Strategic Decision Making	<p>Cooper, R. G., Edgett, S. J. and Kleinschmidt, E. J. (2000), "New Problems, New Solutions: Making Portfolio Management More Effective", <i>Research Technology Management</i>, Vol. 43, No. 2, p. 18-33.</p> <p>Nagji, B. and Tuff, G. (2012), "Managing Your Innovation Portfolio", <i>Harvard Business Review</i>, Vol. 90, No. 5, p. 66-74.</p> <p>Dean, J. W. J. and Sharfman, M. P. (1996), "Does Decision Process Matter? A Study of Strategic Decision-Making Effectiveness", <i>Academy of Management Journal</i>, Vol. 39, No. 2, p. 368-396.</p> <p>Lant, T. K. and Hewlin, P. F. (2002), "Information cues and decision making: The effects of learning, momentum, and social comparison in competing teams", <i>Group & Organization Management</i>, Vol. 27, No. 3, p. 374-407.</p> <p>Mazzolini, R. (1981), "How Strategic Decisions Are Made", <i>Long Range Planning</i>, Vol. 14, p. 85-96.</p>
Strategic Decision-Making and Innovation	<p>Moenaert, R. K., Robben, H., Antioco, M., de Schamphelaere, V. and Roks, E. (2010), "Strategic Innovation Decisions: What You Foresee is Not What You Get", <i>Journal of Product Innovation Management</i>, Vol. 27, No. 6, p. 840-855.</p>
Systematic Review Question 2	<p>Front-End NPD and Strategy</p> <p>Poskela, J. (2007), "Strategic and Operative Level Front-End Innovation Activities — Integration Perspective", <i>International Journal of Innovation & Technology Management</i>, Vol. 4, No. 4, p. 433-456.</p> <p>Khurana, A. and Rosenthal, S. R. (1997), "Integrating the Fuzzy Front End of New Product Development", <i>Sloan management review</i>, Vol. 38, No. 2, p. 103-120.</p> <p>Martinsuo, M. and Poskela, J. (2011), "Use of Evaluation Criteria and Innovation Performance in the Front End of Innovation", <i>Journal of Product Innovation Management</i>, Vol. 28, p. 896-914.</p> <p>Poskela, J. and Martinsuo, M. (2009), "Management Control and Strategic Renewal in the Front End of Innovation", <i>Journal of Product Innovation Management</i>, Vol. 26, No. 6, p. 671-684.</p> <p>Strategy Process</p> <p>Hutzschenreuter, T. and Kleindienst, I. (2006), "Strategy-Process Research: What Have We Learned and What Is Still to Be Explored.", <i>Journal of Management</i>, Vol. 32, p. 673-720.</p> <p>Johnson, G., Melin, L. and Whittington, R. (2003), "Micro Strategy and Strategizing: Towards an Activity-Based View", <i>Journal of Management Studies</i>, Vol. 40, No. 1, p. 3-22.</p>
Strategic Decision-Making and Strategy Process	<p>Noda, T. and Bower, J. L. (1996), "Strategy Making as Iterated Processes of Resource Allocation", <i>Strategic Management Journal</i>, Vol. 17, p. 159-192.</p>
Systematic Review Question 3	<p>Behavioral Operations</p> <p>Gino, F. and Pisano, G. (2008), "Toward a Theory of Behavioral Operations", <i>Manufacturing & Service Operations Management</i>, Vol. 10, No. 4, p. 676-691.</p> <p>Organisational Capabilities</p> <p>Dosi, G., Nelson, R. R. and Winter, S. G. 2000, "Introduction: The Nature and Dynamics of Organizational Capabilities", in: Dosi, G., Nelson, R. R. & Winter, S. G. (eds.), <i>The Nature and Dynamics of Organizational Capabilities</i>, Oxford University Press, New York, p. 1-22.</p> <p>O'Connor, G. C. (2008), "Major Innovation as a Dynamic Capability: A Systems Approach", <i>Journal of Product Innovation Management</i>, Vol. 25, No. 4, p. 313-330.</p>

Study Theme	Related References
Organisational Routines	<p>Salvato, C. (2009), "Capabilities Unveiled: The Role of Ordinary Activities in the Evolution of Product Development Processes", <i>Organization science</i>, Vol. 20, p. 384-409.</p> <p>Feldman, M. S. and Orlikowski, W. J. (2011), "Theorizing Practice and Practicing Theory", <i>Organization Science</i>, Vol. 22, No. 5, p. 1240-1253.</p> <p>Howard-Grenville, J. (2005), "The Persistence of Flexible Organizational Routines: The Role of Agency and Organizational Context", <i>Organization Science</i>, Vol. 16, No. 6, p. 618-636.</p> <p>Levinthal, D. and Rerup, C. (2006), "Crossing an Apparent Chasm: Bridging Mindful and Less-Mindful Perspectives on Organizational Learning", <i>Organization Science</i>, Vol. 17, No. 4, p. 502-513.</p> <p>Peters, L. and O'Connor, G. C. (2012), <i>A Typology of Routines: Demonstrating Transformational Routines as One of Several Types</i>, Lally School of Management & Technology, Rensselaer Polytechnic Institute, Troy, NY (Working Paper).</p> <p>Salvato, C. and Rerup, C. (2011), "Beyond Collective Entities: Multilevel Research on Organizational Routines and Capabilities", <i>Journal of Management</i>, Vol. 37, p. 468-490.</p> <p>Tranfield, D., Young, M., Partington, D., Bessant, J. and Sapsed, J. (2003), "Knowledge Management Routines for Innovation Projects: Developing a Hierarchical Process Model", <i>International Journal of Innovation Management</i>, Vol. 7, p. 27-49.</p> <p>Turner, S. F. and Rindova, V. (2012), "A Balancing Act: How Organizations Pursue Consistency in Routine Functioning in the Face of Ongoing Change", <i>Organization Science</i>, Vol. 23, No. 1, p. 24-46.</p>
Agency	<p>Emirbayer, M. and Mische, A. (1998), "What is agency?" <i>The American Journal of Sociology</i>, Vol. 103, No. 4, p. 962-1023.</p>
Portfolio Management and Capabilities	<p>Killen, C. P., Jugdev, K., Drouin, N. and Petit, Y. (2012), "Advancing Project and Portfolio Management Research: Applying Strategic Management Theories", <i>International Journal of Project Management</i>, Vol. 30, p. 525-538.</p>

Appendix I The Number of Study Themes Published in the Specified Period

	Theme	1981-1987	1988-1992	1993-1997	1998-2002	2003-2007	2008-2012	Total
Systematic Review Question 1	Portfolio Decision-Making					2	7	9
	Portfolio Management	1			3	1	2	7
	Strategic Decision Making	1		1	1			3
	Strategic Decision-Making and Innovation						1	1
Systematic Review Question 2	Front-End NPD and Strategy			1		1	2	4
	Strategic Decision-Making and Strategy Process			1				1
	Strategy Process					2		2
Systematic Review Question 3	Behavioral Operations						1	1
	Organisational Capabilities				1		2	3
	Organisational Routines					3	4	7
	Agency				1			1
	Portfolio Management and Capabilities						1	1
	Total	2	-	3	6	9	20	

Appendix J The Key Findings of the Literature

	Study Theme	Related References	Journal	Research Design	Sample	Key Findings*	Comments
Systematic Review Question 1 <i>How are strategic decisions in the NPD portfolio management process made?</i>	Portfolio Decision-Making	(Lindstedt et al., 2008)	International Journal of Technology Management	Practice Implementation of a portfolio modelling	1 Company Telecommunication Finland	<ul style="list-style-type: none"> The <i>Robust Portfolio Modeling (RPM)</i> model is able to evaluate products with regard to several criteria, which was a basic requirement that would not have been fulfilled by other purely financial models. The <i>RPM</i> model allowed the company to complete the decision process in the allotted amount of time, helped in focusing the data-collecting effort and fostered the development of a decision. The <i>RPM</i> may be useful in drawing attention to the salient features of the problem while recognising that not all the <i>relevant information</i> can be <i>acquired</i> and <i>quantified</i>. The <i>RPM</i> seems suitable for the analysis of portfolios that contain up to a hundred products or so 	<ul style="list-style-type: none"> Descriptive article Implementation of a portfolio modelling Little academic content
		(Closs et al., 2008)	Journal of Operations Management	Qualitative Case Study, Multiple	6 companies Multi industry Global	<ul style="list-style-type: none"> <i>Product portfolio complexity</i> mediates the relationship between <i>environmental drivers</i> and <i>business unit performance</i>. The <i>management competencies</i> moderate these relationships. <i>Drivers-External Environment</i>: (1) technological change created by suppliers or other agents outside the firm's control; (2) Market diversity drives greater complexity; (3) Regulation or other mandated standardization drives reduced portfolio complexity. <i>Moderator-Management competencies</i>: (1) product/technology portfolio strategy; (2) governance and organisational structure for product complexity management; (3) design information and decision support systems 	<ul style="list-style-type: none"> Investigating the organisational factor of decision-making process Overlooked the cognitive and political factors.
		(Kester et al., 2011)	Journal of Product Innovation Management	Qualitative Case Study, Multiple	4 companies Financial services, Medical devices, Food US, European.	<ul style="list-style-type: none"> <i>Strategic decisions</i> are made through some interaction between <i>evidence-</i>, <i>power-</i>, and <i>opinion-based</i> processes Firms that are most effective in <i>portfolio decision-making</i> have a <i>portfolio mindset</i> <i>Strategic alignment</i>, <i>maximum portfolio value</i>, and <i>balance</i> all may result from the firm's ability to develop a portfolio mindset in the decision making <i>Focused effort</i> may relate to achieving strategic alignment <i>Agility</i> in decision-making may contribute to portfolio 	<ul style="list-style-type: none"> A comprehensive study. Focused only on cognitive and political factors of decision-making process The organisational factor is not clearly shown.

*This field includes direct quotations from the articles

Study Theme	Related References	Journal	Research Design	Sample	Key Findings*	Comments
	(McNally et al., 2009)	Industrial Marketing Management	Qualitative Case Study, Multiple	3 SBU Building materials US	<ul style="list-style-type: none"> maximization by quickly eliminating projects that have become marginalized due to some changes in the environment. Different theoretical lenses need to be combined to advance understanding in this domain. <i>Analytic cognitive style, ambiguity tolerance and leadership style</i> are related to certain <i>new product portfolio management (NPPM)</i> dimensions and the importance afforded to each dimension. Analytic cognitive style is associated positively with balance. Ambiguity tolerance is positively associated with the NPPM of strategic fit. Managers' leadership style is positively associated with how much importance or weight they place on each evaluative dimension. There is no association between managerial disposition and the NPPM evaluative dimension of financial return 	<ul style="list-style-type: none"> Link to strategy is constructed through portfolio mindset, rather than formal approaches. Focuses on the personality traits, does not show how decisions are made Political factors are overlooked
	(Perks, 2007)	Creativity and Innovation Management,	Qualitative Case Study, Single	1 company Industrial product (Steel manufacturing) European	<ul style="list-style-type: none"> The nature of <i>inter-functional integration</i> impacts on portfolio management. Two critical dimensions that explain the relationship: <i>Functional Domination</i> and <i>Nature of Dominant Evaluation Criteria</i>. Managers should implement formal evaluation criteria that encourage <i>multi-functional input</i>. 	<ul style="list-style-type: none"> Identified factors that influence the integration How to build and maintain the links is not presented
	(Steffens et al., 2007)	International Journal of Project Management	Qualitative Case Study, Multiple	7 Companies Telecommunication Finland	<ul style="list-style-type: none"> <i>Use of decision criteria in change decisions</i>: Criteria regarding <i>project efficiency, customer impact</i> and <i>project portfolio</i> are the most explicitly considered. <i>Business success</i> and <i>preparing for the future</i> were considered somewhat less frequently and less consistently. <i>Project portfolio</i>: the impacts of the changes on <i>technology platform (roadmap), resource dependencies</i>, development of other products in the same product line and ongoing development projects in other product lines were considered. <i>Decision-making approach in change decisions</i>: Brought structure into the project work; a change management process with its decision-making approach and way of communicating changes helped the projects; the systematic approach have improved the project teams' 	<ul style="list-style-type: none"> The underpinning theories are weak. For example, decision-making theories are not utilised in the analysis.

*This field includes direct quotations from the articles

Study Theme	Related References	Journal	Research Design	Sample	Key Findings*	Comments
	(Bentzen et al., 2011)	Management Decision	Quantitative Experiment	1 company Petrochemical Denmark	overall attitude <ul style="list-style-type: none"> • <i>Quality of information</i> cannot explain the discernable differences in decision makers' attention to various projects. • <i>New projects</i> provide the most significant and important effect on attention. 	<ul style="list-style-type: none"> • It focused only on managers' attention rather than how decisions are made • The influence of manager's attention on portfolio performance is not discussed
	(Müller et al., 2008)	Project Management Journal	Quantitative Survey	242 respondents Multi industry Global	<ul style="list-style-type: none"> • The mechanisms of portfolio control: <i>portfolio selection</i>, <i>portfolio reporting</i>, and <i>portfolio decision-making</i> • <i>Portfolio selection</i> based on the organisation's strategy is positively associated with portfolio performance—<i>achieving purpose</i> • <i>Portfolio reporting</i> is positively associated with portfolio performance—<i>achieving results</i> • <i>Portfolio decision-making</i> is not significantly correlated with the portfolio management performance measure • The relationship between <i>portfolio control</i> and <i>portfolio performance</i> is moderated by <i>contextual factors</i> 	<ul style="list-style-type: none"> • It showed only the relationships between portfolio control, environment and performance. • No discussion about decision-making process
	(Killen and Kjaer, 2012)	International Journal of Project Management	Mixed methods Sequential	2 Organisations Defense (public), Telecommunication (private) Australia	<ul style="list-style-type: none"> • <i>VPM (Virtual Project Mapping)</i> is a network mapping approach for the visualization of project interdependencies to support decision-making. It can provide support for <i>strategic decision-making</i> and be as <i>a communications tool</i>. • <i>Culture</i> and <i>process</i> are important. The culture factors may have more influence than the process factors on an organisation's understanding of project interdependencies. 	<ul style="list-style-type: none"> • It investigated the implementation of a network mapping method • The outcomes is not presented
Portfolio Management	(Cooper et al., 2000)	Research Technology Management	Practice Research Experience	NA	<p><i>Challenges:</i></p> <ul style="list-style-type: none"> • Too many projects, not enough resources • Projects selection methods fail to discriminate • Go/Kill decision without solid information • Too many small projects, too few major hits <p><i>Solutions:</i></p> <ul style="list-style-type: none"> • Introduce resource capacity analysis • Develop a product innovation and technology strategy (PTIS) • Integrating portfolio management 	<ul style="list-style-type: none"> • It is a practical literature • It's not supported by theoretical backgrounds • The decision-making process is not presented

*This field includes direct quotations from the articles

Study Theme	Related References	Journal	Research Design	Sample	Key Findings*	Comments
	(Nagji and Tuff, 2012)	Harvard Business Review	Practice Research Experience	NA	<ul style="list-style-type: none"> • Employ Portfolio tools • Companies that allocated about 70% of their innovation activity to <i>core initiatives</i>, 20% to <i>adjacent</i> ones, and 10% to <i>transformational</i> ones outperformed their peers, typically realizing a P/E premium of 10% to 20%. • <i>Core innovation</i> efforts typically contribute 10% of the long-term, cumulative return on innovation investment; <i>adjacent</i> initiatives contribute 20%; and <i>transformational</i> efforts contribute 70% • Approaches to organise and manage the total innovation system: <ul style="list-style-type: none"> • <i>Talent</i> should include a diverse set of skills and be able to deal with ambiguous data. • <i>Teams</i> should be separated from day-to-day operations. • <i>Funding</i> should come from outside the normal budget cycle. • <i>Pipeline management</i> should focus on the iterative development of a few promising ideas, not the ruthless filtering of many. • <i>Metrics</i> should recognize nonfinancial achievements in early phases 	<ul style="list-style-type: none"> • It is a practical literature • It's not supported by theoretical backgrounds
	(Adams et al., 2006)	International Journal of Management Reviews	Theoretical Literature Review	NA	<ul style="list-style-type: none"> • Seven-dimensional conceptualization of the innovation management measurement areas: <i>Inputs</i> (People , Physical and financial resources, Tools); <i>knowledge management</i> (Idea generation, Knowledge repository, Information flows); <i>Innovation strategy</i> (Strategic orientation Strategic leadership); <i>organisation culture</i> (Culture , Structure); <i>portfolio management</i> (Risk/return balance, Optimization tool use); <i>project management</i> (Project efficiency , Tools , Communications, Collaboration), <i>comersialisation</i> (Market research , Market testing , Marketing and sales) 	<ul style="list-style-type: none"> • It is a broad literature review • The portfolio management part is limited discussed
	(Archer and Ghasemzadeh, 1999)	International Journal of Project Management	Theoretical Model	NA	<ul style="list-style-type: none"> • A framework for simplifying and organizing the project portfolio selection process. • Project portfolio selection decision support system 	<ul style="list-style-type: none"> • Focuses on portfolio selection, rather than portfolio management • No decision-making perspective discussed
	(Cardozo and Wind, 1985)	Long Range Planning	Theoretical Model	NA	<ul style="list-style-type: none"> • The analysis of productivity of the present portfolio and selection of target portfolios: (1) <i>defining investments</i>, (2) 	<ul style="list-style-type: none"> • Normative, based on financial model

*This field includes direct quotations from the articles

Study Theme	Related References	Journal	Research Design	Sample	Key Findings*	Comments
					<p><i>estimating returns and risks, (3) computing portfolio productivity (4) selecting desired sets of investments.</i></p> <ul style="list-style-type: none"> The advantageous of the model: <ul style="list-style-type: none"> Relate corporate or divisional financial objectives of level an volatility of earnings directly to product/market choice Uses explicit forecast to correlate with return Considers not only <i>level of return</i> but also <i>variation in return or risk</i> Provides manager multiple approaches to balancing resource-consuming and resource-generating product-market investment 	<ul style="list-style-type: none"> A procedure fro portfolio selection, rather than portfolio management
	(Cooper, 2008)	Journal of Product Innovation Management	Theoretical Conceptual	NA	<p>New approaches of the <i>next-generation Stage-Gate</i> systems: <i>making the system more flexible, adaptive, and scalable; integration with portfolio management; incorporating accountability and continuous improvement; adapting the system to include open innovation</i></p>	<ul style="list-style-type: none"> It embarks from practical perspective Limited theoretical background
	(Cooper et al., 1999)	Journal of Product Innovation Management	Mixed Sequential	205 Business Units Multi industry US	<ul style="list-style-type: none"> <i>Financial models</i> are used most often but they do not yield the best results. <i>Scoring models</i> tend to produce much better portfolios in terms of the various performance metrics. Four clusters of businesses were identified in terms of where they were located on a perception/satisfaction map: <ul style="list-style-type: none"> <i>Benchmarks</i>, whose portfolio methods rated as high quality and they fit management well. <i>Cowboy businesses</i> rely on an informal (or no) method to select their portfolio but this fits management's style well. <i>Crossroads businesses</i> employ a well-rated, high-quality portfolio approach, but it does not seem to fit management well <i>Duds</i> rate their portfolio approach poor on just about every metric. <i>Benchmark</i> companies: <ul style="list-style-type: none"> View portfolio management as very important. Have an established, explicit, and formal <i>method for portfolio management</i>. The method they use features very clear and well-defined rules and procedures for portfolio management. 	<ul style="list-style-type: none"> The process how decisions are made is not discussed Related more to portfolio selection rather than portfolio management

*This field includes direct quotations from the articles

Study Theme	Related References	Journal	Research Design	Sample	Key Findings*	Comments
Strategic Decision Making	(Mazzolini, 1981)	Long Range Planning	Theoretical Conceptual	NA	<ul style="list-style-type: none"> • Tend to use multiple portfolio methods more: <i>strategic and financial approaches; strategic approaches combined with bubble diagrams; and financial, strategic, and scoring models together.</i> • The <i>quality of the portfolio method</i> appears to have much more impact on <i>performance results</i> than whether or not the method <i>fits management's style.</i> 	<ul style="list-style-type: none"> • It is a decision-making literature not directly related to portfolio management
	(Dean and Sharfman, 1996)	Academy of Management Journal	Quantitative Survey	52 decision (24 companies) Multi industry (industrial and consumer) US	<ul style="list-style-type: none"> • Neither <i>people</i> nor <i>organisations</i> really behave <i>rationally</i> • Organisations are not <i>monoliths</i> behaving as <i>unitary agents</i> but rather <i>aggregations</i> of <i>sub- organisations</i> that loosely knit together by agreed upon <i>procedures.</i> • Strategic behaviour is the product of <i>organisational processes</i> in five main ways: <i>decision-need identification; search for alternatives for action; investigation of courses of action; reviews and approval; implementation.</i> • Four fundamental features of the <i>process approach: Actors; Goals; Search; Top Management Function.</i> • The preeminent trait of organisational activity is its programmed character (the extent to which <i>behaviour</i> is the <i>product of set processes</i>) • The focus is on <i>standard operating procedures</i> and <i>routines</i>, which vitally condition what a company does and does not do. 	
	(Lant and Hewlin, 2002)	Group & Organization Management	Quantitative Experimental	87 students and executives US	<ul style="list-style-type: none"> • <i>Procedural rationality</i> is positively related to decision effectiveness • <i>Political behavior</i> is negatively related to effectiveness • <i>Environmental favorability</i> and <i>quality of implementation</i> are both positively related to strategic decision effectiveness. • <i>Environmental instability</i> moderates the effects of <i>environmental favorability</i> on decision effectiveness. • Prior decisions influenced tactical decision-making; the competitive environment influenced both tactical and strategic decision-making. • Tactical decisions would use internally focused information whereas strategic decisions would use externally focused information. 	
Strategic Decision-Making	(Moenaert et al., 2010)	Journal of Product Innovation	Mixed method Sequential	<i>Exploratory:</i> 17 companies (22	<ul style="list-style-type: none"> • The Strategic market options criteria: <ul style="list-style-type: none"> • <i>Business Opportunity:</i> the economic rent the manager 	<ul style="list-style-type: none"> • It is a strategic decision-making literature not directly related to portfolio management • How decisions are made is not discussed • No linkage between strategic and tactical decision-making
					<ul style="list-style-type: none"> • The Strategic market options criteria: <ul style="list-style-type: none"> • <i>Business Opportunity:</i> the economic rent the manager 	<ul style="list-style-type: none"> • Investigated the factors that influence

*This field includes direct quotations from the articles

Study Theme	Related References	Journal	Research Design	Sample	Key Findings*	Comments
in Innovation		Management		<p>projects). 14 products, 3 services based industry. Belgium and Netherland. <i>Survey:</i> 144 questionnaires. Chemical Global</p>	<p>expects to gain from the investment.</p> <ul style="list-style-type: none"> • <i>Feasibility</i>: the degree to which the proposed option is expected to be possible, in economic, technical, and organisational terms. It assessed based on (1) its alignment with corporate strategy, (2) the resource requirements, (3) the flexibility and (4) the quality of the team that proposes the strategic option. • <i>Competitiveness</i>: the relative strength of the proposed new product compared with the offerings of other firms in the industry. • <i>Leverage</i>: the expected likelihood of positive spillover effects. • <i>Business opportunity</i> and <i>feasibility</i> are the most important decision-making factors when selecting, <i>ex ante</i>, innovation projects • <i>Feasibility</i> does not significantly influence the success of projects <i>ex post</i> as <i>business opportunity</i> and <i>competitiveness</i> do. • All other relationships between the <i>managers' idiosyncrasies</i>, <i>the current and future context</i> of the business unit with the <i>decision-making criteria</i>, are non-significant. 	<p>projects evaluation</p> <ul style="list-style-type: none"> • How projects are evaluated are not discussed

*This field includes direct quotations from the articles

	Study Theme	Related References	Journal	Research Design	Sample	Key Findings*	Comments
Systematic Review Question 2 <i>How does the NPD portfolio management process link to strategy process?</i>	Front-End NPD and Strategy	(Poskela, 2007)	International Journal of Innovation & Technology	Qualitative Case Study, Multiple	20 Companies Multi industry Finland	<ul style="list-style-type: none"> Companies exploit different <i>strategy-making processes</i>, and that each strategy-making mode is prone to particular challenges. The relationship between the <i>integration challenges</i> and <i>employed strategy-making modes</i> is also partly moderated by the <i>company size</i>. <i>Strategic level front-end activities</i> form a basis for the success of <i>operative level innovation activities</i> and necessitate top management involvement. Effective <i>integration of strategic level and operative level front-end activities</i> both in top-down and bottom-up processing is a cornerstone for creating an <i>effective innovation process</i>. From the top-level business managers' point of view the effectiveness of integration of strategic level and operative level front-ends is depended on three factors: (a) the level of concreteness of business strategies, (b) the emphasis of business-minded decision making and (c) the balance between control and creativity. 	<ul style="list-style-type: none"> How the integration is formed and maintained are not considered The linkage between business strategy and strategic portfolio decision-making process is not discussed
		(Khurana and Rosenthal, 1997)	Sloan management review	Qualitative Case Study, Multiple	11 companies (75 managers). Multi industry (consumer packaged good, electronic, industrial products). US (7) and Japan (4)	<ul style="list-style-type: none"> Most companies have unnecessarily fuzzy front-end systems. The best way to integrate the front-end process is to <i>use an overall systems perspective</i> and thoroughly assess the current state of the front-end <i>Company size, decision-making style, operating culture</i> and <i>frequency</i> of new product introduction are some factors that are critical to a preferred front-end solution Managing to become less fuzzy means integrating seemingly disparate but related <i>strategic and operational activities</i>, typically <i>crossing functional boundaries</i> 	<ul style="list-style-type: none"> The framework does not accommodate the portfolio change decision How to link to strategy is not defined
		(Martinsuo and Poskela, 2011)	Journal of Product Innovation Management	Quantitative Survey	107 companies Multi industry (consumer and industrial) Finland	<ul style="list-style-type: none"> <i>Competitive potential</i> has a significant positive correlation with the <i>use of market</i>, and <i>technical criteria</i>. <i>Future business potential</i> has a significant positive correlation with the <i>use of strategic and technical criteria</i> The benefits of <i>strategic criteria</i> may be more apparent at the <i>business level</i>, not at the level of <i>single concepts</i>. <i>Assessment formality</i> and the <i>use of evaluation criteria</i> mediated the relationship between <i>product complexity</i> and <i>strategic opportunity</i>. <i>Concept complexity</i> and <i>novelty</i> had a significant direct 	<ul style="list-style-type: none"> Investigated the relationship between antecedents, moderators and outcomes of the front-end innovation projects It is not discussed the way to establish a link between portfolio

*This field includes direct quotations from the articles

Study Theme	Related References	Journal	Research Design	Sample	Key Findings*	Comments
	(Poskela and Martinsuo, 2009)	Journal of Product Innovation Management	Quantitative Survey	133 companies Industrial product Finland	<p>association with the <i>future business potential</i>.</p> <ul style="list-style-type: none"> • The <i>mediating role of evaluation criteria</i> as a way to enhance the positive effects of <i>concept novelty</i> and to reduce the effects of <i>complexity</i> draws attention to how managers focus their attention, information search, and negotiation on both internal and external sources of uncertainty. • Input control is positively associated with <i>strategic renewal</i>. • Front-end <i>process formalization</i> and <i>outcome-based rewarding</i> are not associated with <i>strategic renewal</i>. • Intrinsic task motivation front-end is positively associated with <i>strategic renewal</i>. • <i>Market and technology uncertainty</i> have positive association with <i>strategic renewal</i>. • None of the <i>control variables</i>—firm (size, R&D intensity), industry (industry sector) and the front-end project itself—had a significant association with <i>strategic renewal</i>. • Higher degrees of <i>market uncertainty</i> do not increase the negative effect of front-end <i>process formalization</i>. • The more <i>technology uncertainty</i>, the more negative association between front-end <i>process formalization</i> and <i>strategic renewal</i>. • Higher degrees of <i>market uncertainty</i> do not increase the negative effect of <i>outcome-based rewarding</i>. • The more <i>technology uncertainty</i>, the more negative the association between <i>outcome-based rewarding</i> and <i>strategic renewal</i>. 	<ul style="list-style-type: none"> • management and strategy process • Front-end performance is represented by strategic renewal • The relationship with NPD is not discussed • business strategy is overlooked in the model
Strategy Process	(Hutzschenreuter and Kleindienst, 2006)	Journal of Management	Theoretical Literature review	NA	<ul style="list-style-type: none"> • Integrative Framework: <ul style="list-style-type: none"> • <i>Antecedents</i>: Environmental Context (uncertainty, complexity); Strategic context (analyzer, defender); Static organisational Characteristics (organisation size, organisation age); Dynamic organisational characteristics (routines, business process); Performance (economic, non-economic). • <i>Strategy Process</i>: Strategists' static characteristics; Strategists' personal and cognitive context; Issue characteristics; process characteristics; process outcome characteristics • <i>Outcomes</i>: Environmental Context; Strategic context; 	<ul style="list-style-type: none"> • There is no stream of research proposed that links strategy process with other fields.

*This field includes direct quotations from the articles

Study Theme	Related References	Journal	Research Design	Sample	Key Findings*	Comments
	(Johnson et al., 2003)	Journal of Management Studies	Theoretical Conceptual	NA	<p>Static organisational Characteristics; Dynamic organisational characteristics; Performance.</p> <ul style="list-style-type: none"> • Research stream: <ul style="list-style-type: none"> • Stream 1: Antecedents' influence on strategy process • Stream 2: Antecedents' influence of outcomes • Stream 3: Strategy process's influence on strategy process • Stream 4: Strategy process's influence on outcomes. • The focus of today's research lies in the planning-performance link and the description of planning practices in organisations. • It was identified six main perspectives of strategy-process research: <i>rational-mechanistic perspective, cognitive perspective, upper-echelon perspective, middle-management perspective, organic perspective, and micro perspective.</i> • <i>Micro strategy and strategizing</i> is concerned with the same <i>strategic issues</i>, but in terms of 'the <i>detailed processes and practices</i> which constitute the day-to-day activities of organisation life and which relate to <i>strategic outcomes</i>'. • <i>Benefit</i>: Extending existing traditions of research; transcending divisions within the discipline; and offering practical, actionable guidance to practitioners • <i>Challenges</i>: (1) Macro level's aim is to explain organisational performance. An activity-based view is trying to demonstrate how configurations of such assets take shape; (2) Knowledge accumulation; (3) Design of research: micro studies have to be constrained in terms of their scope and unit of analysis; (4) Requires a close engagement with practice rather than a reliance on surrogate measures. It will benefit from the joint production of knowledge directly involving practitioners. 	<ul style="list-style-type: none"> • The relationship to portfolio management could not be identified
Strategic Decision-Making and Strategy Process	(Noda and Bower, 1996)	Strategic Management Journal	Qualitative Case Study, Multiple	2 Companies Telecommunication US	<ul style="list-style-type: none"> • The new business development and strategy-making processes using the <i>Bower-Burgelman (B-B)</i> model highlights <i>intra organisational dynamics</i> by which managers at <i>multiple levels</i> relate to <i>external and internal forces</i> and deal with <i>cognitive, political and organisational consequences</i> of their actions. • Seminal elements of strategy making in a complex firm: <i>entrepreneurial initiatives of front-line managers,</i> 	<ul style="list-style-type: none"> • Identified general strategic decision-making • No decision-making in portfolio management

*This field includes direct quotations from the articles

Study Theme	Related References	Journal	Research Design	Sample	Key Findings*	Comments	
Systematic Review Question 3 <i>How does the link between the NPD portfolio management process and strategy process relate to organisational routines?</i>	Behavioral Operations	(Gino and Pisano, 2008)	Manufacturing & Service Operations Management	Theoretical Conceptual	NA	<ul style="list-style-type: none"> • <i>integrating/brokering activities of middle managers</i>, and the <i>corporate context set up by top managers</i> and its subsequent changes. • <i>Entrepreneurial managers</i> can and actually do develop <i>independent strategic premises</i> based on their visions and intentions regardless of those of top managers. • Different <i>corporate contexts</i> function as an internal selection environment to generate a <i>varied resource allocation pattern</i> and to shape different <i>evolutionary dynamics</i> among competing multiple businesses. • A behavioral approach to OM can lead to a better understanding of underlying drivers of operating system performance and also to a better understanding of puzzling “pathologies” (e.g., excess inventory, late product development projects, over-commitment to R&D projects, etc.). • A behavioral perspective can lead to a better identification of appropriate management interventions. 	<ul style="list-style-type: none"> • No suggestions to establish systems based on behavioural perspective • Very limited discussion on portfolio decisions
	Organisational Capabilities	(Dosi et al., 2000)	The Nature and Dynamics of Organizational Capabilities, Oxford University Press	Theoretical Conceptual	NA	<ul style="list-style-type: none"> • Capabilities involve <i>organized activity</i> and the exercise of capability is typically repetitious in substantial part. • <i>Routines</i> are units or ‘chunks’ of organized activity with a repetitive character. Routines are the <i>building blocks of capabilities</i>—although routines are not the only building blocks of capabilities. <i>Routines</i> are the <i>skills of an organisation</i>’ is a metaphorical truth not a literal truth. • A fundamental proposition in evolutionary economics is that firms have ways of doing things that show strong <i>elements of continuity</i>. • Research on capabilities advances the evolutionary economics agenda in three significant ways: (1) It provides concrete examples and specific empirical evidence; (2) the relationship between <i>capabilities</i> and <i>organisational routines</i>; (3) the capabilities discussion provides a bridge between the <i>descriptive concerns of evolutionary theory</i> and the <i>prescriptive analysis of firm strategy</i>. • Within any organisation, capabilities, in principle aimed to ‘<i>solve problems</i>’ in the broadest sense come anyhow together with <i>specific mechanism of governance</i> of potentially conflicting interests and incentives. • <i>The capabilities-based view</i> sees <i>aggregate economic</i> 	<ul style="list-style-type: none"> • No empirical evidences • Linkages to the lower level capabilities (process level) are not addressed

*This field includes direct quotations from the articles

Study Theme	Related References	Journal	Research Design	Sample	Key Findings*	Comments
	(O'Connor, 2008)	Journal of Product Innovation Management	Theoretical Conceptual	NA	<p>progress largely as the consequence of a <i>multiplicity of actions at the firm level</i>.</p> <ul style="list-style-type: none"> • There are seven elements that form a <i>management system</i> rather than a <i>process-based approach</i> to nurturing <i>radical innovation</i> (1) an identifiable organisation structure; (2) interface mechanisms with the mainstream organisation, some of which are tightly coupled and others of which are loose; (3) exploratory processes; (4) requisite skills and talent development, given that entrepreneurial talent is not present in most organisations; (5) governance and decision-making mechanisms at the project, Major Innovation (MI) portfolio, and MI system levels; (6) appropriate performance metrics; and (7) an appropriate culture and leadership context. • These elements must be brought into <i>internal consistency</i> and into <i>alignment</i> with the requirements of operating in a <i>highly uncertain environment</i> 	<ul style="list-style-type: none"> • No empirical evidences • The system proposed is not linked to the innovation performance • The environmental factors is not considered
	(Salvato, 2009)	Organization science	Qualitative Case Study, Single, longitudinal	Single company Home products manufacturing Italy	<ul style="list-style-type: none"> • There are three key findings: (1) <i>established capabilities</i>, which function as semiautomatic, <i>less-mindful entities</i> are systematically reshaped by <i>mindful ordinary acts</i> carried out by individuals within and around the organisation; (2) <i>timely managerial interventions</i> encode successful experiments into higher-level organisational capabilities; (3) whereas <i>“mutated”</i> processes resulting from mindful experiments temporarily underperform the original “level n” capability, “n+1 level” capabilities resulting from the encoding of such heterogeneous experiments display <i>higher process homogeneity</i> and a <i>permanent increase in performance</i>. • <i>Micro and ordinary activities</i> carried out by individuals within and around the organisation and at all levels in the organisational hierarchy are central to determining the idiosyncratic content of <i>capabilities</i> and their <i>dynamic adaptation</i> over time • The heterogeneity and variety of experiments from which lessons for improving capabilities are drawn can be increased through such mechanisms as promoting <i>individual discretion over decisions</i>, <i>reducing bureaucratic controls</i>, <i>favouring face-to-face interaction styles</i>, and <i>promoting diversity of internal and external collaborators</i>. 	<ul style="list-style-type: none"> • The linkage between ordinary (operational) and strategic activities is not discussed • How the activities affect the NPD performance is not analysed

*This field includes direct quotations from the articles

Study Theme	Related References	Journal	Research Design	Sample	Key Findings*	Comments
Organisational Routines	(Feldman and Orlikowski, 2011)	Organization Science	Theoretical Research experience	NA	<ul style="list-style-type: none"> The principles of theorizing routines as practices: (1) the <i>consequentiality</i> of action means not just that <i>routines</i> are created through <i>action</i> and do not exist without action, but also that the development of the <i>routine</i> occurs through the enactment of it; (2) there are <i>two primary dualities</i> engaged in theorizing routines as practices: <i>action/structure</i> and <i>stability/change</i>; (3) both of these dualities are <i>relational</i> and <i>mutually constitutive</i>. In the mutually <i>constitutive</i> ways, <i>agency</i> is shaped by but also <i>produces, reinforces, and changes</i> its <i>structural</i> conditions <i>Actions</i>, as performances or <i>performative</i> aspects, and <i>structures</i>, as <i>patterns</i> or <i>ostensive</i> aspects, are not oppositional but <i>mutually constitutive</i>. In <i>practice theory</i>, the emphasis is on the <i>relationships</i> and <i>performances</i> that produce <i>outcomes</i>. 	<ul style="list-style-type: none"> It is unclear at which level of organisation 'practices' exist No link with portfolio management
	(Levinthal and Rerup, 2006)	Organization Science	Theoretical Conceptual	NA	<p>Four Complementarity Elements of the Mindful and Less-Mindful Behaviour:</p> <p>Mindfulness and Repertoires of Action:</p> <ul style="list-style-type: none"> Mindfulness requires two basic elements: <i>attentiveness</i> to one's context and the <i>capacity to respond</i> to unanticipated cues or signals from one's context. The cognitive processes: (1) responding rapidly to stimuli and to engage in a wide set of possible actions by choosing <i>established routines</i> from an inventory; (2) <i>recombining the existing routines</i> to result in the rapid emergence of <i>novelty</i> <p>Sustaining Mindfulness:</p> <ul style="list-style-type: none"> Variations in mindfulness can occur over time and across organisational units and hierarchical levels. To sustain coordination of the task and prevent detachment, it is required to develop and use several <i>integrating mechanisms</i> that generate a <i>storehouse</i> or <i>structure of action possibilities</i> that shape <i>agency</i> across the organisation. <p>Mindfulness and the Enactment of Routines:</p> <ul style="list-style-type: none"> <i>Ambiguous stimuli</i> are a challenge to <i>less-mindful</i> action because such stimuli require <i>interpretation</i>, and possibly the <i>coordination</i> of such interpretations with others before established <i>repertoires</i> can be triggered. 	<ul style="list-style-type: none"> Mindful and less mindful mechanisms are not associated with decision-making process Impacts on firm performance are not explored

*This field includes direct quotations from the articles

Study Theme	Related References	Journal	Research Design	Sample	Key Findings*	Comments
	(Salvato and Rerup, 2011)	Journal of Management	Theoretical Conceptual	NA	<ul style="list-style-type: none"> • There is an <i>internal dynamic to routines</i> that promotes continuous change and calls for constant <i>re-enactment</i>. <p>Mindfulness and the Encoding of Ambiguous Outcomes:</p> <ul style="list-style-type: none"> • The link between <i>mindful</i> and <i>less-mindful</i> perspectives not only runs from the <i>mindful</i> encoding of the environment, but also runs in reverse in the sense of how the repertoire of <i>less-mindful</i> behavior impacts the <i>mindful process</i> of encoding. <p>Two Tension Elements of the Mindful and Less-Mindful Behavior:</p> <p>Opportunity Costs of Mindfulness:</p> <ul style="list-style-type: none"> • The <i>less-mindful</i> perspective emphasizes the role of <i>continuity</i> as a mechanism to preserve accumulated experience, while the <i>mindful</i> perspective stresses the importance of <i>novelty</i> to respond to changing and possibly unique circumstances. <p>Normative Claims:</p> <ul style="list-style-type: none"> • Research on <i>mindfulness</i> at the <i>individual level</i> and <i>organisational level</i> reveals that <i>mindfulness</i> is almost always conceptualized as leading to <i>positive outcomes</i>, while <i>less-mindful</i> forms of learning are generally seen as leading to <i>less-favorable outcomes</i>. • It is suggested the proposition that all processes, including <i>mindful</i> and <i>less-mindful</i> processes may have both <i>positive</i> and <i>negative</i> consequences <ul style="list-style-type: none"> • By further specifying how <i>capabilities</i> and <i>routines</i> can be interpreted as <i>sequence of individual action</i>, a deeper understanding of the role that <i>individuals play in shaping routines, capabilities and firm performance</i>. • By elaborating how emotions and micro social interactions within and outside the routine are central dimensions of routines' performance, an opportunity to more accurately capture how the <i>proximate micro context in routines influences organisational performance and change</i> is provided • By tracing how the <i>individual activities within a routine</i> can be linked to <i>different levels of the organisational hierarchy</i> and their associated rationalities, the understandings of <i>if and how higher-level rationalities and managerial</i> 	<ul style="list-style-type: none"> • The interrelationship between routines in shaping higher-level entities is overlooked • The level of the portfolio management activities could not be identified

*This field includes direct quotations from the articles

Study Theme	Related References	Journal	Research Design	Sample	Key Findings*	Comments
	(Howard-Grenville, 2005)	Organization Science	Qualitative Case Study, Single	Single company Semi conductor US	<p><i>foresight can emerge across the hierarchy</i> are improved.</p> <ul style="list-style-type: none"> By further specifying how <i>routines</i> can be broken into their <i>ostensive</i> and <i>performative</i> components and how their interactions can be studied, a deeper understanding of the <i>role that routines</i> might be playing in <i>shaping higher-level organisational entities</i> is provided. The more strongly embedded a <i>routine</i> is in other <i>structures</i>, the greater command and individual must have over these <i>structures</i> in order to produce change over time. A <i>routine</i> embedded in <i>technological structure</i> may be altered by those whose power accrues from command over <i>traditional allocative resources</i> (money, knowledge and technical expertise). Changing <i>routines</i> that are strongly embedded in <i>cultural structures</i> may rely heavily on the use of <i>authoritative</i> and <i>relational resources</i> because they can be used to frame and negotiate, over time, shared meaning, shared norms, and collectively identity 	<ul style="list-style-type: none"> The influence of routines that are embedded in other structures on organisational outcomes was not investigated
	(Peters and O'Connor, 2012)	RPI Working Paper	Qualitative Case Study, Multiple	Phase 1: 10 companies Phase 2: 21 companies Multi industry US	<ul style="list-style-type: none"> Transformational Routines: (1) <i>Discovery</i> focuses on the identification, elaboration and articulation of breakthrough opportunities; (2) <i>Incubation</i> focuses on experimenting with how opportunities manifest themselves from a technological, market/business model, and organisational strategy and structure standpoint; (3) <i>Acceleration</i> institutionalises the nascent businesses by scaling them to levels that allow predictability and traditional planning mechanisms to work, and integrates them into the mainstream of the company. Discovery include: a) equipping the organisation for idea generation and alertness to opportunities; b) engaging with the scientific community; c) identifying and elaborating opportunities; d) developing and socializing opportunities, and e) evaluating opportunities for further investment. <i>Discovery</i> allows for <i>path-breaking</i> rather than <i>path-dependent</i> behavior and decision making. Incubation is to nurture opportunities identified in <i>Discovery</i> that have uncertain outcomes but immense possibility for the market and the company. Four sets of activities as key to an <i>Incubation</i> capability: a) legitimizing incubation within the larger organisation; b) 	<ul style="list-style-type: none"> The level of organisation in which the process takes place is not identified Not much information about portfolio management activities

*This field includes direct quotations from the articles

Study Theme	Related References	Journal	Research Design	Sample	Key Findings*	Comments
	(Tranfield et al., 2003b)	International Journal of Innovation Management	Qualitative Case Study, Multiple	11 companies Multi industry UK	<p>managing the portfolio of Break through Innovation's (BI); c) providing support for projects through coaching and mentoring; and d) evaluating project progress.</p> <ul style="list-style-type: none"> • Acceleration is the <i>routine</i> that escalates fledgling businesses to the point where they can stand on their own relative to other business platforms in the organisation's operating units. • Four sets of activities of <i>Acceleration</i>: 1) garnering resources for scaling; 2) preparing the BI businesses to comply with the <i>operational excellence system</i>; 3) preparing the organisation to accept the new business, and 4) evaluating accelerating businesses. • <i>Acceleration is the implementation routine to institutionalise changes that Discovery surfaces and Incubation develops.</i> • A practitioner perspective: <ul style="list-style-type: none"> • It offers a conceptual framework for knowledge management in innovation, a map of the territory rather than a prescriptive route. It offers managers a framework within which they can initially locate, and then subsequently monitor, their innovation activity. • It enables managers to audit their knowledge management processes, either off-line as a review of past procedures or on-line during a current innovation, to assess the presence or absence of routines, to exploit those at which they are adept and to improve on those at which they are less so. • This synthesis and generic model is both theoretically and empirically grounded in evidence from widely dissimilar organisations. It therefore provides a basis for cross sector transfer of learning and practice. • A theoretical perspective: <ul style="list-style-type: none"> • It provides an understanding of the theory of innovation particularly in project-based environments. • It contributes by arguing the case for thinking in terms of routines which can be adapted, developed and crafted locally, but which are grounded in the repetition of common generic patterns. 	<ul style="list-style-type: none"> • No portfolio management process discussed • The process is not related to decision-making.
	(Turner and Rindova, 2012)	Organization Science	Qualitative Case Study,	6 organisations Waste collection	<ul style="list-style-type: none"> • Recognition of the tension between the need to ensure <i>consistency</i> and <i>respond to change</i> leads organisational 	<ul style="list-style-type: none"> • The cases are service organisations

*This field includes direct quotations from the articles

Study Theme	Related References	Journal	Research Design	Sample	Key Findings*	Comments
			Multiple	US	<p>members to simultaneously establish and maintain two <i>ostensive patterns</i>: one of targeted <i>consistency</i> and another of <i>flexibility</i> in internal coordination.</p> <ul style="list-style-type: none"> To maintain dual <i>ostensive patterns</i> that combine targeted <i>consistency</i> and enacted <i>flexibility</i>, organisational members leveraged <i>artefacts</i> and <i>connections</i> both in processes that <i>standardize</i> and <i>stabilize</i> behaviors and in processes that facilitate <i>flexible</i> and <i>mindful</i> responses. Artefacts were used for (a) <i>standardizing routine actions</i>, as emphasized in much of prior research, and (b) for <i>reorganizing routines under conditions of change</i> so that elements of standard action sequences were preserved while discretion is exercised. Similarly, through <i>connections</i>, routines (a) coalesced into well-understood and agreed-upon patterns of interdependent actions and (b) were reconstituted, as social capital was leveraged to arrive at new agreements about redesigned action sequences. 	<ul style="list-style-type: none"> The nature of jobs in the cases is more operational than strategic
Agency	(Emirbayer and Mische, 1998)	American Journal of Sociology	Theoretical Conceptual	NA	<ul style="list-style-type: none"> <i>Agency</i> as temporally constructed engagement by <i>actors</i> of different structural environments Different constitutive elements of human agency: <i>Iterational or habitual aspect, Projective capacity, Practical evaluative</i> Actors are always living simultaneously in the past, future and present, and adjusting various temporalities of their empirical existence to one another in more or less imaginative or reflective ways. 	<ul style="list-style-type: none"> The role of agency in organisational routines is not discussed The role of agency on the organisation's performance is not discussed
Portfolio Management and Dynamic Capabilities	(Killen et al., 2012)	International Journal of Project Management	Theoretical Literature review and Research experience	NA	<ul style="list-style-type: none"> <i>Project Management (PM) as a strategic asset through the Resource-Based View (RBV)</i>: The RBV is appropriate to identify and categorise PM resources. Intangible PM resources directly contribute to competitive advantage through PM. Tangible resources do not. <i>Mixed methods</i> studies can be applied to research on PM and competitive advantage. <i>Project Portfolio Management (PPM) as a Dynamic Capability (DC) using the Processes, Position and Path (PPP) framework</i>: DC theory aligns with the learning and change observed and <i>outlines mechanisms</i> through which PPM can contribute to competitive advantage. Tracking capability initiation and evolution, learning and change are beneficial 	<ul style="list-style-type: none"> Descriptive article The link with portfolio management is not specific The relationship with organisational routines is overlooked

*This field includes direct quotations from the articles

Study Theme	Related References	Journal	Research Design	Sample	Key Findings*	Comments
					<p>for the study of PPM as a DC.</p> <ul style="list-style-type: none"> • <i>Using DC to study PPM in dynamic environments:</i> Terminology such as reconfiguring and transforming were ill-defined in the literature. DC could be decomposed into multiple orders. Challenges in classifying organising mechanisms into sensing, seizing, reconfiguring/transforming and in expressing /translating DC for interviewees • <i>Applying Absorptive Capacity (AC) to PM research:</i> Potential AC (the ability to acquire and assimilate new knowledge) was more easily achieved than <i>realised AC</i> (the ability to transform and exploit this new knowledge). AC conceptual framework helped to qualify and compare the level of <i>potential</i> and <i>realised ACs</i> and to appreciate the mechanisms and processes with the greatest influence on the level of absorption 	

*This field includes direct quotations from the articles

Appendix K Data Collection Plan Details

Task No	Data Collection Source		Participants	Task Descriptions	Data Recording
1		Kick-off Meeting	CEO All Directors	<ul style="list-style-type: none"> • Introduction • Research Plan • Scheduling 	<ul style="list-style-type: none"> • Field notes
2	ITV 1	Interviews 1	CEO Directors: <ul style="list-style-type: none"> • R&D • Marketing 	<ul style="list-style-type: none"> • Company's strategy • Innovation and product strategy • Portfolio management process • Decision-making process 	<ul style="list-style-type: none"> • Audio recordings • Field notes
3	DOC 1	Documents 1		<ul style="list-style-type: none"> • Corporate's profile • Annual report 	<ul style="list-style-type: none"> • Documents • Computer files
4	ITV 2	Interviews 2	Directors: <ul style="list-style-type: none"> • Finance • Manufacturing • Supply Chain Management • Information Technology 	<ul style="list-style-type: none"> • Company's strategy • Innovation and product strategy • Portfolio management process • Decision-making process 	<ul style="list-style-type: none"> • Audio recordings • Field notes
5	ITV 3	Interviews 3	Managers: <ul style="list-style-type: none"> • Product Development • Marketing • Key Account 	<ul style="list-style-type: none"> • New product development process • Portfolio management process 	<ul style="list-style-type: none"> • Audio recordings • Field notes
6	DOC 2	Documents 2		<ul style="list-style-type: none"> • Standard Operating Procedures (SOP) • Forms • Reports • NPD's Minutes of Meetings (MOM) • Manuals 	<ul style="list-style-type: none"> • Documents • Computer files
7	ITV 4	Interview 4	Managers: <ul style="list-style-type: none"> • Engineering • Production • Material Planning 	<ul style="list-style-type: none"> • New product development process • Portfolio management process • Decision-making process 	<ul style="list-style-type: none"> • Audio recordings • Field notes
8	EXP 1	Experiment 1	Directors	A role play of a portfolio decision-	<ul style="list-style-type: none"> • Video recordings

Task No	Data Collection Source		Participants	Task Descriptions	Data Recording
9	MOB 1	Meeting Observation 1	Managers Directors Managers	making process Observing a strategic level portfolio decision-making meeting	<ul style="list-style-type: none"> • Field notes • Audio or Video recordings • Field notes
10	ART	Artefacts		Documenting artefacts: <ul style="list-style-type: none"> • Charts • Pictures • Physical settings (e.g. meeting rooms, working space, equipment) 	<ul style="list-style-type: none"> • Photographs • Video records • Computer files
11	ITV 5	Interview 5	Managers: <ul style="list-style-type: none"> • Purchasing • Distribution • Accounting and Finance 	<ul style="list-style-type: none"> • New product development process • Portfolio management process • Decision-making process 	<ul style="list-style-type: none"> • Audio Recordings • Field notes
12	ITV 6	Interviews 6	Informants	Information gathering from the sources that indirectly involved in portfolio decision-making	<ul style="list-style-type: none"> • Audio Records • Field notes
13	ITV 7	Interviews 7	<ul style="list-style-type: none"> • CEO • R&D Directors • Product Development managers 	<ul style="list-style-type: none"> • Verifying the data gathered • Complementing the evidences collected 	<ul style="list-style-type: none"> • Audio Records • Field notes
14		Closing Meeting	<ol style="list-style-type: none"> 1. CEO and All Directors 2. All Managers 	<ul style="list-style-type: none"> • Reporting the <i>Interim Site Summary</i> • Results validation • Evaluation 	<ul style="list-style-type: none"> • Audio Recordings • Field notes

Appendix L Personal Learning

Reviewing the NPD portfolio management area through various knowledge domains was quite challenging. I was even more enthusiastic after we, i.e. my supervisors and I, decided to include organisational routines as another knowledge domain, following Prof. Cliff Bowman's suggestion. I knew that this would not be easy, as I would be exploring an underdeveloped research area. However, by doing this, I was expecting to be able to contribute something of value.

The consequence of this selection appeared when the keywords searches resulted in an insignificant number of relevant articles. Even though independently selected and cross-referenced articles, together with a number of experts' recommendations were included, the total articles were still insufficient to uncover the area of interest.

The article selection process has taken quite long time, as well as the information extraction. This might be because I conducted these stages in unstructured ways. The most interesting process was the synthesis of findings. In accomplishing this stage, frameworks were the most effective means in assisting me to understand and synthesise the constructs.

The main concern was writing up the arguments. This stage was quite challenging for me. Nevertheless, Prof. Goffin's supervision has helped me in improving this skill. He emphasises to go for simple and straightforward writing, so that my readers can easily understand my ideas. I believe, along the way of my next PhD process, I will be able to continuously build my skills to reaching the required level.

In the future, another point that needs to receive attention concerns how I could work more efficiently, by focusing on achieving the objectives. Overall, this systematic literature review process has given me priceless experiences, which will be useful for the next stages of the PhD process.